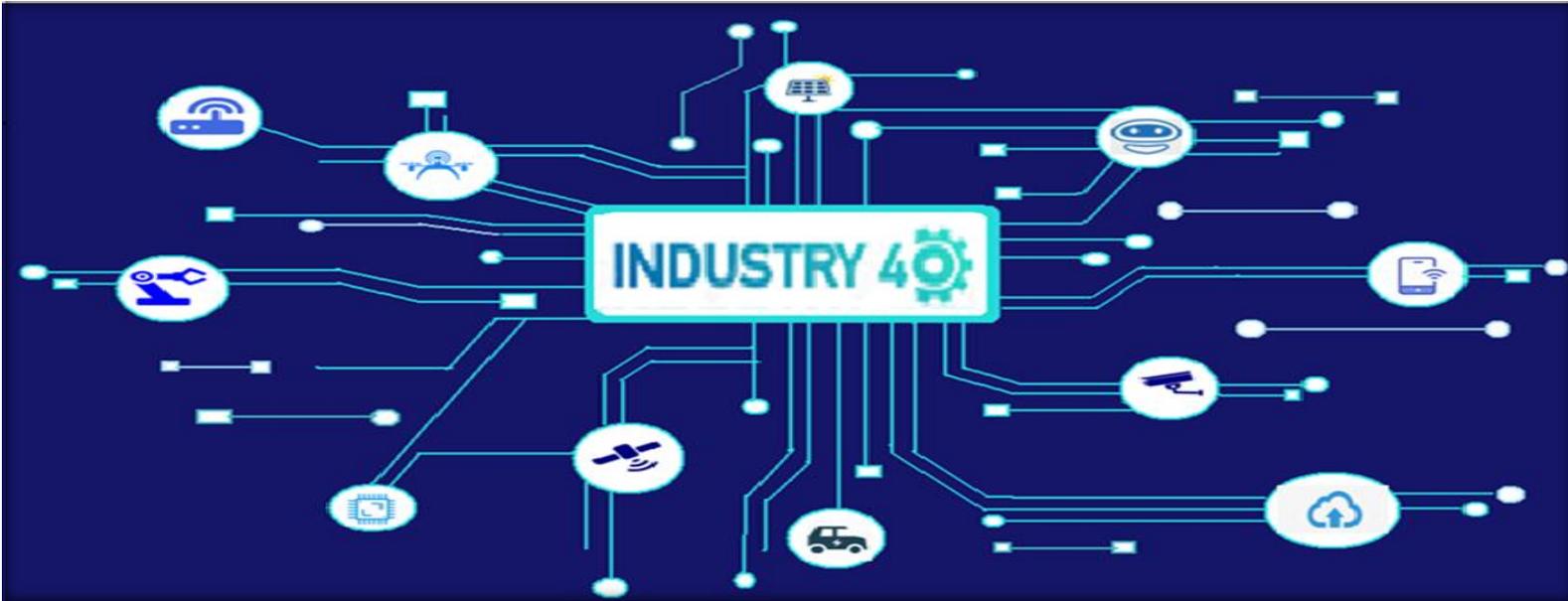


25th Two Days Virtual National Conference on

# **INDUSTRY 4.0**

**28th and 29th October 2020**



**Editors:**

**Dr. V V Bedekar  
Dr. D K Nayak  
Dr. Kirti Agashe  
Mrs. S K Shukla**



**Organised By**

**Department of Industrial Electronics & Computer Engineering  
VPM's Polytechnic, Thane  
Building No.1, "Jnanadweep", Chendani Bunder Road,  
Thane College Campus, Thane (W)- 400601**

# Conference Schedule

<u>Day 1</u>	<u>Day 2</u>
<p>1. 10:00 AM to 10:15 AM - Inaugural Function</p> <ul style="list-style-type: none"> <li>❖ Dr. V V Bedekar, Chairman, VPM Thane</li> <li>❖ Dr. D K Nayak, Convener &amp; Principal</li> <li>❖ Dr. Kirti Agashe, Organising Secretary HOD, Dept. of Industrial Electronics</li> <li>❖ Mrs. S K Shukla, Jt. Organising Secretary HOD, Dept. of Computer Engineering</li> </ul>	<p style="text-align: center;">Industry Expert - Invited Speaker</p> <p>1. 9:00 AM to 11:00 AM</p> <p>Topic : Smart Manufacturing</p> <p>❑ <a href="#">Mr. B A Damahe,</a> Jt.General Manager,L&amp;T, Mumbai</p>
<p>2. 10:15 AM to 11:00 AM - Keynote Speaker</p> <p>❑ <a href="#">Mr.Parag Rede, Executive VP</a> North America BU, Caps Gemini, India</p>	<p>2. 11:00 AM to 11:45 PM</p> <p>Topic : AI in Industry 4.0</p> <p>❑ <a href="#">Dr. Deepak Anand, Head of AI</a> Griffyn Robotech Pvt. Ltd, USA</p>
<p>3. 11:00 AM to 01:00 PM</p> <p>Topic: I4.0 Architectures, Legacy Systems, Digital Transformation &amp; SMART Engineer</p> <p>❑ <a href="#">Mr. Sudhir Panditrao, CEO &amp; CoFounder</a> SAN Techno Mentors Pvt. Ltd, Pune</p>	<p>3. 12:00 Noon to 12:45 PM</p> <p>Topic: Product Market fit _I4.0</p> <p>❑ <a href="#">Mr. Amit Mahajan, Founder &amp; CEO</a> Xcaliber Infotech Pvt.Ltd,USA</p>

## **Organizing Committee**

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HOD, Department of Computer Engineering

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## Message From the Chairman

I am proud to present the proceedings of the 25th National Conference on 'Industry 4.0' organized by VPM's Polytechnic, to create awareness among students about the most significant revolution in the journey of industrial revolution.

Industry 4.0, which is the fourth Industrial revolution, is set to bring a new level of organization and control over the traditional manufacturing industry. Developments in Robotics, Internet of Things (IoT), and Artificial Intelligence, Big Data Analytics, Cloud Computing, and Wireless communication robotics will be the leading technologies of the new era.

This conference will help the students and participants to understand the probable impact of the fourth industrial revolution on Industry, Education System and Society at large.

I congratulate the organizing committee for undertaking the activity of state level paper writing competition to create awareness about the topic and motivate students during the lockdown period. I congratulate all participants who have attempted to write a technical paper. We are happy to publish a few good papers in the proceedings, which will be a great memory for the budding authors.

The inclusion of stalwarts in the list of invited speakers, and keynote speakers has added a spark to this online National Conference.

I wish all the success to this endeavor of making everyone ready to welcome the era of the Fourth Industry Revolution in its true sense.

**Dr. V V Bedekar**  
**Chairman, Vidya Prasark Mandal**



## Message From the Convener

It gives me immense pleasure to welcome you all to the 25 th National Conference of the Polytechnic Industry 4.0.

The Industries ever since their evolution are classified broadly in following way.

Industry 1.0: The first industrial revolution in late 1700's focused on manual labour and use of steam powered engines and other early machine tools are termed as Industry 1.0.

Industry 2.0: Early part of 20 th century, the world entered into the second stage with the use of steel and electricity in factories, i.e. to implement the concept of mass production.

Industry 3.0: Late 1950's manufacturers used electronic/computing based technologies with more use of digital technology and automation software.

Industry 4.0: This has more emphasis on recent digital technologies, interconnectivity through IOT. Access to real-time data, comprehensive, interlinked, holistic approach for manufacturing and services.

The future functioning at industries focus on the latest approaches which will include Enterprise Resource Planning (ERP), Internet of Things (IOT), Industrial Internet of Things (IIOT), Big Data, Artificial Intelligence (AI), Machine to Machine (M2M), Digitization, Smart factories, Machine Learning (ML), Cloud Computing, Real Time data Processing Ecosystem, Cyber-Physical Systems (CPS) and many more.

The Polytechnic is organizing the 25 th National Conference in the series, albeit in Virtual mode. In our continuing efforts to provide exposure to latest technologies, this will help all the participants to understand the future industries in the renewed perspective.

Gratitude to all the resource persons for having spared their time, when most of the industries are trying to recover from the pandemic effect.

Thanks to our affiliating body Maharashtra State Board of Technical Education (MSBTE), for guiding us efficiently for curricular and examination based activities during the year, when the students are learning from home and faculty have become experts in handling online teaching tools.

The support from AICTE NewDelhi is noteworthy as the huge online resources and workshops are helping the students and faculty to a great extent to interact with experts.

We are sure the Conference and it's Proceedings will enrich all the participants in the emerging area.

Greetings to all !

**Dr.D.K.Nayak,**  
**Principal & Convener**  
**VPM's Polytechnic, Thane**



## Message From Organizing Secretary

It gives me great pleasure to present the conference proceedings of the two day National Conference on 'Industry 4.0'.

I am feeling really happy and honored to work as an organizing secretary for the 25th National Conference of VPM's Polytechnic which is a milestone for the institute.

As a next generation industry revolution, the buzz word 'Industry 4.0' is receiving splendid attention by every sector of industry, research field, education, and society. The journey of the industry revolution that started in 1967 with the invention of the steam engine entered the second revolution phase with the invention of electricity and adoption of mass production. 1980 onwards, the development of computers and the role of information technology brought a new dimension of automation in industrial growth. In Germany, 2011 arrived with the new concept of transformation from machine dominant manufacturing to digital manufacturing. Thereafter, the exponential growth rate of the concept of 'Industry 4.0' is bringing a new paradigm in today's Industry and world.

This conference is primarily organized to create awareness of 'Industry 4.0' and understand the role of emerging technologies like Internet of Things (IoT), Artificial Intelligence (AI), Cyber physical systems (CPS), Big Data Analytics, Cloud Computing, Wireless communication that will bring tremendous growth in Smart Manufacturing, Augmented Reality, Robotics, Automation, Smart Grids, Cyber Security, Predictive maintenance, Network Supply chain and many more.

To bring novelty to achieve the conference goal, we announced a state level paper writing competition for Diploma Engineering students. In spite of pandemic conditions, we received an overwhelming response from the budding authors over the state of Maharashtra. This clearly indicates the curiosity about the theme of the conference in young minds. To acknowledge and appreciate the response and efforts we are publishing 25 best papers of the participants in the conference proceedings.

I am sure that the interaction of participants with experts from India and outside India, during the conference will enrich the young minds to welcome the new era of Fourth Industrial Revolution.

**Dr.Kirti Agashe**  
**Organizing Secretary,**  
**Head Industrial Electronics Department**



## Message From Joint Organizing Secretary

Industry 4.0 (or The Fourth Industrial Revolution) is a level up, a modern insurgency that connects people, processes and machines.

The major technological components which are the foundation stones of Industry 4.0 are

- Huge data quantum
- Cloud Computing
- Internet of Things
- Simulation
- Autonomous Robots
- Augmented Reality
- Cyber Security
- System Integration
- Additive Manufacturing

A combination of these will ultimately make machines capable of making decisions with minimal human intervention. It will transform existing technologies and capabilities in the manufacturing and production industry.

It is an amalgamation of traditional manufacturing practices and sophisticated technology; real-time visibility of the complete value chain, thus allowing for better decisions; and recalibration, which leads to greater efficiency and productivity.

Adaption of Industry 4.0 will lead to following benefits

- Advanced analytics would help to enhance production capacity and its quality. The model would shift towards prediction and prevention of defects through data analytics.
- The adoption of Robotics & automation would shorten production cycles, reduce time-to-market and bring about efficient utilization of resources.
- The digitization of various business processes would lead to cost-saving and a better experience for customers and employees.

- IOT and connectivity of machine to people and machine to a machine would tighten supply chain and reduce lead times.

Fascinating as it may sound, the challenges are many.

For India, key challenges in adoption of Industry 4.0 are,

- Cost and Technical Issues
  - ❖ Lack of adequate infrastructure
  - ❖ Cyber Security
  - ❖ High cost of digital technologies
- Skill and Talent issues
  - ❖ Leadership skill gap
  - ❖ Workforce skill gap

It is this workforce skill gap we are trying to address by creating an awareness about the skills required to nurture Industry 4.0 environment.

With Industry 4.0 on the horizon, large scale skilling efforts are must to overcome the obstacles posed by new technologies.

I hope the talks and deliberations in this conference will give an insight into the industry 4.0 environment and how we can groom ourselves to face the challenges.

As Joint organizing secretary, I express my sincere thanks to all the stalwarts from the industry for accepting our invitation.

I am thankful to our chairman Dr. V. V. Bedekar, Principal Dr. D. K. Nayak and all other members of Vidya prasarak Mandal for their constant support and guidance.

**Mrs. Suhasini Shukla**  
**Head Computer Engineering Department**  
**VPM's Polytechnic, Thane**

# Precursory Lecture on “ Role of IoT in Industry 4.0 ”

**We are entering the 4th Industrial Revolution**  
**Integration and Digitalization of Industrial Processes**

**Pravin Bambal**

**INDUSTRY 1.0**

- Mechanization
- Steam Power
- Weaving Loom

1.0  
End of the 18th Century

**INDUSTRY 2.0**

- Mass Production
- Energy Line
- Electrical Energy

2.0  
End of the 19th Century

**INDUSTRY 3.0**

- Automation
- Computers
- Electronics

3.0  
End of the 20th Century

**INDUSTRY 4.0**

- Cyber Physical Systems
- Internet of Things
- Networks

4.0  
Early 21st Century

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**Mr. Pravin Bambal**

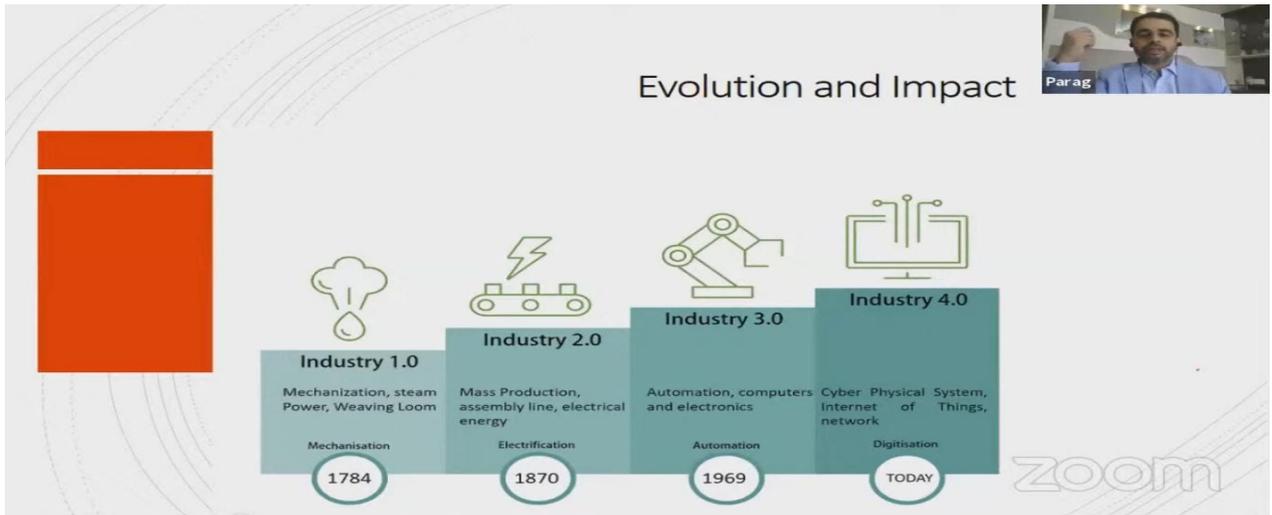
**Head- IoT & Allied Technologies, LafargeHolcim.**

Department of Industrial Electronics and Department of Computer Engineering of VPM's Polytechnic, Thane jointly conducted a Precursory workshop for the forthcoming 25<sup>th</sup> National Conference on Industry 4.0 on 27<sup>th</sup> October 2020 from 10am to 12 noon. The introduction to Industry 4.0 was given by Dr. Kirti Agashe, HOD Industrial Electronics.

Dr. D. K. Nayak, Principal, VPM's Polytechnic has motivated the students through his Introductory speech. The keynote speaker of the workshop was Mr. Pravin Bambal, Head of IoT & Allied Technologies, LafargeHolcim. He gave an overview on "Role of IoT in Industry 4.0". He explained about evolution of Industry 4.0, Trends in IoT, Changes that can occur in manufacturing industries through IoT.

The speech on working of IoT, Building Blocks of IoT, The IT-OT Paradigm, Application of IoT in Smart City and Railways were very informative. 300 participants attended this session through the zoom platform & more than 100 participants through YouTube Live.

# Keynote Speech



**Mr. Parag Rede**

**Executive VP, North America BU, Caps Gemini, India**

He explained that Industry has become intelligent because of four quadrants

**Sense:** Industry and machines should have sensory organs who gathers the data. Augmented Reality and Virtual Reality should be the sensory organs of Industry. When every machine becomes intelligent and when we collect all these data it becomes IoT(Internet of Things)

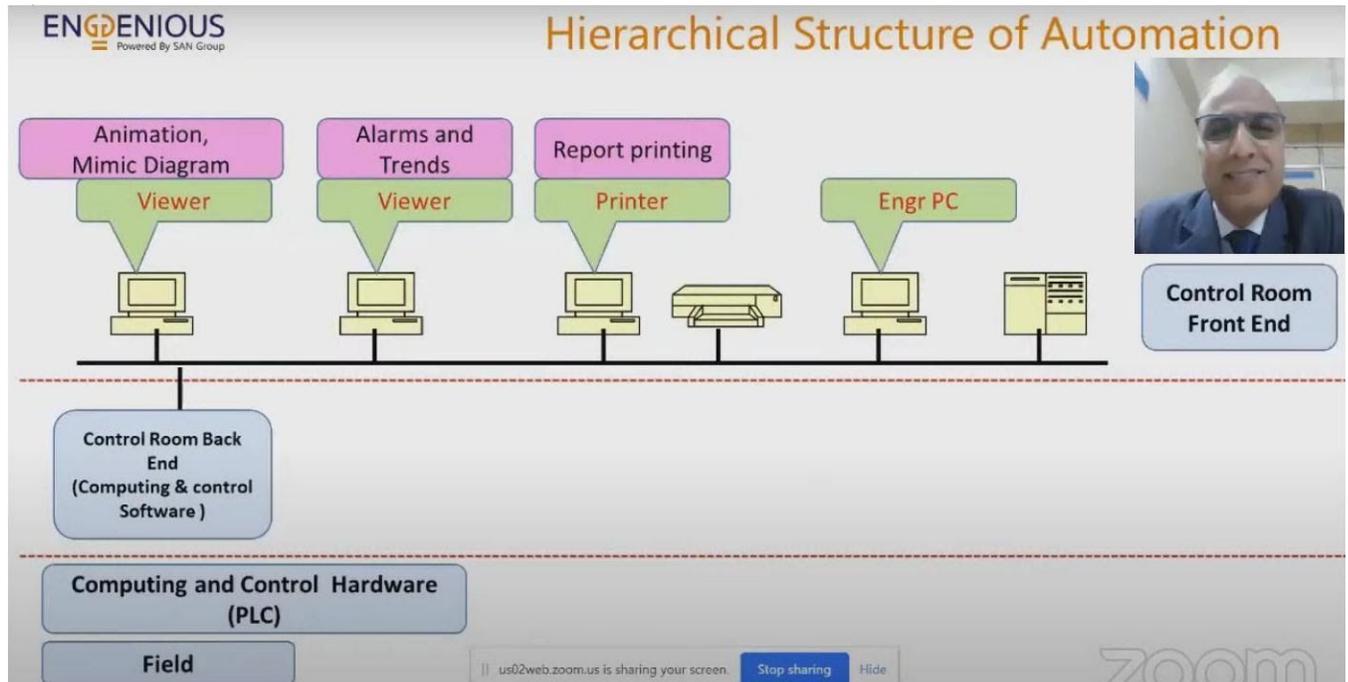
**Think:** Thinking part is done by Cognitive where it happens through AI

**Act :** Small factories use Robots for Automation. Digital Twin is used in Factories where we can monitor all sides of a factory from one monitor and can make decisions according to that.

**Improve:**Tracking and Tracing is needed for improvement

He discussed the points BlockChain (Simple Record of Things or Different stakeholders use a common tracking system) and Machine Learning (Machine learn from previous experience and do improvements to get better products next time). According to him the qualities for a good Entrepreneur are To Be Aware, To Be Curious, To Be Conscious, Apply Knowledge in business situations and Innovate and Enhance(Skills should use more in Innovation).

# Day 1-Session 1 on “I4.0 Architectures, Legacy Systems, Digital Transformation & SMART Engineer ”



**Mr. Sudhir Panditrao**

**CEO & Cofounder, SAN Techno Mentors Pvt. Ltd, Pune.**

He covered the Topics Architecture of Industry 4.0 along with RAMI model, Legacy systems, Digital Transformation in Manufacturing industries etc.

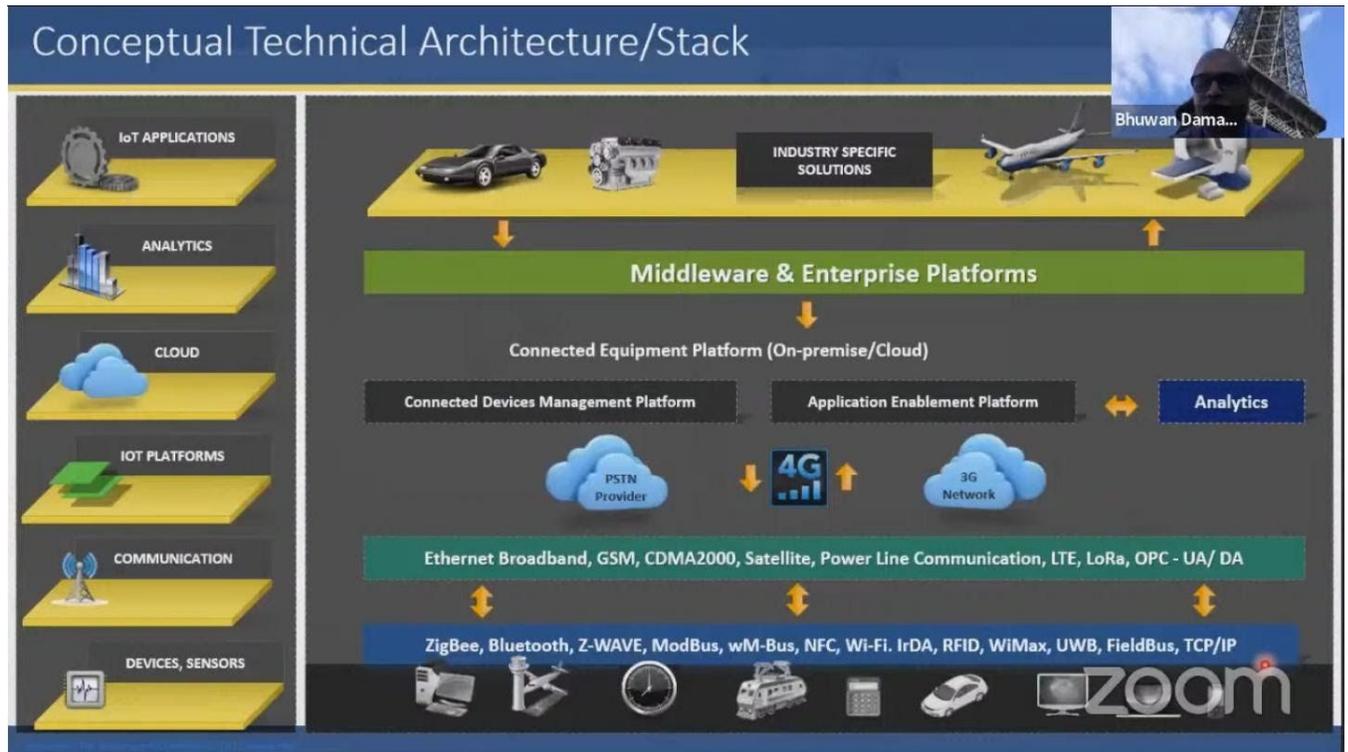
He covered Hierarchical Structure of automation and I4.0 for legacy systems also. He explained that the main focus of Industry 4.0 is on Vertical and Horizontal Integration, Cloud Computing, Big Data analysis, Machine Learning and Artificial Intelligence.

He also emphasized that four pillars of Digital Transformation are

1) People, 2) Organization, 3) Processes & Method and 4) Technology .

He explained the concept of **KASH(Knowledge Skills Habits Attitude) for CASH**. We have to build the **Attitudes and Habits**. and along with these with the help of **Knowledge and Skills** we can generate **CASH**

# Day 2-Session 1 on “ Smart Manufacturing ”



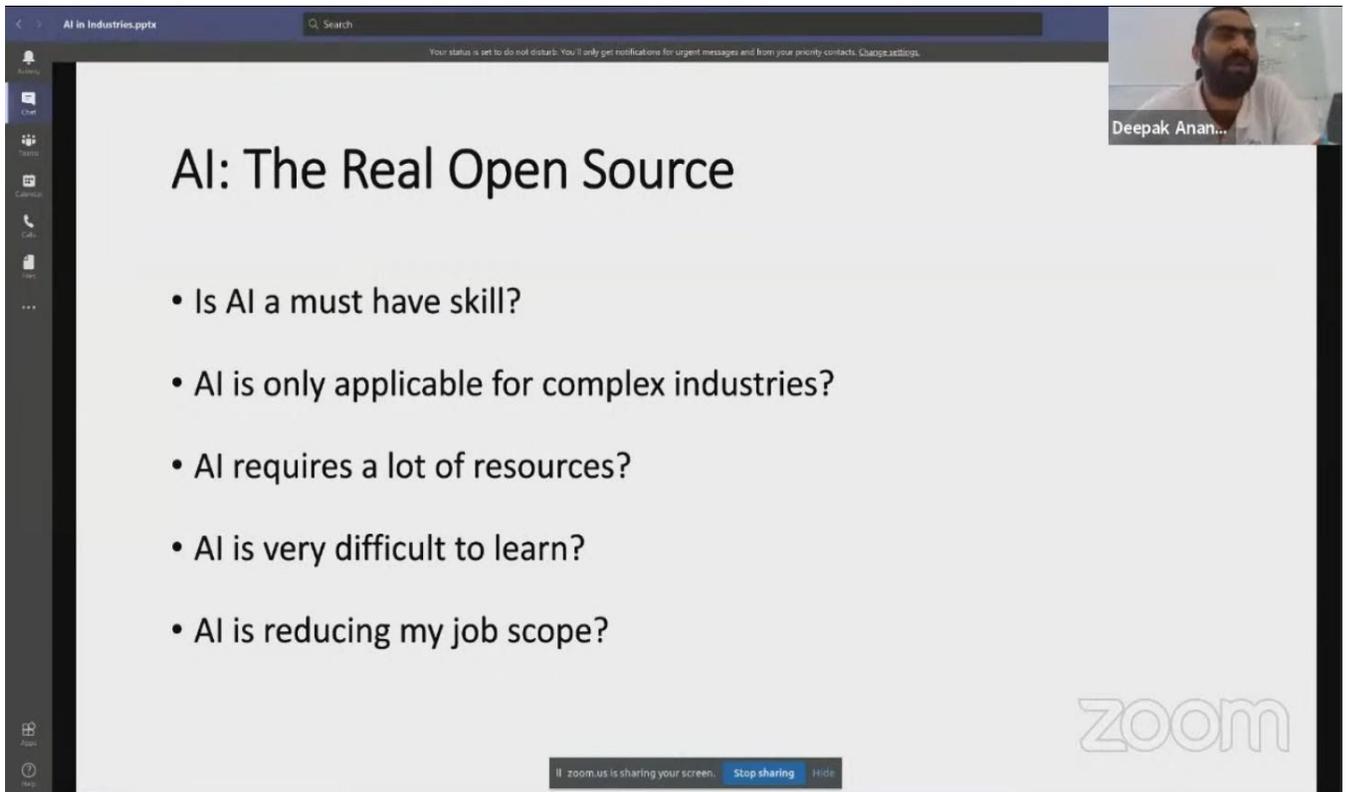
**Mr. B A Damahe**  
**Joint General Manager, L&T, Mumbai**

He explained Evolution of Industry 4.0 with Conceptual Technical Architecture of I4.0 which consists of Devices and sensors in the first level, Communication, IoT Platform, Cloud Analytics, IoT application in the successive layers.

He also discussed about New concepts of Digital Twin, Lean Manufacturing (With Minimum Resource maximum Output) and 5S (Sort, Set in Order, Shine, Standardize, Sustain) for Lean Manufacturing were also explained.

He explained that through IIoT which is known as Industry 4.0 we can connect all the machineries together and can be controlled from anywhere. By the digitization of Construction sites through I4.0, the safety and Quality of the workers were also taken care. This was a wonderful session.

# Day 2-Session 2 on “ AI in Industry 4.0 ”



AI: The Real Open Source

- Is AI a must have skill?
- AI is only applicable for complex industries?
- AI requires a lot of resources?
- AI is very difficult to learn?
- AI is reducing my job scope?

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**Dr. Deepak Anand**  
**Head of AI, Griffyn Robotech Pvt. Ltd. USA**

He discussed the **Role of Artificial Intelligence(AI) in Industry 4.0.**

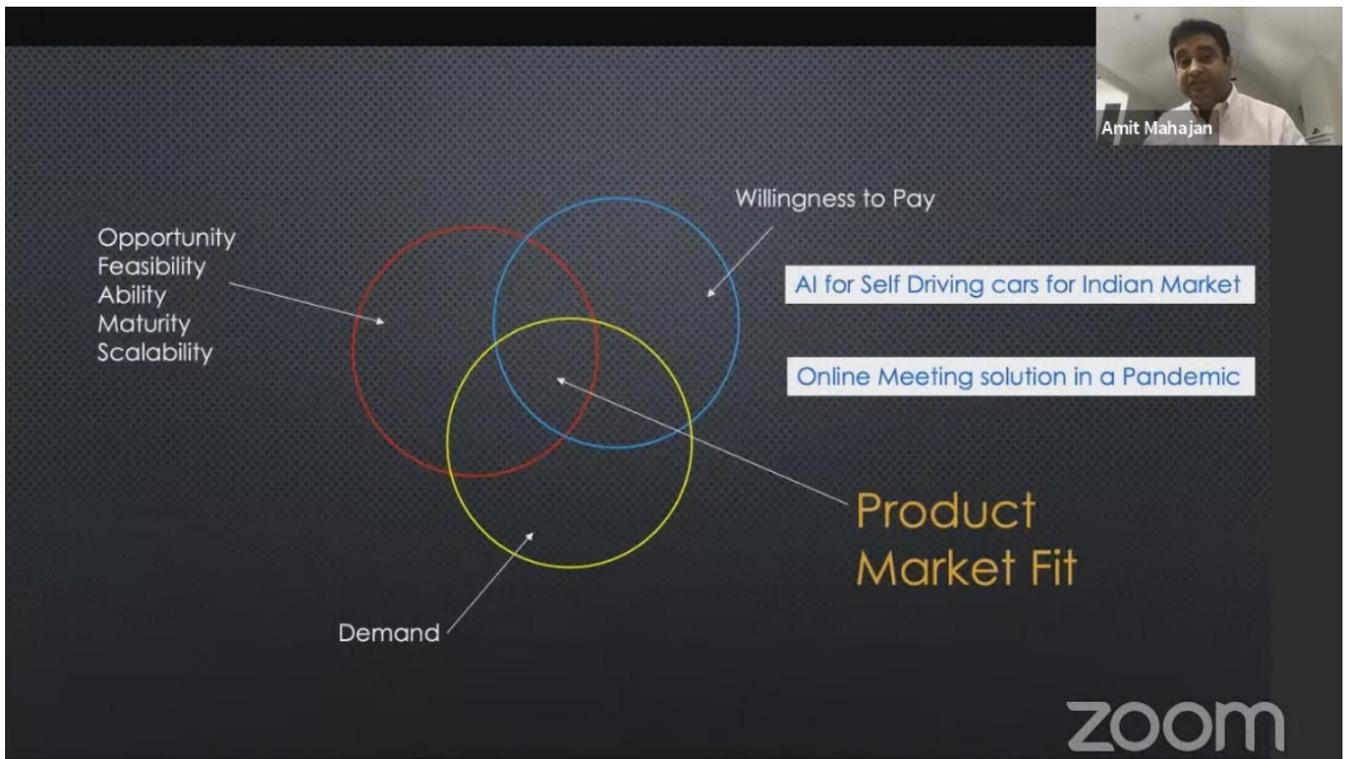
According to his speech, For AI we must have a skill to operate the machines, AI is applicable to any industry not only to the complex industries.

Every application at home can be controlled by AI.

**Transformation** takes place through AI rather than **Termination**. He eliminated the myth of reduction of job opportunities by AI.

He also explained about the open sources available for AI.

# Day 2-Session 3 on “ Product Market fit ”



## **Mr. Amit Mahajan** **Founder & CEO, Xcaliber Infotech Pvt. Ltd. USA**

Mr. Amit initially discussed “**The mechanism of Making Products**” and the methods through which we can fit our product in the market with the concept of Industry 4.0.

According to him Opportunity, Feasibility, Ability, Maturity, Scalability, Demand and Our willingness everything comes together, then the product will be fit in the market. When product market fit is achieved then the growth of the product will be enormous. But it will be achieved through the maturity of the product, Differentiability of the product and its proper introduction time.. **Attitude and Skills** help us to satisfy the demand. He stated that Failure of startup in the initial stage is due to the lack of understanding the market need for that product.

He discussed that For Achieving the Product market fit the following points should be followed.

- 1) Create a Hypothesis
- 2) Test the market
- 3) Validate the chosen path
- 4) Get work in the area of our liking.

## Along with that he gave following Motivational points to the students

- 1) Sky should not be our limit
- 2) Others' opinions should not define us.
- 3) Activity should be Outcome Based.
- 4) We should be Kind and Compassionate.
- 5) Change the direction of working if it is not happening right .
- 6) Try one more time if we feel everything is lost
- 7) Believe in Ourselves for others to trust us
- 8) Our **values** and **Beliefs** are our product(Value should be strict and Belief should be strong).

Along with these he emphasized that if we are disciplined it can take us into the ladder of success.Success depends on Attitude than Personality.

He added the Quote that “**Be someone,Become Someone That can't be ignored by anyone.**”

He concluded by saying that we should be so good that we can't be ignored by anybody. Whatever we do,do it well so that a long impact should be created on everybody's mind.

# Result of State Level Technical Paper Writing on

## “ INDUSTRY 4.0 ”



### VPM's POLYTECHNIC, THANE

Department of Industrial Electronics & Computer Engineering organising

## 25th National Conference on Industry 4.0

Date : 28th to 29th October 2020



### Result of Technical Paper Writing Competition



<b>Title of Paper</b>	<b>Name of Authors</b>	<b>Name of Institute</b>
Artificial Intelligence in Manufacturing: Upgradation to I4.0	Sanika Kahane & Shrutika Gade	Sinhgad Institute SVCP, Pune
Third Eye for Blind People	Shreeyash Kelkar & Pranit Kerkar	VPM's Polytechnic, Thane
Cloud Computing – Radical Shift	Sahil Nilkanth & Mrinmayi Prabhugate	Thakur Polytechnic, Mumbai
Role of chatbots in today's industry	Archita Sehgal & Amaan Jambura	VES's Polytechnic, Mumbai
Cybersecurity: Redefined	Darshan Chindarkar & Pradnyesh Naik	VPM's Polytechnic, Thane

Department of Industrial Electronics & Department of Computer Engineering of VPM's Polytechnic, Thane organised a state level Online technical paper writing competition for diploma level students as precursory activity for 25th National Conference on Industry 4.0

For this competition, more than 46 papers received from students of different institutes across Maharashtra. 25 papers were published in these proceeding booklets of national conference.

Out of these 25 papers, top 05 papers were selected as best technical papers.

Authors of the first 2 papers will get a free internship opportunity in Griffyn Robotech Pvt. Ltd. Pune

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# Internet of Things for Smart Cities

Ms. Pratiksha Ramchandra Kamble,

Ms. Shruti Shantaram Gadhade

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**Abstract**—The Internet of Things (IOT) shall be able to incorporate transparently and seamlessly a large number of different and heterogeneous end systems, while providing open access to selected subsets of data for the development of a plethora of digital services. Building a general architecture for the IOT is hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies, and services that may be involved in such a system. In this paper, we focus specifically to an urban IOT system that, while still being quite a broad category, is characterized by their specific application domain. Urban IOTs, in fact, are designed to support the Smart City vision, which aims at exploiting the most advanced communication technologies to support added-value services for the administration of the city and for the citizens. This paper hence provides a comprehensive survey of the enabling technologies, protocols, and architecture for an urban IOT. Furthermore, the paper will present and discuss the technical solutions and best-practice guidelines adopted in the Padova Smart City project, a proof-of-concept deployment of an IOT island in the city of Padova, Italy,

*Keywords*—*smart city concept and services, smart infrastructure, Smart lighting, smart buildings and properties, waste management, Water management, industrial management, smart parking management.*

## I. INTRODUCTION

The ultimate goal of a smart city initiative is to attract businesses and citizens to ensure a vibrant city economy. Smart cities utilize the Internet of Things (IOT) to achieve sustainable economic development and quality-of-life improvements. IOT refers to devices connected to the internet to transmit data and according to industry experts, by 2020, 10 billion+ new devices and connections will be added to the internet. This will increase the amount of IOT devices and connections to over 26.3 billion. Internet of Things (IOT) is a recent communication paradigm that envisions a near

future, in which the objects of everyday life will be equipped with microcontrollers, transceivers for digital communication, and suitable protocol stacks that will make them able to communicate with one another and with the users, becoming an integral part of the Internet [1]. The IOT concept, hence, aims at making the Internet even more immersive and pervasive. Furthermore, by enabling easy access and interaction with a wide variety of devices such as, for instance, home appliances, surveillance cameras, monitoring, sensors, actuators, displays, vehicles, and so on, the IOT will foster the development of a number of applications that make use of the potentially enormous amount and variety of data generated by such objects to provide new services to citizens, companies, and public administrations. This paradigm indeed finds application in many different domains, such as home automation, industrial automation, medical aids, mobile healthcare, elderly assistance, intelligent energy management and smart grids, automotive, traffic management, and many others.. However, such a heterogeneous field of application makes the identification of solutions capable of satisfying the requirements of all possible application scenarios a formidable challenge. This difficulty has led to the proliferation of different and, sometimes, incompatible proposals for the practical realization of IoT systems. Therefore, from a system perspective, the realization of an IoT network, together with the required backend network services and devices, still lacks an established best practice because of its novelty and complexity. In addition to the technical difficulties, the adoption of the IoT paradigm is also hindered by the lack of a clear and widely accepted business model that can attract investments to promote the deployment of these technologies. In this complex scenario, the application of the IoT paradigm to an urban context is of particular interest, as it responds to the strong push of many national governments to adopt ICT solutions in the management of public affairs, thus realizing the so-called Smart City concept. Although there is not yet a formal and widely accepted definition of “Smart City,” the final aim is to make a better use of the public resources, increasing the quality of the services offered to the citizens, while reducing the operational costs of the public administrations. This objective can be pursued by the deployment of an urban IOT, i.e., a communication infrastructure that provides unified, simple, and economical access to a plethora of public services, thus unleashing potential synergies and increasing transparency to the citizens. An urban IOT, indeed, may bring a number of benefits in the management and optimization of traditional public services, such as transport and parking, lighting, surveillance and maintenance of public areas,

preservation of cultural heritage, garbage collection, salubrity of hospitals, and school.1 Furthermore, the availability of different types of data, collected by a pervasive urban IOT, may also be exploited to increase the transparency and promote the actions of the local government toward the citizens, enhance the awareness of people about the status of their city, stimulate the active participation of the citizens in the management of public administration, and also stimulate the creation of new services upon those provided by the IOT [5].

## II. SMART CITY CONCEPT AND SERVICES

### A. SMART INFRASTRUCTURE

**i. Smart Lighting:** With smart lighting, city authorities can keep real-time tracking of lighting to ensure optimized illumination and deliver demand-based lighting in different zones. Smart lighting also helps in daylight harvesting and save energy by dimming out sectors with no occupancies for e.g. parking lots can be dimmed during work hours and when a car is entering, it will be detected and appropriate sectors can be illuminated, while others can be kept at diffused setting.



Fig. 1 Smart Lighting

**ii. Connected Streets:** Connected and smart streets are capable of acquiring data and delivering information and services to and from millions of devices, which includes information about traffic, road blockages, road works, etc. This helps in the efficient management of resources and people to enhance public transportation and the urban landscape.

**iii. Smart Parking Management:** Smart parking management system can be used to find the vacant location for a vehicle at different public places. Smart Parking's In-Ground Vehicle Detection Sensors are core technologies, playing a key part in the Smart Parking solution that is revolutionizing how drivers in the malls and city centres can find an available parking space. Wireless sensors are embedded into parking spaces, transmitting data on the timing and duration of the space used

via local signal processors into a central parking management application. Smart Parking reduces congestion, decreases vehicle emissions, lowers enforcement costs and cuts driver stress. For effective deployment of smart parking technologies, each device needs to have a reliable connectivity with the cloud servers.

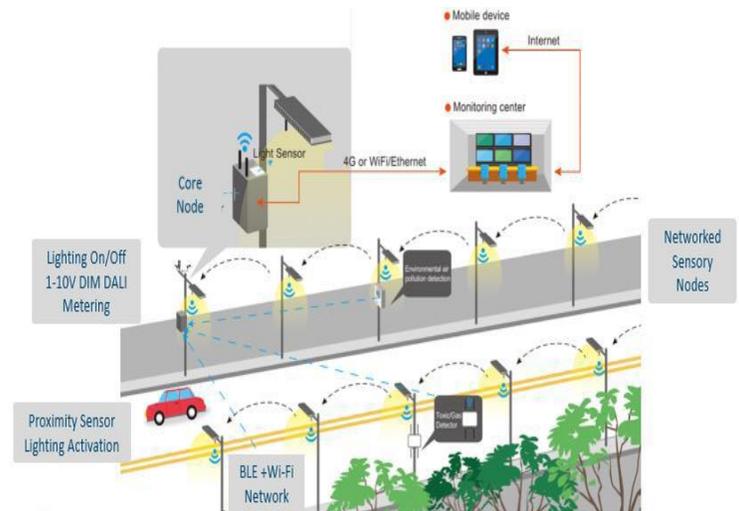


Fig. 2 Smart Parking Management

**iv. Connected Charging Stations:** Smart infrastructure also includes implementing charging stations in parking systems, city fleets, shopping malls and buildings, airports, and bus stations across the city. Electronic vehicle (EV) charging platforms can be integrated with IOT to streamline the operations of EV charging and addresses the impact of the power grid. As the concerns on carbon dioxide emission, energy conservation, and unsustainable fossil fuels are rising, Electrical Vehicles (EVs) become prevalent all around the world. As the market grows, the demand for smart charging station rises. Today, most fuelling stations for electrical vehicles are decentralized and have very complex structure, which means they are hard to manage and maintain for on-site personnel. For instance, EV charging stations have to be online all the time, as users charge their cars with an app, but, in case a station suddenly goes offline, it must be fixed as soon as possible. Moreover, data transmission is also a weak point, as needed data are often failed to be timely delivered. With IoT technology, EV charger stations become smart, connected and hence easily accessible for remote support and maintenance. Furthermore, with the IOT-powered charging apps, drivers can easily search for a nearby station and schedule a time to fill up. The app automatically notifies if the station is available and reserves it when needed. Moreover, a great number of factors such as exact charging time, weather conditions that could affect charging times, cable position, etc. are analysed by the IOT-powered software, so users can access all real-time information about charging processes.



Fig. 3 Connected Charging Stations

## B. Smart Buildings & Properties

**i. Safety & Security Systems:** These include implementing remote monitoring, biometrics, IP surveillance cameras, and wireless alarms to reduce unauthorized access to buildings and chances of thefts. It also includes utilizing Perimeter Access Control to stop access to restricted areas of the property and detect people in non-authorized areas.

**ii. Smart Garden & Sprinkler System:** Smart sprinkler system synced with connected technologies and cloud can be used to water plants with the assurance that plants get the right amount of water. Smart garden devices can also perform tasks such as measuring soil moisture and levels of fertilizer, helping the city authorities to save on water bill (smart sprinkler devices use weather reports and automatically adjust their schedule to stay off when it rains), and keep the grass from overgrowing in a convenient way (robot lawnmowers).

**iii. Smart Heating & Ventilation:** Smart heating and ventilation systems monitor various parameters such as temperature, pressure, vibration, humidity of the buildings and properties such as movie theatres, and historical monuments. Wireless sensor network deployment is the key to ensuring appropriate heating and ventilation. These sensors also collect data to optimize the HVAC systems, improving their efficiency and performance in the buildings

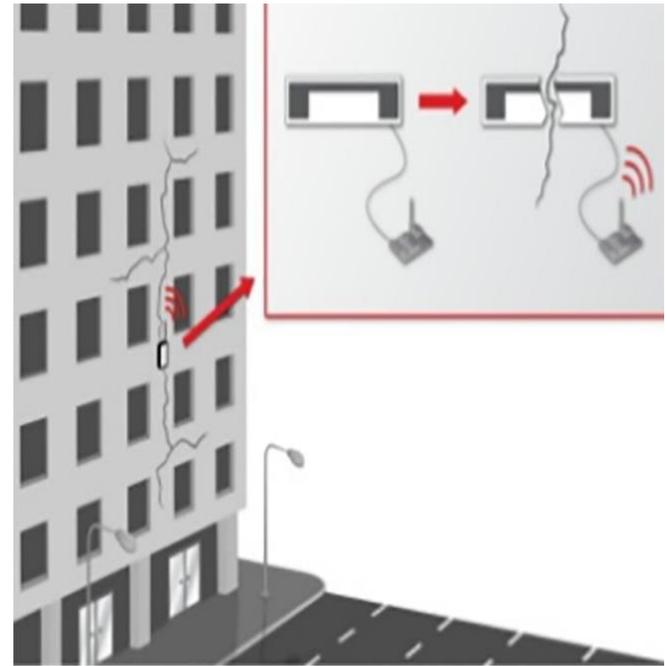


Fig.4 Smart Heating &amp; Ventilation

## C. Smart Industrial Environment

Industrial environments present unique opportunities for developing applications associated with the Internet of things and connected technologies which can be utilized in the following areas:

**i. Forest Fire Detection:** Helps in the monitoring of combustion gases and pre-emptive fire conditions to define alert zones.

**ii. Air/Noise Pollution:** Helps in controlling of CO<sub>2</sub> emissions of factories, pollution emitted by cars and toxic gases generated on farms.

**iii. Snow Level Monitoring:** Helps in identifying the real-time condition of ski tracks, allowing security corporations for avalanche prevention.

**iii. Landslide and Avalanche Avoidance:** Helps in the monitoring of soil moisture, earth density, as well as vibrations to identify dangerous patterns in land conditions.

**iv. Earthquake Early Detection:** Helps in detecting the chances of tremors by utilizing distributed controls at specific places of tremors.

**v. Liquid Presence:** Helps in detecting the presence of liquid in data centres, building grounds, and warehouses to prevent breakdowns and corrosion.

**vi.** Radiation Levels: Helps in the distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

**vii.** Explosive and Hazardous Gases: Helps in detecting gas levels and leakages in chemical factories, industrial environments, and inside mines.

### III. Conclusion

The future of IOT is unlimited. It provides solutions in all sectors including manufacturing, fashion, restaurant, healthcare, education etc. Smart cities can share a common smart city platform, which makes sense especially for small cities. Small cities can form a common urban ecosystem. In this way, solutions of small and large smart cities are networked and controlled via the central cloud platform. Finally yet importantly, the size of a city is not an obstacle on the way to becoming "smart". Cities in each group can benefit from intelligent technologies. Integrating smarter technologies with their economic development and public services plans and considering how technology or use of data might help them achieve existing objectives more effectively. Smart technologies can provide solutions for cities by helping them save money, reduce carbon emissions.

### Acknowledgement

We would like to express our special thanks of gratitude to my teachers as well as our principal D.K. Nayak who gave me the golden opportunity to do this wonderful project on the topic Internet of Things for Smart Cities, which also helped us in doing a lot of Research and we came to know about so many new things we are really thankful to them. Secondly we would also like to thank our VPM's polytechnic college teachers who guide me a lot in finalizing this project within the limited time frame.

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# Third Eye for Blind People

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**Abstract**—Third eye for the blind is an innovation with the help of the multi discipline subjects like computer science, electronics engineering and health science which helps the blind people to navigate with speed and confidence by detecting the nearby obstacles using the help of ultrasonic waves and notify them with a buzzer sound or vibration. According to WHO 39 million people are estimated as blinds worldwide. They are suffering a lot of hardships in their daily life. The affected ones have been using the tradition white cane for many years which although being effective, still has a lot of disadvantages. This will be a wearable technology for the blinds. One of the main peculiarities of this device is that it will be affordable. The Arduino Pro Mini 328- 15/16 MHz board is worn like a device. This will be equipped with ultrasonic sensors, consisting of module. Using the sensor, visually impaired can detect the objects around them and can travel easily. When the sensor detects any object it will notify the user by beep or vibration. Thus this is an automated device. Thus this device will be of a great use for the blinds and help them travel different places.

**Keywords**— arduino, wearable band, buzzer, blind, people, compact, ultrasonic Sensor (US sensor), obstacles

## I. INTRODUCTION

The objective of this project The Third Eye for the Blind is to design a product which is very much useful to those people who are visually impaired and those who often have to rely on others. Third eye for Blind project is an innovation which helps the visually impaired people to move around and go from one place to another with speed and confidence by knowing the nearby obstacles using the help of the wearable band which produces the ultrasonic waves which notify them with buzz sound or vibrations. It allows the user those who are visually impaired to walk freely by detecting the obstacles. They only need to wear this device as a band or cloth on their body.

The physically disabled ones have been using the traditional way that is the white cane for many years which although being effective, still has a lot of disadvantages and limitations. Another way is, having a pet animal such as a dog, but it is really expensive. Thus the aim of the project Third eye for the Blind is to develop a cheap, affordable and more efficient way to help the blind people to navigate with greater comfort, speed and confidence. This is the wearable technology for the blinds which helps resolve all the problems of the existing technologies. One of the main peculiarity of this innovation is, it is affordable for everyone, the total cost being less than 1500 INR

It will drastically benefit the community of the visually impaired or the blind people. The walking cane is a simple and purely mechanical device dedicated to detect the static or the constant obstacles on the ground, uneven surfaces, holes

and steps via simple tactile-force feedback. This device is light, portable but limited to its size and it is not used for dynamic obstacle detection. These devices operate like the radar and the system of the device uses the ultrasonic wave's fascicle to identify the height, direction and the speed of the objects. The distance between the person and the obstacle is measured by the time of the wave travel. However, all the existing systems inform the blind the presence of the object at a specific distance in front of or near to him.

## II. LITERATURE SURVEY

. Till the last few years, there are many new technologies have been developed for visually challenged peoples. But, there are a lot of limitations and restrictions on those new inventions. Shovel proposed a method for blind people. He proposed two different types of sounds. The major drawback of his work is to identification of round. The blind people cannot differentiate the sounds. Yuan introduced concept of active triangulation that was used in his proposed device. It will detect the object. The main disadvantage of this work is, it can only detects the object at the rate of 15 measurements/second and also faces a surface discontinuities.

J M Benjamin proposed a three direction detectable laser cane. The direction is 45 degrees over and parallel to the ground and with sharp deepness. It is basically a hit and trial method it is used only in indoor systems. The main disadvantage in his system is it is not suitable for outdoor activities. R Sabarish proposed a system which is similar to our project nearly, but has a some vibration in his device. Till it is not successful.

MA. Espinosa S. Ungar introduced an idea that was more costly than the normal one. He did not consider the poor peoples who cannot buy those things. Pooja Sharma created a device for blind people. In that case the object has been detected but within a certain range. only within that range the object can be identified. This was the major limitation in this paper. All the above existing system cannot satisfy the exact needs of the blind peoples. They use a white cane and pet dogs which is very costlier and difficult to maintain. To overcome those limitations this project will help. Nowadays there is a lot of technologies available for the visually challenged but our project is cheaper among them.

## III. SYSTEM ARCHITECTURE

. The device or the wearable band is circuited with the Arduino. The LEDs and the buzzer are connected to the Arduino and similarly the ultrasonic sensors are also connected to the Arduino board. The soldering is done according in the Arduino and the connections are established.

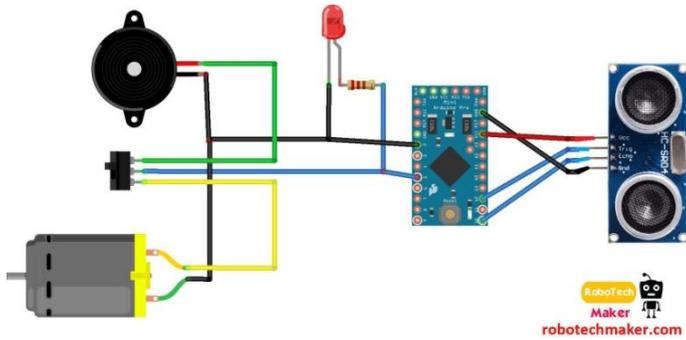


Fig. 1. Circuit Diagram



Fig. 3. Arduino UNO

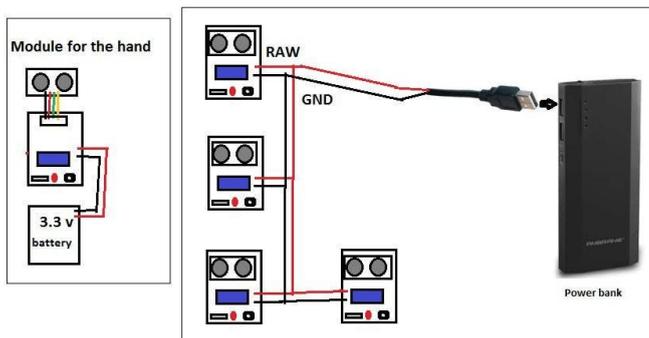


Fig. 2. Detailed Circuit Diagram

### ULTRASONIC SENSOR

The ultrasonic sensor consists of transmitter, receiver and transceiver. The transmitter convert electrical signal into sound waves. The receiver converts the sound waves into electrical signal again. The transceiver performs both the receiver and transmitter operations. It also has crystal oscillators in it. It will perform the stabilization operation in the ultrasonic sensor.

### IV. PROPOSED SYSTEM

The proposed system deals with the cheaper and effective obstacle detection with a wide range of coverage. The device includes the following components:

- Arduino UNO
- Ultrasonic sensor
- Bread board
- Buzzer
- 5 mm LED: Red
- Slide Switch
- Female Header
- Male Header
- Jumper wires
- Power bank
- Some elastics and stickers

Let us see about the components in brief:

#### ARDUINO UNO

The Arduino is an open source hardware and software that can make a user to do effective operation in it. The Arduino is a micro-controller. These micro-controller devices help in sensing and controlling the objects in the real-time situations and environment. These boards are available cheaper in the market. There are a number of inventions performed in it and still it is going on.



Fig. 4. Ultrasonic Sensor

### JUMPER WIRES

The jump wires are also known as jumper wire used to connect devices. Without soldering we can make an easier connection with devices. These are available as a set of wire that has the pin on both sides. These wires are used as making their one end connecting to the corresponding device and another end to the breadboard.



Fig. 5. Jumper Wire

### PIEZO BUZZER

The piezo buzzer is an electronic device which generates sound through it. The buzzer is used as an indication to the user. It is used in the car reversing system and braking system as an indication. It is based on the principle of piezoelectric discovered in 1880 by Jacques and Pierre Curie



Fig. 6. Piezo Buzzer

### ARDUINO SOFTWARE

The Arduino is the most used programming software to perform the above-mentioned operation. Using some program in the software we can do every operation.

### V. WORKING OPERATION

This proposed system consists the equipment like Arduino mini pro, ultrasonic sensor, pref board, vibrating motor, buzzers for detecting the obstacles and letting the user know about the obstacle, Red LEDs, Switches, Jumper cable, power bank, Male and female header pins, 3.3 volt old mobile battery which is unused or discarded, some elastic and stickers to make the device wearable as a band for wearing for the users. The wiring of the device is done in a following manner. The Ground of LED, buzzer and vibration motor are connected to GND of the Arduino. The +ve of the LED and the middle leg of switch is connected to the Arduino pin 5. The +ve of the Buzzer is wired to the first leg of the switch and the +ve of the Vibration motor is wired to the third leg of the switch.

The Ultrasonic sensor is wired accordingly. The Ultrasonic sensor pin VCC is connected to the Arduino pin VCC, Ultrasonic sensor pin GND is connected to the Arduino pin GND, Ultrasonic sensor pin Trig is attached to the Arduino pin 12, Ultrasonic sensor pin Echo is connected to the Arduino PIN 12. The switch used here is for selecting the mode. (Buzzer or vibration mode.) We first cut the pref board in 5 X 3 cm dimension and solder the female headers for the arduino to the board. Then soldering of the buzzer is carried out. Then using the glue connects the vibrating motor and solder the wires to it. Then connection of the LED is done. Then connect the switch. Connect the header pins for ultrasonic sensors and for the battery input. Then solder all the things and connect the arduino and ultrasonic sensor to the board. Also connect the elastic band to all the modules. For making the module for the hand, connect the ultrasonic sensor to the board by using 4 jumper cables. Then connect a 3.7 volt mobile battery to this module. Then connect the elastic band. In the end after all the connections are done to the Arduino board, upload the code to each arduino board and power the 4 other modules using a power bank.

The US sensor is a transducer, and is used in pair as trans receiver. The transmitter emits the US waves and if obstacles are present in the path, the US waves hits the obstacles and gets reflected back, the reflected wave is received by the receiver. The US sensor is a combination of one transmitter and receiver. The time interval between sending and receiving of the US signal is calculated, this time interval is used to calculate the distance between sensor and the obstacle. The equation for the distance calculation between the sensor and the object is as follows:  $D = (HPTW * SV)/2$  Where, D = Distance in cm. HPTW = High time of pulse width. SV = Sound velocity in cm/s. The objective is to cover a wide angle to detect the obstacles with the help of the ultrasonic sensors to help the blind and make it easy for them to move around easily without any hassle. Hence, the distance calculation is calculated and the sensor detects and the further procedure of the buzz sound to the user is carried out. Thus, this way

Third Eye for Blind will be designed for the visually impaired people and will make it very easy and convenient as it will be a wearable device and thus will help the user in travelling and detecting the obstacles while walking very easily.



Fig. 7. Model for Hand

## VI. OUR PROJECT

The project which is given below is the project which we have made in the pandemic time. This is the project which helps the blind people. In this we have use buzzer, arduino, jumper wires, and sensor and 9V battery. It is cheap and can be affordable. The cost we required to make this project is around 1200 RS. As shown in figure 4.

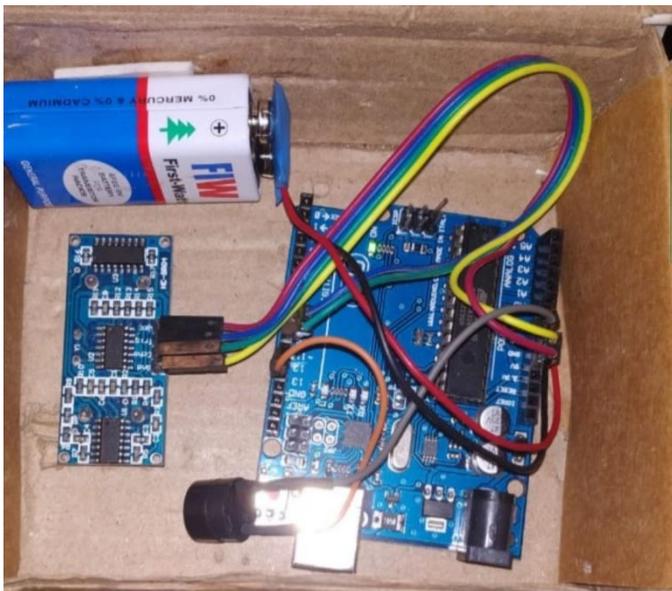


Fig. 8. Project made by us in Pandemic

## VII. RESULT AND DECLARATION

The presented system is designed and configured for the use of the blind and visually disabled people. This device is able to handle several states that the visually impaired people face. This device responds to the user in all the circumstances which is faced by the blind people with the help of the use of the Ultrasonic sensors and the Arduino Board.

Case 1: When the obstacle or the object is in the left it will tell the user that: The obstacle is in left

Case 2: When the obstacle is in right it will say: The obstacle in right.

Case 3: When the obstacle is in front, the device will say: the obstacle is in front. Similarly for all the directions like left, right, back etc it will notify the user wearing it.

## VIII. CONCLUSION

Thus, this project proposed the design and architecture of a new concept of Arduino based Virtual Eye for the blind people. A simple, cheap, efficient, easy to carry, configurable, easy to handle electronic guidance system with many more amazing properties and advantages is proposed to provide constructive assistant and support for the blind and visually impaired persons. The system will be efficient and unique in its capability in specifying the source and distance of the objects that may encounter the blind. It is able to scan and detect the obstacles in the areas like left, right, and in front of the blind person regardless of its height or depth. With the proposed architecture, if constructed with at most accuracy, the blind will be able to move from one place to another without others help.

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# SMART CITY DESIGN WITH IOT

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**Abstract**—Due to successive technological advancements, developments and innovations, the global industrial landscape has drastically transformed over the last years. The fourth industrial revolution (Industry 4.0) aims at transforming traditional industries into intelligent ones by incorporating innovative technologies. Industry 4.0 enables physical assets to be integrated into intertwined digital and physical processes thus creating smart factories and intelligent manufacturing environments. Internet of Things (IoT) is a rapidly growing technology that has drastically contributed to the Industry 4.0 realization.

**Keywords**— Internet of Things, Industry 4.0, IoT applications, Industrial Internet of Things, Ubiquitous computing, Cyber-physical systems.

## 1 Introduction

IoT pursues to pervade our everyday environment and its objects, linking the physical to the digital world and allowing people and “things” to be connected anytime, anywhere, with anything and anyone ideally using any network and service. IoT is regarded as a dynamic and global network of interconnected “things” uniquely addressable, based on standard and interoperable communication protocols and with self-configuring capabilities. Despite still being at an early development, adoption and implementation stage, Industry 4.0 and IoT can provide a multitude of contemporary solutions, applications and services. Hence, they can improve life quality and yield significant personal, professional and economic opportunities and benefits in the near future. This study scrutinizes IoT in the Industry 4.0 context.

## 2 SMART CITY CONCEPT

According to Pike Research on Smart Cities,<sup>2</sup> the Smart City market is estimated at hundreds of billion dollars by 2020, with an annual spending reaching nearly 16 billion. This market springs from the synergic interconnection of key industry and service sectors, such as Smart Governance, Smart Mobility, Smart Utilities, Smart Buildings, and Smart Environment. These sectors have also been considered in the European Smart Cities project to define a ranking criterion that can be used to assess the level of “smartness” of European cities. Nonetheless, the Smart City market has not really taken off yet, for a number of political, technical, and financial barriers. Under the political dimension, the primary

obstacle is the attribution of decision-making power to the different stake- holders. A possible way to remove this roadblock is to institutionalize the entire decision and execution process, concentrating the strategic planning and management of the smart city aspects

into a single, dedicated department in the city.

On the technical side, the most relevant issue consists in the no interoperability of the heterogeneous technologies currently used in city and urban developments. In this respect, the IoT vision can become the building block to realize a unified urban-scale ICT platform, thus unleashing the potential of the Smart City vision.



Figure 1: application of IOT smart city

## 3 SMART CITY SERVICES

In the rest of this section, we overview some of the services that might be enabled by an urban IoT paradigm and that are of potential interest in the Smart City context because they can realize the win-win situation of increasing the quality and enhancing the services offered to the citizens while bringing an economical advantage for the city administration in terms of reduction of the operational costs [1].

- I. **Structural Health of Buildings:** Proper maintenance of the historical buildings of a city requires the continuous monitoring of the actual conditions of each building and identification of the areas that are most subject to the impact of external agents. The urban IoT may provide a distributed database of building structural integrity measurements, collected by suitable sensors located in the buildings, such as vibration and deformation sensors to monitor the building stress, atmospheric agent sensors in the surrounding areas to monitor pollution levels, and temperature and humidity sensors to have a

complete characterization of the environmental conditions. This database should reduce the need for expensive periodic structural testing by human operators and will allow targeted and proactive maintenance and restoration actions.

- II. **Waste Management:** Waste management is a primary issue in many modern cities, due to both the cost of the service and the problem of the storage of garbage in landfills. A deeper penetration of ICT solutions in this domain, however, may result in significant savings and economical and ecological advantages. For instance, the use of intelligent waste containers, which detect the level of load and allow for an optimization of the collector trucks route, can reduce the cost of waste collection and improve the quality of recycling.
- III. **Air Quality:** The European Union officially adopted a 20-20- 20 Renewable Energy Directive setting climate change reduction goals for the next decade.<sup>4</sup> The targets call for a 20% reduction in greenhouse gas emissions by 2020 compared with 1990 levels, a 20% cut in energy consumption through improved energy efficiency by 2020, and a 20% increase in the use of renewable energy by 2020. To such an extent, an urban IoT can provide means to monitor the quality of the air in crowded areas, parks, or fitness trail [6].
- IV. **Noise Monitoring:** Noise can be seen as a form of acoustic pollution as much as carbon oxide (CO) is for air. In that sense, the city authorities have already issued specific laws to reduce the amount of noise in the city centre at specific hours. An urban IoT can offer a noise monitoring service to measure the amount of noise produced at any given hour in the places that adopt the service [2]. Besides building a space-time map of the noise pollution in the area, such a service can also be used to enforce public security, by means of sound detection algorithms that can recognize, for instance, the noise of glass crashes or brawls. This service can hence improve both the quiet of the nights in the city.
- V. **Traffic Congestion:** On the same line of air quality and noise monitoring, a possible Smart City service that can be enabled by urban IoT consists in monitoring the traffic congestion in the city. Even though camera-based traffic monitoring systems are already available and deployed in many cities, low-power widespread communication can provide a denser source of information. Traffic monitoring may be realized by using the sensing capabilities and GPS installed on modern vehicles [3], and also adopting a combination of air quality and acoustic sensors along a given road. This information is

of great importance for city authorities and citizens: for the former to discipline .

- VI. **City Energy Consumption:** Together with the air quality monitoring service, an urban IoT may provide a service to monitor the energy consumption of the whole city, thus enabling authorities and citizens to get a clear and detailed view of the amount of energy required by the different services (public lighting, transportation, traffic lights, control cameras, heating/ cooling of public buildings, and so on). In turn, this will make it possible to identify the main energy consumption sources and to set priorities in order to optimize their behaviour.
- VII. **Smart Parking:** The smart parking service is based on road sensors and intelligent displays that direct motorists along the best path for parking in the city [4]. The benefits deriving from this service are manifold: faster time to locate a parking slot means fewer CO emission from the car, lesser traffic congestion, and happier citizens. The smart parking service can be directly integrated in the urban IoT infrastructure, because many companies in Europe are providing market products for this application. Furthermore, by using short-range communication technologies, such as Radio Frequency Identifiers (RFID) or Near Field Communication (NFC), it is possible to realize an electronic verification system of parking permits in slots reserved for residents or disabled, thus offering a better service to citizens that can legitimately use those slots and an efficient tool to quickly spot violations.
- VIII. **Smart Lighting:** In order to support the 20-20-20 directive, the optimization of the street lighting efficiency is an important feature. In particular, this service can optimize the street lamp intensity according to the time of the day, the weather condition, and the presence of people. In order to properly work, such a service needs to include the street lights into the Smart City infrastructure.

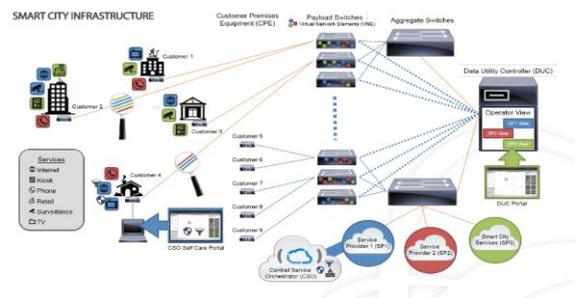


Figure 2: Smart City Infrastructure

- IX. Automation and salubrity of Public Buildings: Another important application of IoT technologies is the monitoring of the energy consumption and the salubrity of the environment in public buildings (schools, administration offices, and museums) by means of different types of sensors and actuators that control lights, temperature, and humidity. By controlling these parameters, indeed, it is possible to enhance the level of comfort of the persons that live in these environments, which may also have a positive return in terms of productivity, while reducing the costs for heating/cooling [5].

#### 4 OPEN RESEARCH ISSUES AND CHALLENGES OF IOT AND INDUSTRY 4.0

It is obvious that in the context of Industry 4.0, IoT can enhance and transform the current industries and yield a lot of benefits due to its advanced technologies, applications and services. It is also vital to point out that IoT not only aims at transforming industries and increasing their productivity but also at adding value to the core purpose of enterprises and mitigating the weaknesses caused by legacy systems. Hence, it should be compatible with existing devices, systems and infrastructure and be able to embed intelligence into them. As a result, enterprises that are undergoing digital transformation will be facilitated to adopt and implement IoT and exploit its numerous benefits and solutions without having to directly invest in totally brand-new equipment as cost might far outweigh the immediate benefits.

#### 5 CONCLUSION

IoT is an innovative and rapidly growing technology which offers various novel applications, services and solutions and links the physical to the digital world. It also allows people and “things” to be connected anytime, anywhere, with anything and with anyone ideally using any path/network and any service. Moreover, it improves the quality for the end-user community and our lives in general and supports infrastructure and general-purpose operations. In addition, it aims at transforming the current industries into intelligent ones utilizing the dynamic network of

interconnected devices. Enhancing their operation and functionality, increasing their productivity and reducing their costs and waste are some of the many benefits and profits that enterprises can gain by using IoT. Moreover, enterprises that fully adopt IoT will be ahead of their competitors, become more agile, adapt to the continuously changing market, create products of higher quality that satisfy customers' needs and requirements.

Although IoT offers a magnitude of solutions to industries as well as multitude of contemporary and advanced applications and services, it is still at an early stage of development, adoption and implementation. Thus, in order for the various current challenges and open issues to be encountered and solved, further research should be carried out. All in all, the complete implementation and prompt adoption of IoT along with appropriate utilization of its novel technologies, applications and services cannot only improve life quality, but can also yield significant personal, professional and economic opportunities and benefits in the near future.

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# Enhancement in Healthcare using IoT Applications during Covid-19 Pandemic

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**Abstract-** The concept of Internet of Things (IoT), has been developing at a high pace for that last two decades and has proved to be the most promising sector of technology. With the advent of industry 4.0, IoT is also revolutionizing the health care sector. In the global covid-19 pandemic, internet of medical things (IoMT) has been a great helping hand in fighting the virus. It is transforming the conventional health care system to personalized system, wherein patients can be remotely diagnosed and treated, provided the ailment is not acute. So that the density of patients in hospitals is controlled and the overall time and cost of treatment is reduced, also helping the people follow the protocols laid down by WHO. This paper analyzes the role IoT plays amidst the pandemic.

**Keywords** –IoT, industry 4.0, Internet of medical things IoMT.

## I. INTRODUCTION

The internet of things (IoT) is described as a network of physical things that are embedded with sensors, software's, and other technologies for the purpose of exchanging data over the internet. IoT is known as the third wave of world information industry after computer and internet.

IoT has a lot of potential to play a vital role in various fields like the healthcare sector, industrial areas, automation, autonomous vehicles etcetera. But the basic idea behind this concept is to seamlessly connect the things to internet so that a secure network is created, hence automating the connected things. Moreover, IoT can be combined with any domain like cloud based storage, computing, cyber physical systems and big data networks. If we talk a bit more about IoT, it is beyond to a concept that develops the overall architectural background which ultimately allows the integration and the effective exchange of the data between the person in need and the service providers. In the present typical situation, most of the problems are arising because the non-effective reachability to the patients, which is the second most considerable issue after the concern of vaccine development. The use of the IoT

concept makes the reachability to the patients quite useful, which ultimately help to provide them with significant care.

## II. SIGNIFICANT APPLICATIONS OF IOT FOR COVID PANDMIC

IoT uses a large number of interconnected devices to create a smart network for the proper health management system. It alerts and tracks any types of diseases to improve the safety of the patient.



Figure 1: IoT Mechanism in healthcare

It digitally captures the data and information of the patient without any human interaction. IoT is used for various applications to fulfil the important requirement of alleviating effects of COVID-19 pandemic. It has the capability to predict the upcoming situation with the help of appropriate captured data. Its applications are applied for proper management of this pandemic. The patient can use IoT services for proper monitoring of heart rate, blood pressure and other activities for personalised attention. It helps to track the health conditions of older people. The significant applications of this technology in healthcare are to track the real-time location of medical equipment and devices for smooth treatment process without any delay. Healthcare insurance companies can use this technology to detect fraud claim and provide transparency in the overall system. This improves treatment workflow of the patient with efficient performance and also helpful for decision-making process during complex cases.

Major applications of IoT for COVID-19 pandemic:

1) Internet-connected hospital

The implementation of IoT to support pandemic like COVID-19 needs a complete integrated network within hospital

premises. The connected hospital is a place where wireless technology allows caregivers and patients to roam throughout the hospital while providing accurate and timely monitoring.

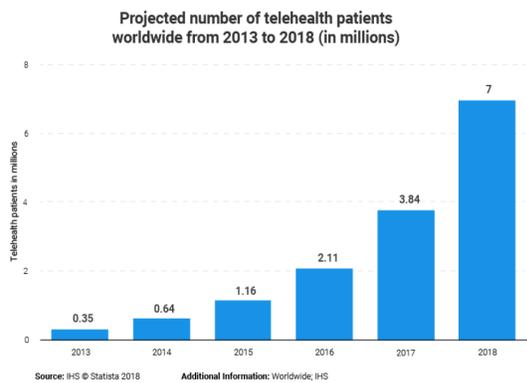


Figure 2: Growth rate of Healthcare technology.

This vision stems from the increasing number of wireless medical devices in the hospital environment. The global wireless health market is projected to grow from 39 Billion in 2015 to 110 Billion by 2020. In a connected hospital, caregivers use wireless medical equipment to provide the best quality of care to patients, rather than being preoccupied by time-consuming administrative tasks. It is no longer efficient or feasible for medical staff to manually transport files, to spend precious time inputting patient data into legacy systems, or make time consuming trips from department to department to find medical devices or information. The availability of devices and patient medical information is vital to ensure a hospital runs efficiently.

2) Enables immediate actions

Sensors could track and monitor patients from the moment they arrive in a hospital – or even in the home before that – with real-time data automatically added to patient records without the need for nurses to take readings or update charts. This integrated network will allow the patients and the staffs to respond more quickly and effectively whenever needed and make patient monitoring possible with the help of connected medical gadgets. In case the doctors fail to reach the remote locations at least some instructions can be given via the network.

3) Automated treatment process

The selection of treatment methods become productive and help the appropriate handling of the cases. The automation in treatments ensures better and accurate results.



Figure 3: Machine learning in healthcare

4) Tele-health consultation

This especially makes the treatment available for the needy ones in the remote locations via employing the well-connected tele-services. Thus ensuring the accessibility of certain medical amenities to anyone who needs.

5) Wireless healthcare network to identify COVID-19 patient

In one instance, this sensor technology once placed under the patient’s mattress can analyse the patient’s heart rate, respiratory rate, and body movement under observation amidst taking care of high priority COVID patients.

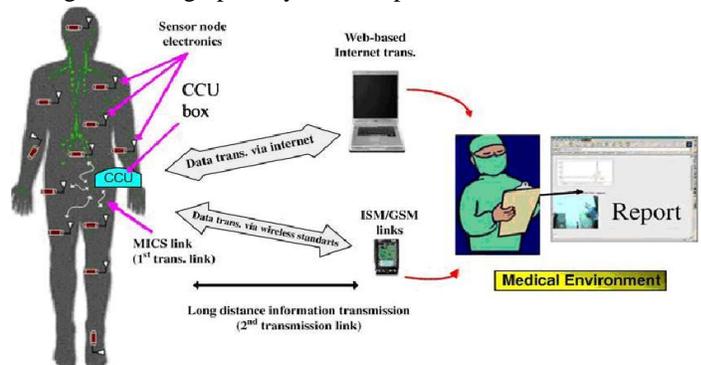


Figure 4: Medical applications of wireless network

6) Smart tracing of infected patients

According to a study by Massachusetts Institute of Technology (MIT), by superimposing geographic information systems (GIS) on IoT mobile data, it can assist epidemiologists in identifying people who have encountered the infected patients. The technology can also assist in monitoring patients who are at high-risk and can provide useful data to the healthcare workforce. To comprehend, predict and detect people infected with COVID-19, technology researchers are persuaded to deploy tools to identify the infected ones by evaluating the sound of their cough, the way they speak or even breathe.

Currently, these efforts are at a nascent stage where researchers are gathering data – speech and coughing recordings paired with information to determine the infected. After feeding the data to AI algorithms, specifically deep learning, and machine learning programmers, it determines and predicts the outcome.

The impactful tracing of patients ultimately strengthens the service providers to handle the cases more smartly. Until now many countries like India, China, Georgia, Australia, Italy etcetera,. Have made mobile applications for spreading awareness and fighting against the situation, which can make the identification procedure smoother. This technology is remote monitoring, which is being instigated by medical facilities to protect the workforce and thoroughly monitor patients even in hospital's dormitories.

**7) Rapid COVID-19 screening:**

As the case arrived/found at first instance, the proper diagnosis will be attempted through smart connected treatment devices. This ultimately makes the overall screening process more superior. Use of interconnected medical network has made screening of patients effective in public places like airports, schools, railway stations etcetera.



Figure 5: Screening test- COVID 19

**8) Identify innovative solution**

The overall quality of supervision is the utmost goal. It can be achieved by making innovations successful to the ground level. Creating a network of smart devices has helped a lot in tackling the problem. During COVID-19 treatment, IoT connected all medical tools and devices through internet which convey the real-time information during treatment.

IoT merged with AI and other domains can create the best of both worlds.

**9) Accurate forecasting of virus**

Based on the data report available, the use of some statistical method can also help to predict the situation in the coming times. It will also help to plan the government, doctors, academicians, etc. to plan for a better working environment.

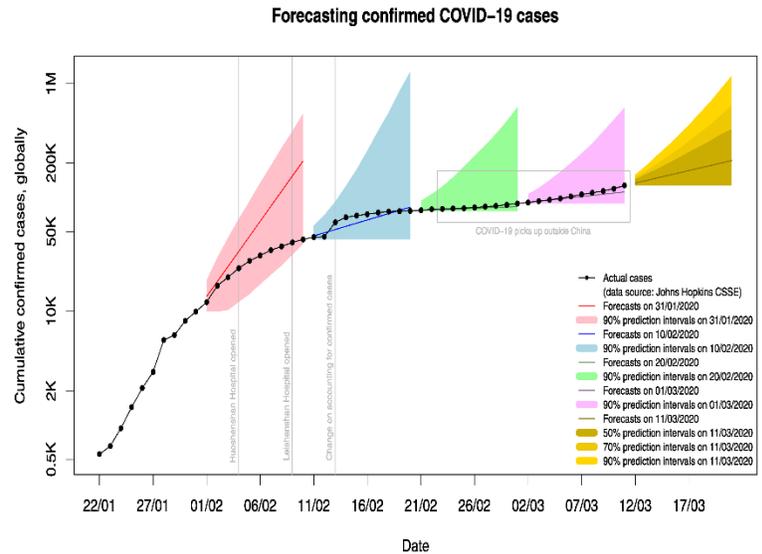


Figure 6: COVID 19 virus Forecasting

**III. CONCLUSION**

In a nutshell, IoT in healthcare sector has provided with many solutions and alternatives. This paper had focuses on interconnectivity provided, automated medical systems, Telehealth consultation, and wireless network for identification, rapid screening, and predicting the possible outcomes. It has ultimately forced the researchers, academicians, and scientists to propose some productive solutions to overcome or confront this pandemic.

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# Evolution of Cloud Computing and Enabling Technologies

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## Abstract

**Today is the era of Cloud Computing Technology in IT Industries. Cloud computing which is based on Internet has the most powerful architecture of computation. It reckons in of a compilation of integrated and networked hardware, software and internet infrastructure. In this paper, I have given a brief information on the advancement of cloud computing from its start till date. The result of this article reflects the face of the IT industries before and after the cloud computing.**

**Keywords**— Cloud, SaaS, PaaS, IaaS, Cloud Computing.

## I. INTRODUCTION

Like real clouds which are the collection of water molecules, the term “cloud” in cloud computing refers to collection of networks at a single location. The user can use the different phases of cloud boundlessly whenever demanded. Instead of setting up their own physical storage, the users commonly prefer a mediator provider (Transfer data from one source to other as and when user commands) for the service of the internet in cloud computing. The users have to pay only for the services they had used. The workload can be shifted from PC storage to internet storage to reduce the workload on PC hardware. A load of service is handled by the networks which forms the cloud that's why the load on local computers is not heavy while running an application. So, the

requirement of hardware and software at the user side is decreased. All we need to have a web browser that has access to internet like chrome and a PC that supports internet to use cloud computing.

Following are the key features of cloud computing:

I.I Resource Pooling and Elasticity

I.II Self-Service and On-Demand Services

I.III Pricing

I.IV Quality of Service

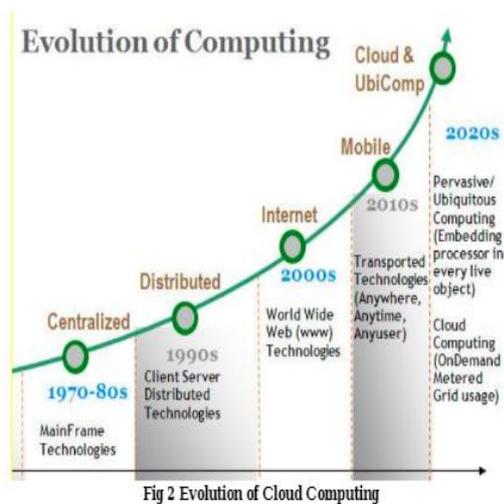
There are three services provided by cloud computing that are Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). The basic examples of cloud computing which are used by general people in daily life are Facebook, YouTube, Dropbox, and Gmail etc. It offers scalability, user friendly, flexibility, agility and simplicity that's why its use is rapidly increasing in the enterprises.



Fig 1 Network of Cloud

## II. EVOLUTION OF CLOUD COMPUTING

One day in a speech at MIT around in 1960 John McCarthy indicated that like water and electricity, computing can also be sold like a utility. And in 1999, the Salesforce Company started distributing the applications to the customers through a convenient website. Amazon Web Services were started by Amazon in 2002 and they were providing the services of storage and computation. In around 2009 big companies like Google, Microsoft, HP, Oracle had started to provide cloud computing services. Nowadays each and every person is using the services of cloud computing in their daily life. For example, Google Photos, Google Drive, and iCloud etc. In future cloud computing will become the basic need of IT Industries.



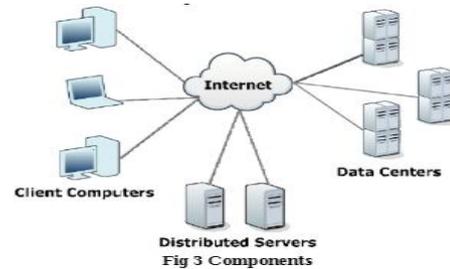
## III. COMPONENTS OF CLOUD COMPUTING

Cloud computing has three basic components as follows-

- 1. Client Computers:** The user using cloud or accessing information from cloud can interact with the cloud using the client computers.
- 2. Distributed Servers:** The servers are distributed among the different places but

acts like they as working with each other like a company with many branches serving for one purpose.

- 3. Data Centers:** Data centers are the compilation of servers (Central Storage of Data).



## IV. SERVICES OF CLOUD COMPUTING

- 1. Software as a Service (SaaS):** The way of carrying application as a service on the internet is known as software as a service. In place of installing the software on his computer, the user can simply access it via the internet.

It makes the user free from managing the complex software and hardware. The SaaS users do not need to buy software or hardware, maintain, and update. The only thing user must have an internet connection and then access to the application is very easy. Example, Microsoft Office 365, Google Apps etc.

- 2. Platform as a Service (PaaS):** A development environment or platform is given to the consumers as a service in PaaS, upon which user can deploy their own software and coding. The customer has the freedom to construct his own applications that can run on the provider's platform. Product (Cloud) as a service provider offers a predefined composition of operating system and application server (Platform) to obtain the management capacity of the applications. For example, LAMP (Linux, Apache, MySQL, and PHP), J2EE, Ruby etc.

### 3. Infrastructure as a Service (IaaS):

Many computing resources are provided by the IaaS in the form of storage, network, operating system, hardware, and storage devices on demand. IaaS users can access the services using a WAN, such as the internet. For example, a user can create virtual machines by getting access to the IaaS platform.

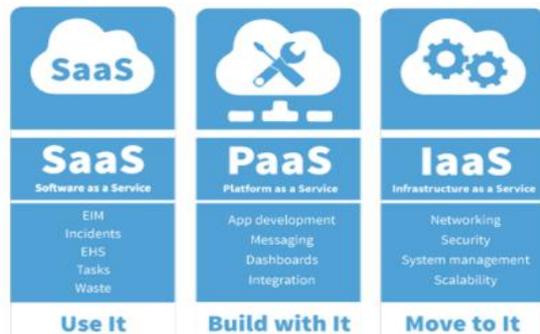


Fig 4 Cloud Computing Services

## V. TYPES OF CLOUD COMPUTING

**1. Public Cloud:** The public cloud is a computing service supplied by the third-Party providers uploaded on the public Internet server. These services are available for any user who wants to use them and they have to pay only for the services they consumed.

**2. Private Cloud:** The computing services provided over the internet or private network for only to the selected users come under the private cloud. A higher security and privacy are granted by private clouds through the firewall and internal hosting.

**3. Hybrid Cloud:** Hybrid cloud is the combination of public cloud and private cloud. In the hybrid cloud, each cloud can be managed independently. But the only drawback is that the data and applications can be shared among the clouds.

## VI. BENEFITS OF CLOUD COMPUTING

**1. Cost Saving:** In cloud computing users have to only pay for the services they consumed. Maintenance cost is low as user do not need to purchase the hardware support.

**2. Flexibility:** Cloud computing is scalable. The rapid scale up and down in the operations of your business may require quick adjustment of hardware and resources so in order to manage this variations cloud computing provide flexibility.

**3. Enhanced Security:** Cloud computing provide high security by using the data encryption (Converting data into codes), strong access controls, key management, and security intelligence.

## VII. CONCLUSION

In this review paper we described in short, the introduction, evolution, types and components of cloud computing and also, different approaches of cloud computing and some of its advantages. The application of cloud computing will continuously be increasing as advancement in generation goes on. Today approximately all small and big industries are using cloud computing to manage storage, Reduce network traffic, hardware requirements. So, it is clear that there is major impact of cloud computing on society and business.

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# Cloud Computing – Radical Shift

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## Abstract

**Using Cloud Computing provides the required Facilities for its patrons. Data storage is among one of the leading facilities offered by cloud computing. A cloud service provider creates data owner's data on their server and the user can access their data from these servers. As data, owners and servers are separate identities, the concept of data storage poses many security challenges. A standalone method is required to ensure that data is properly stored on a cloud storage server. In this paper, we will the architecture of cloud computing.**

Keywords—Cloud computing, Data storage, Cloud storage server.

## I. INTRODUCTION

Cloud computing is that the delivery of varied Internet services. These tools include tools and applications such as data storage, servers, data, network connectivity. Instead of storing files on a portable hard drive or local storage device, cloud-based storage makes it easy to store them in a remote database. As long as the electronic has access to the web, it has access to data and software programs to use it. Cloud computing is so named because the data access is located remotely in the cloud or in the visible space. Cloud service providers enable users to store files and applications on remote servers and access all data via the Internet. This means that the user does not have to be in a certain place to access it, allowing the user to work remotely. Cloud computing is a combination of many new technologies that have grown at different levels and in different contexts. The purpose of using the cloud is to allow users to benefit from all of these technologies. Cloud computing can be public and private. Public cloud services offer their services online for a certain amount of money. Private cloud services, on the opposite hand, only provide services to a particular number of individuals. These services are a network of networks that provide hosted services. There is also a hybrid option, which includes both public and private services. Cloud computing is so named because the data access is located remotely in the cloud or in the visible space. Cloud service providers enable users to store files and applications on remote servers and access all data via the Internet. This means that the user does not have to be in a certain place to access it, allowing the user to work remotely. The use of the Cloud computing device can be measured and must

be measured per client and application daily, weekly, monthly and yearly. Cloud providers typically use a "pay-as-you-go" model, which can lead to unexpected operating expenses if administrators are not familiarized with cloud-pricing models.

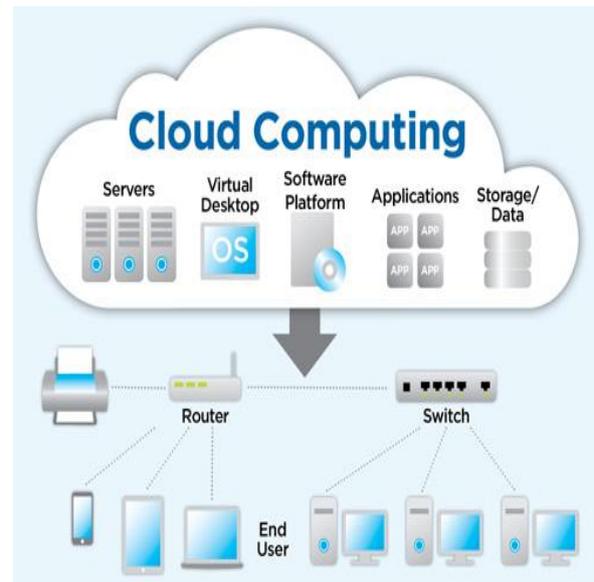


Figure 1. Cloud Computing

## II. KEY FEATURES OF CLOUD COMPUTING

1) Cloud computing technology provides flexible and fast infrastructure at a low cost. It is important to take into account the fact that organizations must often deal with business restructuring, market downturns, increasing resource size etc.

2) Companies can significantly reduce their spending on IT by adapting to a cloud computing model. This can be achieved mainly through computing-based computing where computer resources such as hardware, software, network bandwidth and other components of the infrastructure are employed by a third-party service provider. Therefore, in this way the organization will have to worry only about operating costs from the perspective of IT infrastructure. Another advantage of computing-based computing is that the IT skills required to maintain the infrastructure will be greatly reduced.

3) Users can access systems from anywhere in the world via the Internet no matter where the infrastructure is (third party service provider). All that is needed for the end user is an Internet-enabled device such as a computer, laptop or other mobile device.

4) The use of Cloud resources can be measured and must be assessed on a per-client basis and on a daily, weekly, monthly and annual basis. Various computer layers

5) Cloud based application is easy to support and maintain as it is not installed on customer machines. Any changes made to the application are available to users immediately

### III. CLOUD SPACE

There are four Sorts of cloud storage — personal, public, private and hybrid

#### A. *Personal Cloud Storage*

Also known as mobile cloud storage, personal cloud storage may be a set of public storage that works to store individual data within the cloud and provides one access to data from anywhere. It also provides data synchronization and skills sharing across multiple devices. Apple Cloud is an example of private storage. Units

#### B. *Public Cloud Storage*

Public cloud storage is where business provisioning and storage are different and no cloud services are stored within the business data centre. The cloud storage provider fully controls the business public cloud storage.

#### C. *Private Cloud Storage*

A type of cloud during which a business and cloud storage provider are integrated into a business data center. Privately cloud storage the hosting provider has the infrastructure within the business data center which is typically managed by the storage provider. Private cloud storage helps to resolve security issues while providing the advantage of cloud storage.

#### D. *Hybrid Cloud Storage*

Hybrid Cloud Space may be a combination of public and personal cloud storage where some sensitive data resides during a private business cloud while other data is stored and accessible by a safe cloud storage provider.

### IV. CHARACTERISTICS OF CLOUD COMPUTING

There are five characteristics of cloud computing they can be listed as:

#### A. *On Demand Self Service*

Computer cloud resources may be supplied without personal contact from the service provider. In other

words, the production organization can provide additional computer resources as needed without having to go to a cloud service provider. This can be storage space, virtual machine conditions, database conditions, and so on. Manufacturing organizations can use the web-service portal as a visual connector to access their cloud accounts to see their cloud services, their use, and to provide services as needed.

#### B. *Broad Network Service*

Cloud computing resources are available online and can be accessed through a variety of client platforms. In other words, cloud services are available via a network - a high-speed broadband communication link - such as the Internet, or in the case of private clouds it can be a local network (LAN). Network bandwidth and delays are the most important Aspects of cloud computing and broader network access, quality of service (QoS) in the network. This is very important in serving sensitive production requests of the time.

#### C. *Multi Tenancy and Resource Pooling*

Cloud computing resources are designed to support a multi-person model. Multiple rentals allow multiple customers to share the same requests or the same infrastructure while maintaining privacy and security in their information. It is the same with people living in an apartment, who share the same building infrastructure but still have their own flats and privacy within that infrastructure. That's how much cloud performance works. Resource pooling means that more customers are provided with the same resources.

#### D. *Rapid Elasticity and Scalability*

Stability is a hallmark of a cloud computing and means that manufacturing organizations can quickly provide and eliminate the provision of any computer services. Prompt delivery and re-delivery can apply to storage or virtual machines or customer requests. With the advent of computer cloud computing, less money is being spent on the cloud client side. This is because as a cloud client needs more computer resources, they can simply provide as needed, and are available quickly. Variation is more planned and slower. For example, a descent means that productive organizations plan more energy and that the cloud can handle that ups and downs.

#### E. *Measured Services.*

The use of Cloud resources has metrics and producer organizations pay fairly for what they use. Utilization of resources can be made using the power of charging for each use. This means that the use of the cloud resource - whether active or active server cloud conditions - is monitored, measured and reported by the cloud service provider. The cost model is based on "operational payments" —

payments vary based on actual use of the production organization

- Software such as operating system and browser to access the cloud system via internet. Depending on the cloud service delivery services.

Layer	Cloud Computing Components
Five Characteristics	On-demand self-service
	Broad network access
Three Delivery models	Resource pooling
	Rapid elasticity
	Measured Service
Four Deployment models	IaaS PaaS SaaS
	Public Private Community Hybrid

Figure 2. Cloud Architecture

V. CLOUD COMPUTING ARCHITECTURE

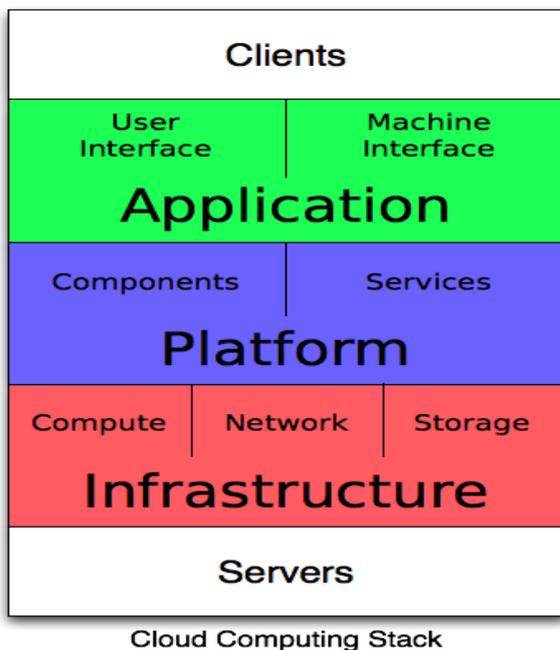


Figure 3. Cloud Computing Layers

A. Client Layer

The client layer consists of the following:

- Device computer hardware such as PCs, laptops and other mobile devices enabled by the Internet.

B. Application Layer

Application layer contains cloud application services (Software as a service). Users can access the cloud app from anywhere in the world using their internet-enabled devices. The main advantages of using cloud services are as follows:

- Software can be accessed by users from anywhere via the web without installing it on their computer devices.
- 2. Cloud application is easy to maintain and support due to a single infrastructure. 3. Easy dot installation and upgrade of cloud systems due to a single infrastructure.

C. Platform Layer

The platform layer contains a cloud platform as a service. Third-party providers offer a computer platform and a list of services to its customers using cloud infrastructure and usage. So, in this way customers do not have to worry about the cost of managing and supporting sub-software and hardware.

D. Infrastructure Layer

Layout: Infrastructure layer contains cloud infrastructure services (Infrastructure as a service). Often, third-party providers use virtualization technology to create a cloud infrastructure environment for their customers

E. Server Layer

The server layer consists of a configured computer hardware (multiple memory and memory processors) that runs cloud-based applications and cloud-based service delivery applications

VI. ADVANTAGES AND DISADVANTAGES OF CLOUD COMPUTING

A. Advantages

1) Low Cost

Services are free of charge for capital expenditure no major hardware costs per computer. You should pay as you work and enjoy the model depending on your subscription plan

2) 24\*7 Availability

Most cloud providers are really loyal to providing their services, most of them maintaining a 99.9% downtime. Employees can access the much-needed applications from anywhere. Some of the apps even work offline.

B. Disadvantages

1) Limited Control

As we know, cloud infrastructure is fully managed, managed, and monitored by a service provider, so cloud users have little control over the performance and performance of services within cloud infrastructure

## 2) Security

While cloud service providers use advanced security standards to store important information. However, before using cloud technology, you should know that you will send all sensitive information about your organization to a third party, that is, a cloud computing service provider. While sending information to the cloud, there may be a chance that your organization's information may be hacked by hackers.

## CONCLUSION

Today, if such cloud-based communications are less visible, cloud computing can be accurately described as "sky computing," with many of the cloud services IT clients have to connect to themselves. On the other hand, with virtualization and SOA pervasive in business, the concept of freely integrated services operating in an agile, crippled infrastructure should ultimately make all businesses a safe haven. It is a long-term practice with a very long standing. But among the major megatrends. Cloud computing is much harder to counter in the long run.

Cloud Computing is a technology that has taken software and the business world by storm. Proper hype over it will continue for years to come.

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# Everything You Should Know About Cloud Computing

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## Abstract

This paper describes the use of cloud computing in the modern world and how cloud computing works and its uses and types. Today is the era of cloud computing and it is based on the Internet and has the most powerful architecture for computations.

In this paper I have given a brief evaluation of cloud computing. The outcome of this paper is to show how Cloud Computing has revolutionised the IT industry.

## Index

1. Introduction
2. History Of Cloud Computing
3. Types Of Clouds
4. Types Of Cloud Services
5. Benefits Of Cloud Computing

## Keywords:-

Cloud,SaaS,Paas,IaaS,Cloud Computing, Operating System.

## Contents

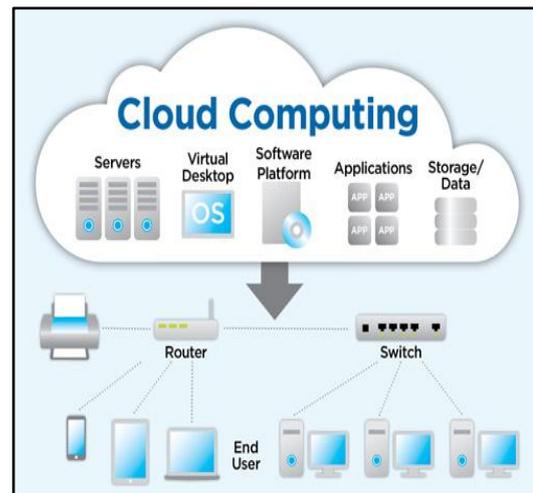
### 1.Introduction

Just like the way clouds are made up of water molecules in nature the term 'CLOUD' in Cloud Computing refers to the collection of various networks of which the cloud is made up of.

According to the practical definition of Cloud Computing in IT industries Cloud Computing is "The on-demand availability of computer resources, especially data storage and computing power without direct active management by the user."

Basically in Cloud computing the user may not setup their own physical infrastructure instead they search for a mediator to provide the services. Users only pay for the service they use.

A load of service is handled by the networks which forms the cloud that's why the load on local computers is not heavy while running an application. So the resources required by the user



are reduced. All we need is just a browser to use the services.

Figure 1

Source:- [datamation.com/cloud-computing](http://datamation.com/cloud-computing)

### 2.History of Cloud Computing

The term Cloud Computing has been around since the 2000's but the concept of computing as a service has been around since as long as 1960's when computer bureaus would allow companies to rent time on a mainframe, rather than have to buy one themselves.

These services were later overtaken by the advent of PC's as it made computers affordable but the idea of the time-sharing services remained and has resurfaced again in the form of 'Cloud Computing'. Cloud Computing took hold with the emergence of software as a service and hyperscale cloud computing providers such as Amazon web services.

### 3.Types of Clouds

**Public Cloud:-**Public cloud is the classic cloud computing model, as the name suggests it is a public which means it is open for everyone and follows the multi-tenant architecture. They are used mainly due to their ability to rapidly scale up a service which means that they can cope up for any

additional resources if the customer shall require them. But the downside is that the multi-tenant feature of these clouds which makes them vulnerable to security attacks or accidental deletion of data from other tenants in the system hence these type of systems are mostly used for less sensitive applications.

**Private Cloud:-**As the name suggests these clouds are private which means that they allow the organizations to enjoy the benefits of the public system without worrying for the theft of data or attacks cause the system is kept secure behind the corporate firewall. Companies are able to control exactly where their data is going or who and how it is being used.

But this comes with a huge cost and have a very high cost but if you want security for your cloud this system is a useful stepping stone.

**Hybrid Cloud:-**Hybrid cloud takes the best of the two worlds i.e. it takes the best features from the public and private clouds.

Some data would be stored in the public cloud (mostly the less important data) and the more important projects in the private cloud. But managing the multiple cloud systems is quite a difficult job .The main reason for choosing hybrid cloud is the disaster recovery planning and the desire to avoid hardware costs by the organization.

**4.Types Of Cloud Services**

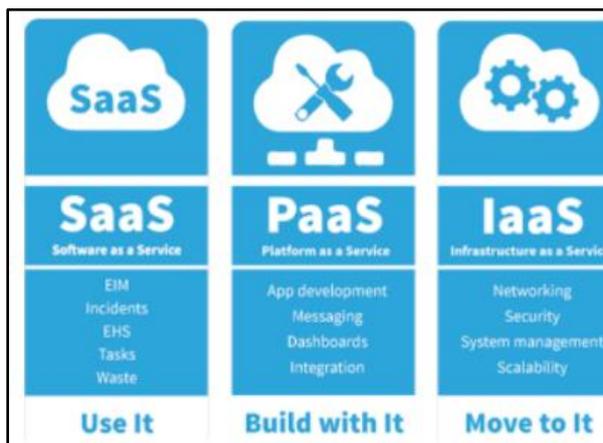


Figure 1

(Srivastava, Priyanshu & Khan, Rizwan. (2018). A Review Paper on Cloud Computing. International Journal of Advanced Research in Computer Science and Software Engineering. 8. 17. 10.23956/ijarcsse.v8i6.711.)

**Infrastructure As A Service:-**Infrastructure-as-a-service (IaaS) refers to the fundamental building blocks of computing ,basically it provides the basic physical or virtual servers,storage and networking for rental purposes. They provide the basic infrastructure required to small companies who want to build applications from the ground and want to control all the elements by themselves but do not have the required technical support to be able to create and manage services at that level.

**Platform As A Service:-**Platform-as-a-service is the layer above IaaS.It provides the platform which is basically tools and softwares that developers need to build applications on top of, it includes things like middleware,database management systems, operating systems and other development tools.

**Software As A Service:-**Software-as-a-service (SaaS). Is the delivery of applications as a service?

It is a software distribution model in which a third party provider (mostly the cloud service provider) hosts applications and makes them available to customers over the internet.

The provider gives the customers network based access to a single copy of an application that the provider created specifically for SaaS distribution.

**5.Real World Examples Of Cloud Computing**

- Cloud Computing is used by mail and social media services like Gmail and Facebook,etc. to store the information of users on a large scale but of course on a private cloud system. These media services also provide its users with a free storage as a service by the use of cloud.
- Cloud Computing can also be used for education and has almost revolutionised the education system .Platforms like Slide Rocket, Ratatype, Amazon web services enable students to build presentations and submit them. Students can even present them through web conferencing all on the cloud.Other services like Google Classrooms provide free services to students and teachers to setup a virtual classroom like environment and continue the teaching learning process.

**6.Benefits Of Cloud Computing**

The exact benefits of Cloud Computing are difficult to gauge because they mostly depend

upon the type of service you ask and pay for and the type of system you ask for.

But the common benefits are:-

- No need to buy and maintain huge and expensive servers as you would be using the servers of the cloud service provider which would be maintained by them only.
- No need to update applications or operating systems or decommissioning of hardware because all of that is taken care by the cloud service provider.
- Cloud services are good for new or small companies which do not have better skills or experienced staff to maintain such services so they can just go and get these services.
- Using Cloud Computing services means that companies can move faster in projects and test out concepts without having to pay any big upfront cost.
- If used as a secondary or backup storage service then it can also protect from data loss and act as a disaster recovery measure.
- They also provide with mobility which means that Cloud Computing allows mobile access to corporate data via smartphones and other mobile devices cause the data is stored on the net and is a great way to ensure that the staff can work from anywhere if suddenly an emergency arises.

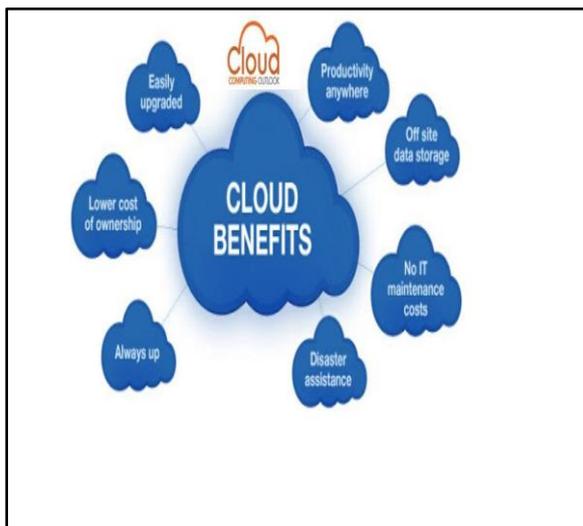


Figure 2: Source medium.com

## Conclusion

In this paper we gave a short introduction and history of cloud computing and also gave a brief insight in the various types of Cloud Computing and the various services available.

We also discussed the various benefits of using Cloud Computing for various businesses.

The application area of Cloud Computing will continuously be increasing. Today approximately all small and large businesses, from local businesses to MNC's all use Cloud Computing in one form or the other.

So, it is clear that Cloud Computing has a major impact on the society and businesses.

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# Cloud Computing: Research Issues and Implications

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## Abstract

Cloud computing is not a new concept; it is originated from the earlier large-scale distributed computing technology. However, it will be a subversion technology and cloud computing will be the rapid revolution in the Computer Science and Information Technology field. Which represent the development trend in the IT industry from hardware to software, software to services, and distributed service to centralized service. Cloud computing is also a new mode of business computing is virtualization. It will be widely used in the near future. The core concept of cloud computing is reducing the processing burden on the users. Eventually users use a wide variety of devices, including PCs, Laptops, Smart Phones, and PDAs to access different kinds of utility programs, storage, and application development platforms over the Internet. All these services offered by cloud computing providers. An advantage of the cloud computing technology includes cost savings, high availability, and easy scalability. However, still there exist many problems in cloud computing today, the current researchers or practitioners pointing that data security and privacy risks have become the primary concern for people to transfer or migrate to cloud computing[1].

## Keywords—

Cloud computing Deployment model and Issues Implications.

### 1. DEFINITION

"Cloud" is a virtualized pool of computing reusable resources. It can:

Control or customizing a variety of different workloads. Batch update of back-end and front-end operations with GUI applications.

Rapidly deployment and increase workload by physical or virtual machines.

Support for redundancy, self-healing and highly scalable API.

Real-time monitoring resource usage. [2]

Cloud computing is categorically into three major segments: "Applications", "Platforms," and "Infrastructure". Each segment serves a different purpose and offers different products for businesses and individuals around the world. The server administrator monitoring traffic and client demands to ensure everything runs accurately. It

follows a set of rules called protocols and using software is called middleware.

### 2. CLOUD COMPUTING FEATURES

Cloud computing brings an array of new features and advantages compared to any other computing paradigms.

There are briefly described in this section.

Scalability and On-Demand Services - Cloud computing provides resources and services for users on demand. The resources are scalable over several data centers.

Quality of Service (QoS) - Cloud computing can guarantee QoS for users in terms of hardware or CPU performance, bandwidth, and memory capacity.

User-Centric Interface - Cloud interfaces are location independent and they can be accessed by well-established interfaces such as Web services and Web browsers.

Autonomous System - Cloud computing systems are autonomous systems managed transparently to users. However, software and data inside clouds can be automatically reconfigured and consolidated to a simple platform depending on user's needs.

Pricing - Cloud computing does not require up-front investment. No capital expenditure is required. Users may pay and use or pay for services and capacity as they need them.

### 3. CLOUD COMPUTING ISSUES AND IMPLICATIONS

The new paradigm of cloud computing provides sophisticated benefits and advantages over the previous computing paradigms and many organizations are customizing, migrating and adopting it. In the last few years, cloud computing has grown from being a promising logic; business is virtualization concept to one of the fastest growing segments of the IT industry. Now, recession-hit companies are increasingly realizing that simply by tapping into the cloud and gain fast access to best-of-breed business applications or drastically boost their infrastructure resources, all at negligible cost. However, there are still a number of issues, challenges and implications are identified, which are currently addressed by researchers, academicians and BI (business intelligence) practitioners.

### 1. Security

Clouds provide companies are still concerned about security when using cloud computing. Users are also worried about the vulnerability to attacks, when information and critical IT resources are outside the firewall. Where is the data more secure, on local hard drive or on high security servers in the cloud? However, in the cloud, the data will be distributed over the network through individual computers regardless of where the repository of data is ultimately stored. Industrious hackers can invade virtually at any server, and there are the statistics show that one-third of breaches result from stolen or lost laptops and other devices and from employees' accidentally exposing data on the Internet, with nearly 16 percent due to insider stealing.[4]

### 2. Reliability

Clouds computing still always offer round the clock reliability. There were few cases where cloud computing services suffered few hours' outages. In the present and future days to expect more cloud computing providers, richer services, established standards and best practices. Servers in the cloud have the same problems as your own resident servers. The cloud servers also experience downtimes and slowdowns, what the difference is that users have a higher dependent on cloud service provider (CSP) in the taxonomy of cloud computing. Once you choose a particular provider, you may be locked-in, thus bring a potential business secure risk.

### 3. Privacy

Different from the traditional computing model, cloud computing utilizes the virtual computing technology, users personal data may be scattered in various virtual data center rather than stay in the same hard drive physical location, even across the national borders, at this time, data privacy protection will face the controversy of different legal systems. On the other hand, users may leak hidden information when they accessing cloud computing services. Attackers can analyze the critical task depend on the computing task submitted by the users. [5]

### 4. Open Standard

Open standards are critical to the growth of cloud computing. Most cloud provider's interpretation with APIs which are typically well-documented but also unique to their implementation and thus not interoperable. Some vendors have adopted others' APIs and there are a number of open standards under development, including the OGF's Open Cloud Computing Interface. The Open Cloud Consortium (OCC) [6] is working to

develop consensus on early cloud computing standards and practices.

### 5. Performance

The major issue in performance can be for some intensive transaction-oriented and other data intensive applications, in which cloud computing may lack adequate performance. Also, users who are at a long distance from cloud providers may experience high latency and delay.

### 6. Bandwidth Cost

Cloud computing offered companies, can save money on hardware and software; however they could incur higher network bandwidth charges. Bandwidth cost may be low for smaller Internet- based applications, which are not data intensive, but could significantly, grow for data-intensive applications.

### 7. Long-term Feasibility

Users may be sure that the cloud data or information put into the cloud storage will never become invalid even particular cloud computing service provider go broke or get acquired and swallowed up by a larger company. "The cloud potential providers how to would get the data back, and it would be in any format that it is import into a replacement application"-Gartner.[7]

### 8. Legal Issues

In the same way that the electricity one uses may have been generated in another country where costs are lower, the computer processing power or storage one buys via a Cloud service may be based in another country, or indeed may be divided between multiple countries. But as well as the cost and efficiency advantages brought in this arrangement, this also raises vexing legal issues in the case of Cloud Computing arising out of exporting customers data abroad; also, the Cloud Services Provider has to contend with the Legal Systems under different Jurisdictions with not so much of visibility as to where the Data resides and how it is routed to the End User while passing through different Legal Jurisdictions. Again, vexing Legal Issues relating to ownership of data and liability for its loss or misuse have to be dealt with by the Cloud Service Providers. The legal issues differ from those arising from conventional outsourcing or hosting.[8]

#### 4. DEPLOYMENT MODEL

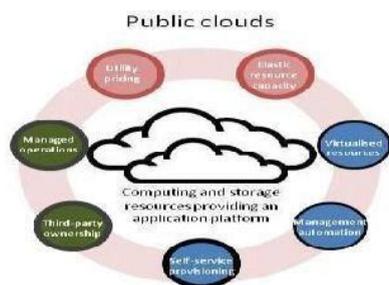


figure.1

Public Cloud (or External Cloud) figure.1: In this model, computing resources are dynamically provisioned

Overt he Internet via Web applications or Web services from trusted third party provider.

Public clouds are run by third parties, and applications from different customers are likely to be mixed.

Together on the cloud's servers, storage systems, and networks. Although the public cloud has compelling advantages, there existing the hidden risk of security, regulatory policy compliance and quality of service (QoS) requirements.

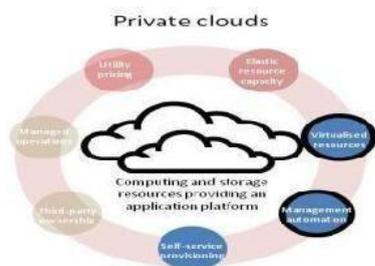


figure.2

Private Cloud (or Internal Cloud) figure.2: In the private cloud deployment, computing resources are used and controlled by a private enterprise. It is generally deployed in the enterprises data center and managed by internal personnel or service provider. The main advantage of this model is that the security, compliance, and QoS are under the control of the enterprises. [3]

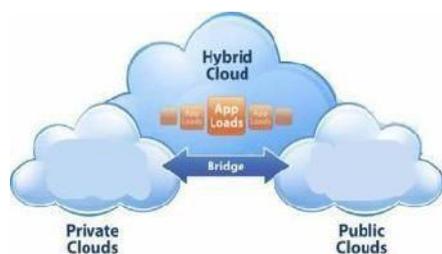


figure 3

Hybrid Cloud (or Mixed Cloud figure.3): The Hybrid Cloud environment intersects and combines multiple

Public and private cloud models enable the enterprise applications to running state-steady workload in the private cloud, and requesting the public cloud for intensive computing resources when peak workload occurs. Hybrid clouds introduce the complexity of determining how to distribute applications across both a public and private cloud.

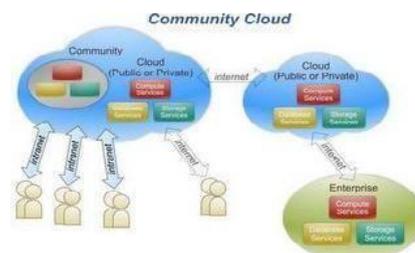


figure 4

Community Cloud (or Group Cloud) figure.4: In this Community deployment model several organizations.

Jointly construct and share cloud infrastructure as well as policies requirements values, and concerns. The cloud community forms into a degree of economic scalability and democratic equilibrium. The cloud infrastructure could be hosted by a third-party vendor or within one of the organization in the community. This is emerging cloud used by many social networking website like Facebook, orkut,etc.

#### 5. CONCLUSION

In this paper, to analyze and discussed an emerging technology: Cloud Computing. The evolving is one of the core platform for Computer Science (academics) and Information Technology (industry) in the professional world. It describes cloud background, evolution, definition, service models, deployment models and some existing issues. There is no doubt that the cloud computing is the emerging development trend in the future. Cloud computing brings us the approximately infinite computing capability, good scalability, on- demand service and so on, also challenges at security, reliability, and privacy, legal issues and so on. Because of this, it has been attracted by everyone including the attackers. The paper is expected to be a right path or URL for those who works or does research in cloud computing. We acknowledge the cloud computing era, to solving and prevent the existing issues and implications for maximum

necessity is required.

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# Role of Chatbots in today's Industry

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**Abstract:** This paper represents a brief introduction of Chatbots and the benefits of chatbot in the industry. A Chatbot is one of the most exceptional and promising inventions of interaction between humans and machines. Chatbots can chat like human beings and they can learn from their experiences.

Chatbots can be economically useful as it offers 24/7 service hence improves customer satisfaction which reduces cost and increases revenue. A chatbot is like a one-time investment which helps to reduce the number of staff required in the industry. It can be much more efficient than a human responding to customers' questions. Thus, a chatbot is able to answer questions in a quick and more efficient manner. Many companies are using Chatbot in lots of exciting ways.

**Keywords:** Artificial Intelligence, chatbot, Communication, types of chatbots.

## I. BRIEF INTRODUCTION TO AI

Artificial intelligence is a broad division of computer science that develops smart machines capable of executing tasks that usually require human intelligence.

Artificial Intelligence is a way of thinking about how smart humans think about a computer, a robot, or a product. AI is a study of how the human brain thinks, learns, decides, and functions as it tries to solve obstacles. It produces clever computing programs. The aim of AI is to improve computer functions, such as logic, comprehension, and problem-solving, which are related to human intelligence.

It is a set of thoughts, tools, and techniques that represents an enormous potential for change and transformation.

More precisely, AI explains whether a computer can learn from information, produce some degree of comprehension, and then use the knowledge gained to do something. AI covers artificial learning and particular methods as subsets, such as deep learning.

The fathers of the sector, Minsky and McCarthy, defined artificial intelligence back in the 1950s as any work performed by software or system that, if a human being performed the same operation, we would conclude that the human being had to use intelligence to perform the task.

Usually, AI systems can show at least some of the following human intelligence related behaviours: planning, observing, thinking, problem-solving, representation of information,

vision, motion, and manipulation, and, to a lesser degree, social intelligence and imagination.

## II. WHAT IS A CHATBOT?

A chatbot can be described as an AI-based computer program that simulates human conversation. They are also known as robotic assistants who comprehend human capabilities. Chatbots interpret and manage user questions and provide prompt, appropriate responses.

Chatbots can communicate in both voice and text and can be distributed through websites, apps, and networking platforms such as Facebook Messenger, Twitter or WhatsApp, Telegram.

## III. WHY WERE CHATBOTS CREATED?

Digitization has turned society into a "mobile-first" community. As messaging apps become more popular, chatbots are increasingly playing an important role in this mobility-driven transition. Intelligent conversational chatbots are mostly frameworks for smartphone apps and transform the way companies and consumers communicate.

Chatbots empower companies to communicate with consumers on a personal basis without the cost of human representatives. For example, many of the questions or concerns clients have are normal and easy to address. That's why businesses are developing FAQs and troubleshooting manuals. Chatbots offer a personalized substitute to a written FAQ or guide, and can also work out queries, like handing over a customer problem to a live human, if the issue gets too difficult for a chatbot to fix. Chatbots became popular as a time and money saver for companies and added comfort for consumers.

## IV. HOW CHATBOTS HAVE EVOLVED

The root of the chatbot is presumably Alan Turing's idea of intelligent machines in the 1950s. Artificial intelligence, the basis for chatbots, has evolved since then to include super-intelligent supercomputers such as IBM Watson.

The original chatbot was the phone tree, which guided phone-in customers down the frequently lengthy and exhausting road of choosing one alternative after another to work their way through an automated customer support platform.

Enhancements of technology and the increasing maturity of AI, ML, and NLP have turned this paradigm into live on-screen, pop-up chats. And the journey of evolution has started.

With today's digital assistants, businesses will scale AI to provide even more easy and successful connexions between corporations and customers directly through digital consumer devices.

## V. ARE CHATBOTS BAD?

There are a few myths regarding the word chatbot. Although the words chatbot and bot are often used interchangeably, the bot is essentially a computer application that can be used for any legitimate or malicious purposes. The negative connotation surrounding the term bot is due to the past of hackers using computer systems to invade, usurp and, in general, create chaos in the digital environment.

Bots and chatbots should also not be mistaken. Generally speaking, chatbots have no experience of being used for hacking purposes. Chatbots are conversation instruments that execute simple tasks effectively. People enjoy them so they help them get through these assignments efficiently so that they can direct their energy on high-level, strategic and entertaining activities that involve human skills that cannot be replicated by machines.

## VI. HOW DO CHATBOTS WORK?

Chatbots operate by interpreting and defining the intention of the user's request to determine the appropriate individuals, which is the most critical role of the chatbot. If the review has been carried out, the required response will be given to the customer.

Chatbots process data and provide fast responses to all forms of user requests with predefined rules and AI-based chatbots.

## VII. TYPES OF CHATBOT

Chatbots process data to deliver quick responses to all kinds of users' requests with pre-defined rules and AI-based chatbots.

There are two types of chatbots

1. Rule-based chatbots- During communications, rule-based chatbots track the predefined routes. The user would need to select from explicit alternatives at each point during the conversation to decide the next point in the conversation.

### Core attributes-

- a) Such bots respect predetermined laws. For simplified situations, it is therefore convenient to use the bot.

- b) Interactions are strongly organized for rule-based chatbots and are most applicable to customer service tasks. Rule-based bots are ideally suitable for answering common queries such as an inquiry about business hours, delivery status, or tracking details.

2. Conversational chatbots- Conversational chatbots are also referred to as virtual assistants or digital assistants.

They're more social and customised than the rule-based chatbots. Conversational chatbots communicate to clients in a manner that people interact and connect in real-life situations.

Conversational communication skills of chatbot technologies allow them to provide what customers are looking for.

### Core attributes-

- a) Conversational bots may understand and attempt to provide more relevant answers about the meaning and purpose of complicated interactions.
- b) To grasp consumer sentiments closely, AI bots apply predictive intelligence and sentiment analysis.
- c) Bots for machine learning learn about user experience and have more tailored conversations.

## VIII. WHY ARE CHATBOTS IMPORTANT FOR BUSINESS

Chatbots increase operating performance and carry cost savings to organizations while providing consumers comfort and additional services. They allow businesses to address all kinds of customer questions and concerns quickly while reducing the need for human contact.

How chatbot profits from attracting further clients or keeping current ones

1. Reduce customer waiting time -According to the Chatbot Survey, 21 percent of customers see chatbots as the fastest way to get in touch with a company. Chatbots are a better way to ensure that consumers get the instant answers they're looking for without waiting in a line.
2. 24x7 availability- A number of consumers turn to a rival if they don't think you care for them. Bots are often available to provide consumers with instant responses to the basic questions they have posed. The maximum possible advantage of using chatbots is 24-hour customer support.
3. Better customer engagement-

Conversational bots will connect consumers around the clock by beginning a constructive dialogue and providing customised insights that improve customer service.

4. Save customer service costs– Juniper Research predicts that chatbots will help companies save more than \$8 billion a year by 2022. Chatbots help companies save on customer care expenses by recruiting more support agents who entail extra costs, such as wages, training and maintenance costs.
5. Reduce customer churn rate– Engaging customers is probably the most efficient way to minimise bounce rates and thus increase revenue. You will also develop the engagement schedule with chatbots and simply keep the guests entertained.
6. Automation leads qualification & sales- You can automate the sales funnel with chatbots to pre-qualify leads and guide the customer to the right team for more assistance. Being able to engage customers instantly increases the number of leads and conversion rates.

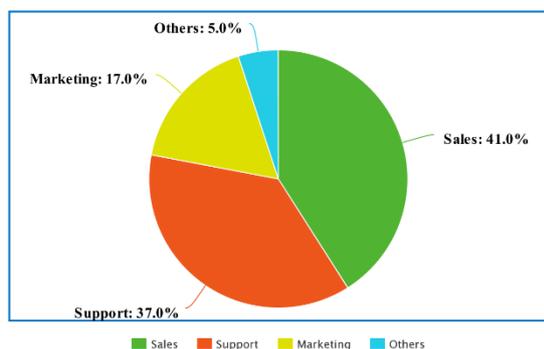


Figure (a)- Where Chatbots are being majorly used in today's industry

Some key customer service use cases are as follows:

1. Website support– Today's consumers demand response in real-time. Businesses are embracing the technologies of a chatbot to offer timely customer engagement.
2. IT Helpdesk – Chatbots will help the IT helpdesk improve the team's productivity and drive performance.
3. In-app support– The use of a bot to manage FAQs within apps increases user experience. It allows companies to deliver updates to keep consumers up-to-date.
4. Sales-Lead generation is the most critical feature of any company. With chatbots, you can pre-qualify your leads and simplify your sales enclosure. You will do this by submitting the leads straight into your CRM or bypassing them

to the sales reps to support them more. The key use cases of sales bots are:

- a) Segment your audience- Chatbots allows you to recognize the product preferences of both guests and consumers. Based on this, you will segment your target demographic.
  - b) Pre-Qualifying leads - Chatbots, equipped with a predefined sales questionnaire, turns visitors to the website into prospects. They are then led to the next floor of the sales enclosure.
  - c) Bookings- Chatbots help arrange appointments for accommodation or health care, as well as bookings for personal facilities.
5. **Marketing**-Bots can benefit from user engagement and exchange useful knowledge about the brand, goods, and services. Essentially, it's capable of marketing and selling in a customized, conversational, and entertaining way.

The Chatbot marketing use cases for better customer engagement are:

- a) Product Suggestions – Bots may be used to recommend items or mix deals depending on the customer experience.
- b) Start a constructive conversation– Bot will facilitate a positive discussion when the customer is lost in the product and leads them in the right way.
- c) Personalized alerts – You can recognize the habits of your client and enhance interactions by personalizing them.

## IX. THE FUTURE OF CHATBOTS

Chatbots, like other AI technologies, can be used to further improve human skills and free people to be more imaginative, focusing more of their time on strategic rather than operational tasks.

In the near future, as AI is coupled with the advancement of 5 G technologies, enterprises, staff and customers are expected to experience improved chatbot capabilities, such as quicker advice and forecasts, and quick access to high-definition video conferencing from inside a conversation. This and other possibilities are under study and will develop rapidly as Internet access, AI, NLP, and ML progress. Eventually, every person should have a completely functioning personal assistant in their pockets, making our planet a more productive and connected place to live and work.

## X. CONCLUSION

In this paper, we explain how it would be useful for the industry to use chatbots for user interactions

A chatbot is a rising innovation and a chatbot improves the productivity of a business by offering improved service at a low cost. A chatbot is a perfect platform for easy contact with the customer. They support us by delivering fun, saving time, and addressing questions that are hard to find. Recent advances in machine learning technology could be able to address complicated conversation topics, such as purchases, correctly.

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# Virtual Reality

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**Abstract**—Virtual reality (VR) is a technology which allows user to interact with a computer-simulated environment, whether that environment is a simulation of the real world or an imaginary world. It is the medium of creating our own world, our own customized reality. It could range from creating a video game to having a virtual stroll around the universe, from walking through our own dream house to experiencing a walk on an alien planet. With virtual reality, we can experience the most intimidating and grueling situations by playing safe and with a learning perspective.

Very few people, however, really know what VR is, what its types and applications are. In this paper an overview of virtual reality is presented, basic types are explained and an insightful study of uses of VR system is done.

**Keywords**— *Virtual Reality, Introduction, Types, Applications*

## I. INTRODUCTION

The concept of virtual reality is built on the natural combination of two words: the virtual and the real. The former means “nearly” or “conceptually,” which leads to an experience that is near-reality through the use of technology. To understand virtual reality, let’s draw a parallel observation with real-world. We understand our surroundings through our senses and the perception mechanisms of our body. Senses include taste, touch, smell, sight, and hearing, as well as spatial awareness and balance. The inputs gathered by these senses are processed by our brains to make interpretations of the objective environment around us. Virtual reality attempts to create an illusory environment that can be presented to our senses with artificial information, making our minds believe it is (almost) a reality. Technically, Virtual reality is the term used to describe a **three-dimensional, computer generated environment** which can be explored and interacted with by a person. That person becomes part of this virtual world or is immersed within this environment and whilst there, is able to manipulate objects or perform a series of actions.

## II. TYPES OF VIRTUAL REALITY

### A. Non-immersive Virtual Reality

Non-immersive virtual reality refers to a virtual experience through a computer where you can control some characters or activities within the software, but the environment is not directly interacting with you. For example, when you play video games such as World of WarCraft, you can control characters within the game that have their own animations and attributes.

### B. Fully Immersive Virtual Reality



Fig 1: Fully Immersive Virtual Reality

On contrary to non-immersive virtual reality, a fully immersive virtual technology ensures that you have a realistic experience within the virtual world. It will be as if you are physically present in that virtual world and everything is happening to you for real.

One example could be a Virtual Shooter gaming zone where you will be equipped with the gears in a small room and you will be viewing a virtual world through the helmet where you are facing other shooters trying to kill you. You will move your arms and body to run, jump, crouch, shoot, throw and many more within the game.

### C. Semi-Immersive Virtual Reality

A semi-immersive virtual reality is a mixture of non-immersive and fully immersive virtual reality. This can be in the form of a 3D space or virtual environment where you can move about on your own either through a computer screen or a VR box/headset. However, you have no real physical movements other than your visual experience.

A virtual tour is the most popular semi-immersive virtual reality that most businesses are embracing today.

### D. Augmented Reality

Augmented Reality is when a certain entity or device seems to be present in reality but is actually not. Rather than putting you into a virtual world, a virtual entity is placed in the real world through any device. For example, Snapchat filters.

### E. Collaborative VR

This is a form of a virtual world where different people from various locations can come into contact within a virtual environment, usually in the form of 3D or projected characters. For example, there is a video game called PUBG, where tons of players come to existences as individual virtual characters which they can control. Here they can interact with each other through microphones, headsets, and chatting.

### III. TYPES OF VIRTUAL REALITY

#### A. Through medical training:

The proper and effective COVID-19 (**Immediate use**) medical staff training (or any medical staff training) will make the physician quite familiar with the actual case and the exact situation to be handled. Virtual reality offers the doctors or medical personals to withstand and practice all the complex cases by supporting them to have reach ability as similar to real patient handling, as the case may be. We can educate not only the healthcare personals but also its ultimate beneficiaries, i.e. patients. This theme also enhances patient satisfaction as well as provides the doctors with a vast work gratification too.

#### B. Gaming:

For the past few years, the Virtual Reality gaming industry has already won significant market size and still shows fast growth rate. The global Virtual Reality in Gaming market is expected to grow at a compound annual growth rate of 30.2% from 2020 to 2027, to reach USD 92.31 billion by 2027

#### C. Aviation and military:

Commercial pilots can use realistic cockpits with VR technology in holistic training programs that incorporate virtual flight and live instruction. Police and soldiers are able to conduct virtual raids that avoid putting lives at risk.

#### D. Automotive industry:

Brands such as BMW and Jaguar Land Rover already use VR to hold early design and engineering reviews to check the visual design and object obscuration of the vehicle before any money has been spent on physically manufacturing the parts.

#### E. Retail:

The body-scanning technology in VR will allow us to try on clothes in the virtual world to see what they would look like on a person. Various companies (for example, the European retailer ASOS) are attempting to bring us the VR shopping experience

#### F. Education:

VR could revolutionize by enabling students to learn in an immersive, experiential way. Unimersiv have apps that allow users to take a tour of Ancient Rome, explore the human brain, and board the Titanic.



Fig 2: Educational use of Virtual Reality

#### G. Real estate:

You can look around the properties from the comfort of your [existing] home - no estate agent or sacrificing your weekend needed. Matterport are leading the way and have already scanned thousands of homes using their scanning hardware.

#### H. Architecture:

VR makes possible to see not just what a building or space will look like but how it will feel. For home-owners, they can experience the space before it is physically built.

#### I. Sports:

LiveLikeVR enables broadcasters and sports teams to deliver live sports viewing experiences on mobile VR. This is a great way of opening up live sports events to people who can't travel to the venue or can't afford tickets to watch the sports in person.

#### J. Art and design:

With VR, you don't just create life-size artwork - you can be in it. You can also make virtual 3D models and sculptures with Masterpiece VR.

#### K. Charity:

People are more likely to be moved to action when they are immersed in a situation they would otherwise not be able to relate to, or come close to experiencing. For example, in 2015, UNICEF used the video 'Clouds Over Sidra' to double their donations towards their work with the Syrian Refugee Crisis.

#### L. Marketing:

VR is becoming popular for universities to create virtual campus tours of universities. Princeton, Yale and Columbia have all tried this out as a way of more students to be able to see their campus.

#### M. Tourist:

People would be able to try your holiday before you buy it. The industry is taking the first steps to enabling you to go on guided virtual tours of hotels, restaurants and tourist landmarks.

### IV. CONCLUSION

In this report, the authors have aimed to share insights and lessons which will be useful to a new field, in a new industry. Virtual Reality is a conceptual idea, not some products with the specified definition. It will diversely enrich and revolutionize our world in many areas. It offers new possibilities to understand and experience which can be of great benefit and use in our present and future.

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# Application of Augmented Reality Techniques Uses in daily life

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**Abstract**— *Augmented Reality is a combination of a real and a computer-generated or virtual world. It is achieved by augmenting computer-generated images on real world. It is of four types namely marker based, marker less, projection based and superimposition based augmented reality. It has many applications in the real world. AR is used in various fields such as medical, education, manufacturing, robotics and entertainment. Augmented reality comes under the field of mixed reality. It can be considered as an inverse reflection of Virtual Reality. They both have certain similarities and differences. This paper gives information about Augmented Reality and how it started. It analyses various types of augmented reality, its applications and its advantages and disadvantages. This paper also gives us knowledge regarding those major threats that augmented reality will face in the near future and about its current and future applications. It gives us a comparison between the two related topics, Augmented reality and Virtual reality. The following paper also helps us know about the effect of Augmented Reality on the human life.*

**Keywords**— Augmented Reality; Through-life Engineering Abbreviation: Augmented Reality (AR)

## 1. Introduction-

Augmented Reality (AR) is an innovative technology able to supplement a real-world environment with computer-generated sensory inputs. These virtual components seem to coexist with real ones in the same space, enhancing the user's perception of reality and enriching the provided information content. Thanks to the considerable improvement in the quality and effectiveness of human-machine interaction, the use of this technology is shifting from laboratories and academic institutions around the world to different industrial contexts and consumer markets.

The first researches in this area were carried out in the 60's by Ivan Sutherland at Harvard University, but it was during the 90's that AR reached concrete experimental results, applicable on a large scale. Currently, there are many application areas for AR, ranging from the engineering field to various aspects of everyday life

AR has been defined as a human-machine interaction tool that overlays computer-generated information on the real-world environment and can be described as a set of three key features :

- Combination of real and virtual objects in a real environment;
- Real-time interaction with the system, able to react to user's inputs;
- Geometrical alignment of virtual objects to real ones in the real world.

The strengths of AR can be identified as follows:

- Immersive system: information are directly integrated in the real world;
- Immediate interpretation of information: the provided messages are easily understandable by the user;
- Paperless ability to provide a large amount of knowledge;
- Possibility of integrating the system with other computer-aided devices;
- Faster procedures: the operator does not detract the attention from the real environment, while consulting procedural instructions.

## 2. Overview on AR techniques-

To combine virtual objects and real images, one of the following methodologies can be used, according to the method of overlaying virtual components on the real world environment:

- Optical combination: virtual images are projected in the visual field of the user, while he directly observes the real scene.
- Video mixing: digital information are acquired by a camera and reworked by a computer. The result is then displayed on a monitor through which the user indirectly observes the real scene.
- Image projection: images are directly projected on the surfaces of physical objects.

The main hardware components required for performing AR applications and their functions are:

- Computer; besides creating virtual contents and managing all the devices, it has to collimate the

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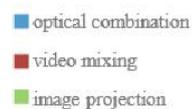
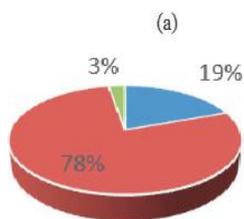
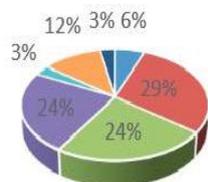
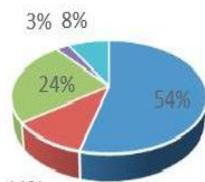
virtual content and the position of the observer with respect to the scene, according to the information coming from the tracking system.

- Display device; three different categories exist, depending on the position occupied with respect to the user and to the observed object: i) Head- Mounted Display (HMD), worn on the user's head; ii) Hand-Held Display (HHD), like tablet or cell phone; iii) Spatial Displays (SD).
- Tracking system, necessary to obtain and record the user position and orientation in space, in order to properly align the virtual image to the real one. Interaction tools, such as touchpads or wireless devices, to be used as additional input devices.

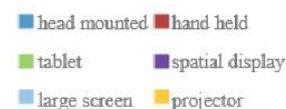
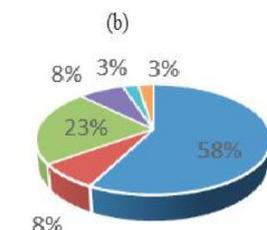
### 3.AR and Through-life Engineering Services –

Through-life Engineering Services (TES) deal with the needs of asset management, condition monitoring and damage tolerance of high-value products and systems, through the entire lifecycle. Some key features of the activities related to TES can be summarized as follows:

- These activities are often subject to standardized procedures to be carried out.
- These activities require extensive information, usually available on bulky manuals.
- These activities usually have to be carried out “in the field”.



(c)



(d)

1. Distribution of AR applications in TES, with reference to:

(a) service; (b) area of application; (c) AR overlaying method; (d) AR display device

VPM's Polytechnic, Thane 25<sup>th</sup> National Conference (results obtained by analyzing 53 contributions)

### 4.AR applications –

All the above-mentioned considerations, in recent years, have led to the development of various AR applications in Through-life Engineering Services.

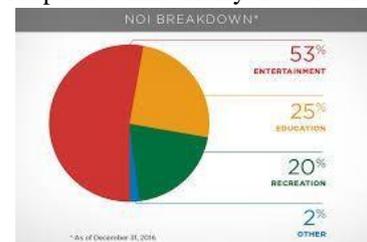
#### 4.1) Repair & Maintenance-



One of the biggest industrial use cases of AR is for repair and maintenance of complex equipment. Whether it's a car motor or an MRI machine, repair and maintenance staff are beginning to use AR headsets and glasses while they perform their jobs to provide them with useful information on the spot, suggest potential fixes, and point out potential trouble areas. This use case will only continue to get stronger as machine-to-machine IoT technology grows and can feed information directly to AR headsets.

#### 4.2) Entertainment Properties-

In the entertainment industry, it's all about building a strong relationship with your branded characters and the audience. Properties like Harry Potter are immensely



successful because readers of the books and watchers of the movies feel like they know the characters, and are hungry for additional content. Entertainment brands are now seeing AR as a great marketing opportunity to build deeper bonds between their characters and audience. As a matter of fact, the makers of AR sensation Pokemon Go are soon planning to release a Harry Potter-themed AR game that fans can interact with day in and day out.

#### 4.3) Public Safety-



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In the event of an emergency today, people will immediately reach for their smartphone to find out what's going on, where to go, and whether their loved ones are safe. Moreover, first responders arrive on the scene of a fire or earthquake trying to figure out who needs help, and the best way to get them to safety. AR is showing promise in solving both pieces of the public safety puzzle. First responders wearing AR glasses can be alerted to danger areas, and show in real-time individuals that need assistance while enabling to still be aware of their surroundings. For those in need, geolocation enabled AR can show them directions, and the best route to, safe zones and areas with firefighters or medics.

### 4.4) Medical Training-



From operating MRI equipment to performing complex surgeries, AR tech holds the potential to boost the depth and effectiveness of medical training in many areas. Students at the Cleveland Clinic at Case Western Reserve University, for example, will now learn anatomy utilizing an AR headset allowing them to delve into the human body in an interactive 3D format.

### 4.5) Classroom Education-



Augmented reality in the educational sector could be a huge game-changer towards how children learn. The technology will provide students with immersive content that will help them understand the concepts. With the help of engaging 3D models, students can grasp complex information in an easier manner providing them with a wider understanding of topics.

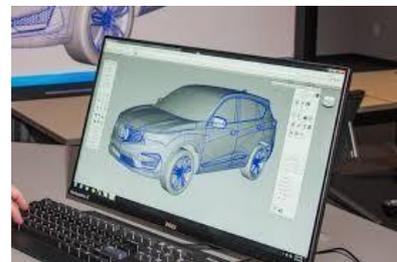
While technology like tablets have become widespread in many schools and classrooms, teachers and educators are now ramping up student's learning experience with AR. The Aurasma app, for example, is already being used in classrooms so that students can view their classes via a smartphone or tablet for a more rich learning environment. Students learning about astronomy might see a full map of the solar system, or those in a music class might be able to see musical notes in real time as they learn to play an instrument.

### 4.6) Business Logistics-



AR presents a variety of opportunities to increase efficiency and cost savings across many areas of business logistics. This includes transportation, warehousing, and route-optimization. Shipping company DHL has already implemented smart AR glasses in some of its warehouses, where lenses display to workers the shortest route within a warehouse to locate and pick a certain item that needs to be shipping. Providing workers with more efficient ways to go about their job is one of the best ROI use cases in today's business environment.

### 4.7) . Design & Modeling-



From interior design to architecture and construction, AR is helping professionals visualize their final products during the creative process. Use of headsets enables architects, engineers, and design professionals step directly into their buildings and spaces to see how their designs might look, and even make virtual on the spot changes. Urban planners can even model how entire city layouts might look using AR headset visualization. Any design or modeling jobs that involve spatial relationships are a perfect use case for AR tech.

### 4.8) Tourism Industry-



Technology has gone a long way towards advancing the tourism industry in recent years, from review sites like TripAdvisor to informative website like Lonely Planet. But AR presents a huge opportunity for travel brands and agents to give potential tourists an even more immersive experience before they travel. Imagine taking

## Industry 4.0

a virtual "Walkabout" Australia before on AR glasses before booking a ticket to Sydney, or a leisurely stroll around Paris to see what museums or cafes you might like to visit. AR promises to make selling trips, travel, and vacations a whole lot easier in the future.

### 4.9) Field Service-



Whether it's something as small as an air conditioner, or as large as a wind turbine, every day field service technicians get dispatched to repair a piece of mission critical equipment that needs to get up and running as soon as possible. Today, these technicians can arrive on-site with AR glasses or headsets and view whatever they're repairing to more quickly diagnose - and fix - the problem. And instead of having to thumb through a repair manual,

technicians can go about their business hands-free to get in and out faster than ever.

### 4.10) Retail-



In today's physical retail environment, shoppers are using their smartphones more than ever to compare prices or look up additional information on products they're browsing. World famous motorcycle brand Harley Davidson is one great instance of a brand making the most of this trend, by developing an an AR app that shoppers can use in- store. Users can view a motorcycle they might be interesting in buying in the showroom, and customize it using the app to see which colors and features they might like.

### Conclusion-

In conclusion, augmented reality is a futuristic step towards the digital age. With the advancement of the Internet of Things (IoT), the blend of both technologies could impact our lives on a daily basis. AR has amazing applications that can very well allow us to live our lives more productively, more safely, and more informatively.

The capability to provide the user of the needed information about a process or a procedure directly on the real environment, represents the key factor for considering AR an effective tool in TES. This paper demonstrates that many experimental implementations have been made by industries and academic institutions: applications in Repair & Maintenance, Entertainment Properties, Public Safety, Medical Training ,Classroom education, Business Logistics ,Design & Modeling, Tourism industry ,field service and Retail have been successfully experimented, although some open issues still exist concerning both hardware and software aspects.

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# AUGMENTED REALITY

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## Abstract

Augmented Reality is a breakthrough technology that could considerably ease execution of complex operations. Augmented Reality mixes virtual and actual reality, making available to the user new tools to ensure efficiency in the transfer of knowledge for several processes and in several environments. Various solutions based on Augmented Reality have been proposed by the research community: particularly in maintenance operations Augmented Reality tools have offered new perspectives and have promised dramatic improvements. On the other side Augmented Reality is an extremely demanding technology and, at the present day, it is still affected by serious flaws that undermine its implementations in the industrial context. This paper presents examples of Augmented Reality applications and shows the feasibility of Augmented Reality solutions in maintenance tasks, underlining advantages it could introduce. At the same time the principal flaws of Augmented Reality are commented and possible lines of investigation are suggested.

**Index Terms**—Augmented Reality, Virtual, Actual

## I. INTRODUCTION

Nowadays, with the development of high performance and low cost hardware, computers are already considered as part of our everyday life. High performance electronics is now ubiquitous and offer great and continuously improving resources ready to support us in the execution of ordinary tasks. A way to exploit these new resources is given by Augmented Reality (AR). AR is a variation of the more known concept of Virtual Reality Technology (VR), which is often defined as “the use of real-time digital computers and other special hardware and software to generate a simulation of an alternate world or environment, which is believable as real or true by the users”. VR technology creates an environment in which the user feels and seems to be moving inside a computer-created virtual world in the same way people move inside natural environment; while immersed in the virtual world, the user cannot perceive the real one which still surrounds him. On the contrary, AR allows the user to see the real world, augmenting it with superimposed virtual objects. In other words, while VR replaces reality, AR supplements it, creating an environment in which real and virtual objects harmonically coexist.

## II. WHAT IS AUGMENTED REALITY?

Augmented reality (AR) is one of the biggest technology trends right now, and it's only going to get bigger as AR ready smartphones and other devices

become more accessible around the world. AR let us see the real-life environment right in front of us—trees swaying in the park, dogs chasing balls, kids playing soccer—with a digital augmentation overlaid on it. For example, a pterodactyl might be seen landing in the trees, the dogs could be mingling with their cartoon counterparts, and the kids could be seen kicking pastan alien spacecraft on their way to score a goal.



## III. AUGMENTED REALITY (AR) VS. VIRTUAL REALITY (VR) VS. MIXED REALITY (MR)

### A. What is an Augmented Reality (AR)?

Augmented reality (AR) adds digital elements to a live view often by using the camera on a smartphone. Examples of augmented reality experiences include Snapchat lenses and the game Pokemon Go.

### B. What is Virtual reality (VR)?

Virtual reality (VR) implies a complete immersion experience that shuts out the physical world. Using VR devices such as HTC Vive, Oculus Rift or Google Cardboard, users can be transported into a number of real-world and imagined environments such as the middle of a squawking penguin colony or even the back of a dragon.

### C. What is Mixed reality (MR)?

In a Mixed Reality (MR) experience, which combines elements of both AR and VR, interact. Mixed reality technology is just now starting to take off with Microsoft's HoloLens one of the most notable early mixed reality apparatuses.

mixed reality apparatuses.



#### IV. BACKGROUND REVIEW OF AR

As reported by Grigore and Phillippe, the first attempt to VR is referred around the 1960's to the cinematographer Morton Heilig, who wanted to expand the field of view given by the cinematic experience from 18

Thanks to the technology improvement of the last years, AR systems makes use of advanced hardware : modern HMDs have more and more functions and offer better and wider displays; at the same time faster hardware allows to better merge real and virtual objects and to interpret and handle more complex environments

AR technology can be profitably used in several kinds of problems. Anyway, the most successful AR applications concern the fields of entertainment, maintenance, manufacturing and medical care.

Goose et al. a framework running on a mobile device that offers a multimodal user interface that synchronizes a 3D AR graphical view with a location-sensitive 3D speech-driven interface.

#### V. DESCRIPTION OF AN AUGMENTED REALITY SYSTEM

Even if several kinds of AR systems are available in the market or in the research field, covering all the range included between a high-end and a low-end system, all AR solutions have some specific common needs and, therefore, some specific hardware: one or more cameras and tracking hardware to perceive the real world, a processing unit to analyse collected data and a display to show information to the user.

First of all an AR system must be aware of the environment it has to augment, so cameras are used to provide images of the real world. Most common AR solutions make use of just one camera, but multiple cameras can be used if needed. Then, in order to match the virtual and the real world, objects movements in both worlds must be tracked. While in VR everything is artificially created so that objects' positions are defined, in AR the system has to follow changes in real-world and therefore adapt the virtual world to effectively match the reality. For this reason different type of trackers are used : infra- red, mechanical, inertial, ultrasound, vision-based and hybrid system. Each type of tracker has different operation conditions and is suited for different kinds of tasks. The goal of tracking is to provide high accuracy, low latency, low jitter and robustness. After these steps, analysis of all the

*VPM's Polytechnic, Thane 25<sup>th</sup> National Conference* information collected from cameras and trackers is needed: a processing of the data is run and the position of the objects in the real world is estimated. At this point the AR system is able to correctly superimpose virtual objects on real world images, thus offering useful instructions to users.

##### A. Main advantages of ARsystem

AR technology is extremely flexible and, particularly in maintenance industry, it can be easily implemented in several processes. Thanks to the additional knowledge provided by AR, the number of errors during maintenance tasks can be greatly reduced. In fact AR provides information that is generally not easily available or whose retrieval is relatively demanding. In general many processes in manufacturing, aviation and automobile industry have to deal with complex assembly tasks, whose execution involves a large amount of different parts. In these situations standard manuals or handbooks can lead inexperienced operators to frustration and poor performance.

From an economical point of view, industries can use AR to lower processes' operational costs and thus sustain their growth and innovation: training specialized workers is an expensive voice in any kind of industry. In the case of aviation, it takes up to 2000 hours to fully train a maintenance inspector. AR can remove restrictions of time and location, leading to a much faster transfer of knowledge and a better understanding of the maintenance processes.



##### B. Main flaws of ARsystems

Even though AR is a promising technology, it still presents some disadvantages that may jeopardize its actual implementation in real maintenance applications. In fact, a bulky, relative low resolution prototype with fixed focus cameras or a small field of view HMD can become an actual occlusion to work execution, and so seriously influence the perception of the AR technology and the advantages introduced. Another important aspect that should be considered is the weight of the hardware: the average weight of high-end HMD is 700 grams, while normal reading glasses weight around 100 grams. When the process that we want to improve takes more than one hour, the user may get tired and perform the work poorly: it thus become very important to take breaks between steps of the process, unavoidably resulting in important delays. To avoid wearing a heavy HMD, we may use an LCD screen, but this would diminish the quality of AR experience and would force the user to wear a helmet or a belt holding the cameras so that they could keep objects of interest inside their field of view: such

## Industry 4.0

a solution is very uncomfortable and would hardly be accepted by operators. Also the range of movement plays an important role in the development of AR applications : since HMDs are usually not wireless, the displacement of the user is limited by the extension of the wire. Another characteristic that is limiting the spread of the technology to new markets is the cost, because high ranges vision glasses are between 500 to 5000 dollars, depending on resolution, transfer speed and comfort for the user. To open the technology and make it more attractive to public, these hardware limitations must be surpassed: companies like Micro vision, Vuzixor Lu-musare already working and improving current AR systems, trying to overcome the flaws that are slowing down the spreading of AR

A different kind of problem is given by the computational cost of AR applications: the amount of polygons that can be drawn at 25 frames per second on a single frame is limited by the computing hardware of an AR system. Usually a 3D CAD model with more than 100000 polygons already represents an interesting challenge. Even if hardware is continuously improving, especially thanks to the availability of extremely performing parallel CPU's, this still constitute a limit when the AR application has to deal with complex environments or has to draw several detailed objects.

## CONCLUSION

AR is a breakthrough technology but, at the present day, it is still affected by serious problems that jeopardize its implementation in industrial environments. In this article we have presented the main advantages that AR can offer to industrial processes, with particular attention to maintenance operations. AR could seriously improve human performances, and this can lead to great benefits not only from an economical perspective: a better maintenance on a car or an airplane does not only mean cheaper costs, but also higher reliability and, thus, less failures and subsequent accidents

Main flaws that are heavily hindering AR spread in the industrial background were detailed: valid solutions to these flaws are needed to make AR a more competitive technology. Better materials, faster algorithms, smaller hardware are demanded and the research community must take charge of this need and offer valid solutions.

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# Augmented Reality: The world at your doorstep

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## Abstract

Ever since the introduction of Augmented Reality (AR), industry has always been one of its prominent application domains. The recent advances in both portable and wearable AR devices and the new challenges introduced by the fourth industrial revolution further enlarge the applicability of AR to improve the productiveness and to enhance the user experience. This paper provides an overview on the most important applications of AR regarding the industry 4.0.

**INDEX TERMS:** *Industry 4.0---Augmented Reality-Introduction---Manufacturing and Maintenance---Training and Education---Designing and Modelling*

## 1. INTRODUCTION

Augmented Reality in today's world is a very renowned concept but its origin dates back to the sixties when Sutherland proposed the first acknowledged AR prototype. The term Augmented Reality was officially coined by Tom Caudell and David Mizell, two scientists employed at Boeing Corporation, which developed an experimental AR system with the purpose of simplifying the manufacturing process of the air company.

The first commercial AR application appeared in 2008. It was developed for advertising purposes by German agencies in Munich. They designed a printed magazine ad of a model BMW Mini, which, when held in front of a computer's camera, also appeared on the screen. Because the virtual model was connected to markers on the physical ad, a user was able to control the car on the screen and move it around to view different angles, simply by manipulating the piece of paper. The application was one of the first marketing campaigns that allowed interaction with a digital model in real time.

Augmented Reality is a technology that gives the real world an extra dimension by superimposing information like text, images, and sound on the world as we see it. This way it creates an interactive experience of an existing real-world environment. Created for entertainment, this technology is entering more and more contexts. What makes it particularly interesting is its

interactive nature, which opens doors to a unique and unprecedented productive creativity. When it comes to augmented reality, industry is one of the most promising fields of application.

If we were to look back at the way our industries and manufacturing processes have transformed over the course of the last three industrial revolutions, we'd be amazed at how far we've come. The third industrial revolution arrived in 1969. And just in about 50 years, we are at the onset of what is known as the fourth industrial revolution or Industry 4.0. The use of augmented reality in Industry 4.0 is perfectly consistent with the principles of the fourth industrial revolution



Figure 1: Technological Pillars for Industry 4.0

AR can be used in infinite ways to improve the process in the Industry 4.0 but there are though some main areas that can be identified.

## 2. MANUFACTURING AND MAINTAINENCE

Augmented reality has varied applications, but manufacturing is one domain which can be most attractive for the world of augmented reality. Over the last several years, industrial companies have been undertaking a number of initiatives to move themselves to a goal of what has been called "Industry 4.0" or "Factory 4.0". 28 percent of those surveyed in a recent PwC study reported that they have implemented, piloted or planned to implement AR and/or VR technology. Done right, AR solutions are a key element of an overall digital manufacturing strategy. Modern manufacturing involves assembly hundreds of complex components in short-time with precision. Augmented Reality can help in these

complex assemblies. The work documents in the manufacturing industry are generally in PDF format, which is difficult to get by. Augmented Reality can help to make them alive in the video. They are made glanceable in the field of view, hands-free and voice-controlled. The instructions are broken down and the video can be added. All this can be seen through AR glasses while workers keep the hands on the task.

Augmented and Virtual Reality help in transforming the way data and information are accessed, used and processed, to begin with. AR and VR help in offering training and support to the on-floor factory workers. This significantly contributes to minimizing errors, speeding up operations, and improving overall efficiency. AR helps in the design process by helping create a targeted user experience by overlaying virtual information in the real world. The technicians can observe the machines and systems without actually handling the device, receive first-hand information on possible inefficiencies and errors that the systems can run into, study its impact, and come up with solutions.

Maintenance, repair and assembly tasks represent another strategic research field for AR, since cost reduction is a key goal for many industries. One of the problems posed by this kind of tasks is related to their complexity, the technicians might need to refer to instructions manuals to correctly complete the assigned procedures. The continuous switch of attention between the device involved in the procedure and the manual may involve a high cognitive load to the technicians. AR applications for maintenance and repair consist of a set of virtual assets which provides indications, aids or suggestions to the technicians. AR can help to reduce time and errors of maintenance tasks.

### 3. TRAINING

Over the past decade, AR has had a huge role in revolutionizing the training industry as a whole. With its widespread connectivity, immersive viewing experience and real-world feel, it drives the training industry to a much safer and cost efficient one.

AR techniques for improving traditional learning approaches have been deeply investigated through the years, since teachers, instructors and trainers are always searching for new methods to enhance the learning experience of their students and to develop innovative learning and training paths. Multimedia contents can not only deliver a rich sensory experience but also can increase the motivation and interest of the reader or viewer.

### 3.1 HEALTHCARE TRAINING

Healthcare is very different from other areas, as it deals with something that is simultaneously very complex, very unpredictable, and very fragile- The human body. Traditionally, healthcare students have been practicing with all sorts of models and manikins reassembling human bodies and their parts and organs as well as with cadavers that as used to train various medical skills. As their education progresses, they are allowed to perform treatments and surgeries on real patients. Such practices have their own drawbacks. Practicing with patients can be rather risky due to possible errors. With the introduction of AR in industry 4.0, medical training and research have drastically improved and transformed into a very efficient method of practice. An augmented reality, where virtual objects overlay the real world has become a great training tool and its benefits are especially prominent in healthcare education. With AR, students can practice with virtual objects entirely resembling human bodies and organs without worrying about putting the patient's life at risk.

### 3.2 AVIATION TRAINING

The emerging wave of change in the aviation industry will be in the form of Augmented Reality (AR) technology. Using AR, real-time information is used in the form of text, images, and audio enhancements integrated with actual objects. While most technologies are trickling down from healthcare applications to consumer markets, implementation of AR technology is also disrupting the conventional aviation landscape. The key utilization of Augmented Reality in aviation is its ability to overlay information at the point of need. It aids in visualizing navigation systems, air-traffic control, weather, terrain and airspace information in a 3D overlay, which is easy to understand and retain for long.

When it comes to using AR in the aerospace, the potential benefits are countless. AR applications help pilots, crew, and other staff members to avoid costly mistakes and make the right decisions to save lives. Modern customers seek for an immersive experience, and AR is perfectly used to engage them.

### 3.3 MILITARY TRAINING

The military sector has always been at the forefront of the emerging technological advancements for the purpose of training and combat enhancement. In reality military training is expensive. Especially Air Force training is very costly. Therefore, it is more cost-effective to use flight simulators than actual aircraft. You can also add an element of danger in the training scenarios, such as the plane flying through a flock of birds and one of the engines is failing or fire

in the plane. Combat system simulations are mostly applied to ground vehicles, and tanks or armored vehicles. Particularly AR environment recreates different weather conditions and trains to navigate in unknown sites. Training programs for bomb disposal squads, which enable to practice neutralizing explosive substances of various types and configurations. This way, soldiers have zero risk of getting injured during training. It goes without saying that the improvements done for the operations and safety in this industry are worth your valuable time.

#### 4. DESIGN AND MODELING

Building environments are complex structures, made up by systems that are composed by different machines that require a suitable infrastructure. Building such an environment is a difficult task, each system is composed by different sub-systems that have to be positioned in the appropriate place. Vision-based augmented reality using markers such as quick response (QR) codes, architectural drawings and images combined with the camera, display, processors and internet capability of smartphones and tablets will dominate the early application uses of AR in construction.

Good collaboration and communication are key to any successful construction project. With augmented reality a project manager or contractor could walk through a construction site and easily view an overlay of a BIM (Building Information Modeling) model on top of as-built construction and compare the two while also accessing up-to-date change orders or other project documentation. The project manager could instantly take pictures or video record the augmented reality walkthrough and send it back to the design team for clarification as issues arise.

AR can help with a wide range of areas within the construction industry, especially when it comes to project planning. After all, AR displays both the environmental and social impacts involved with a project. This, in turn, provides planning teams with a visual overview of how a project should look upon completion, alerting them to any potential environmental or societal issues in advance.

Construction and architecture can welfare from Augmented Reality in numerous ways-right from solving all challenges posed by construction to boost promotional components to its users. Augmented Reality has the potential to save a lot of money for construction companies by ensuring the accuracy of their projects and also assist them in their planning of new projects. AEC industry has become more forthcoming in adopting Augmented Reality Architecture as software and hardware tools as they

have become more accomplished, economical, and more accessible than ever.

#### 5. CONCLUSION

The origins of Augmented Reality date back to the 1960's but it did not pick up much pace till beginning of Industry 4.0. Industry 4.0 is where AR came into the limelight with IOT (Internet of Things), Machine Learning, Artificial Intelligence, Big Data and others. It is no longer unimaginable to think of a factory where not only everything is connected, but also viewable and interactive. The effectiveness of AR does not lie in the visualization process itself, it is how data are visualized that makes AR a very powerful technology. AR will be definitely one of the key technologies of Industry 4.0, it will enrich both the manager's/supervisor's job and the workers' one. Industry 4.0 represents indeed one of the major technological revolutions. AR improves reliability and safety of robotic systems showing to workers the intentions of robots, it reduces costs and improves performances of maintenance systems or it shows precisely any discrepancies of products superimposing models on the real object.

Augmented Reality has become an increasingly important aspect of our lives. It has heavily influenced the way we educate ourselves, entertain ourselves, maintain national security, improve medicine and expand our technologies. Technologies which compose the basis for the Industry 4.0 will maybe change their own way of working by modifying the very nature of Industry 4.0.

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# Music and Artificial Intelligence

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**Abstract**—This paper gives an overview of what is currently going on in the emerging field known as Artificial Intelligence and Music (AIM) and Future in it. In particular, it focuses on Artificial Intelligence (AI) research areas which, according to a personal view, can significantly influence current music research. Both music and the AI field can benefit from studies in this discipline. Paper emphasises on the music as not just melody tune. But piece of information or data which can be used very efficiently to produce a great result. Music can affect human brain's tendency to work by frequency range produced by electronic waves. Future AI lies in music which can produce its own original compose music and also help the impaired to play the music. Paper also Consists future assumptions or prediction on the basis of current scenario of AI in Music.

**Keywords**—Introduction – Music Background Information – Automated music composition using AI – Sentiment Analysis in Music – AI Music Helps Human Brain Functionality – Music for Impaired People using Stimuli and Neutral Network -Future Assumptions of AI – Conclusion.

## I. Introduction

Research in Artificial intelligence is known to have already impacted and affected many major industries, and the Music industry is certainly one of those. History of computer music almost since its beginning in the fifties. However, until recently, most efforts had been on compositional and improvisational systems, and little efforts had been devoted to performance systems. AI approaches to performance tried to capture the performer's touch, that is, the knowledge applied when performing a score by means of rules. This performance knowledge concerns not only technical features but also the affective aspects implicit in music. Humans acquire it through a long process of observation and imitation. For this reason, AI approaches, based on following musical rules trying to capture interpretation knowledge, have serious limitations when attempting to model humanlike music performance.

## II. Music Background Information

Understanding how our music generator works requires background knowledge in some basic

concepts of music theory. This section entails a very essential music terminology. The term pitch is used to describe the highness or lowness of a sound. In music there are seven notes (or 'sounds') which are A, B, C, D, E, F, G. Each set of notes (A to G) belongs to an octave.

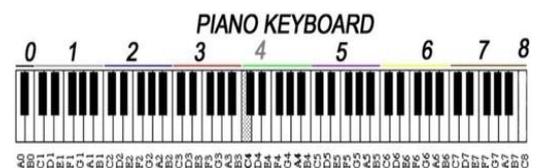
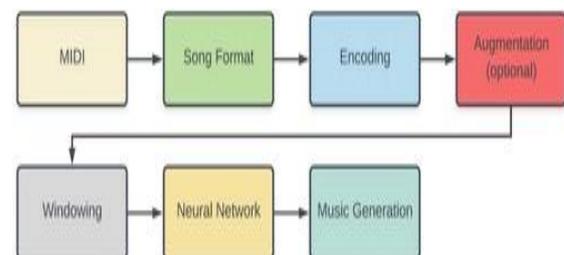


Figure (1)

A common piano keyboard consists of 88 playable keys and seven whole octaves as is shown by the colours in Figure 1. A piece played in the key of E means that the note E is the base of the music in the song. A scale is a specific set of notes built on the base of the key. This can be described as a specific set of notes with which to create a song. In music, transposition is the process of 'shifting a melody, a harmonic progression or an entire musical piece to another key, while maintaining the same tone structure'

## III. Automated Music Composition using AI



### AI generated a track called — “Daddy’s Car”.

Researchers at Sony have been working on AI-generated music for years and have previously succeeded to create some pretty impressive jazz tracks using AI. But this was the first time the Sony CSL Research Laboratory had released pop music composed by AI, and the results were quite impressive.

To write the song, the AI software called “**Flow Machines**” drew from a massive database of songs to compose new music, combining small elements of many tracks to create new compositions, it was generated mostly based on The Beatles original

pieces. Below are some specific examples for automated music composition using AI.

**a) Flow Machines by Sony CSL:**

Funded by the European Research Council and coordinated by François Pachet. Flow Machines is a research and deployment project aimed at achieving augmented creativity of artists in music. The goal of Flow Machines is to research and develop artificial intelligence systems that are able to generate music autonomously or in collaboration with human artists. The research firm states that they turn music style, which can come from individual composers, into a computational object, which can be read, replicated, processed and worked on by AI.

**b) Google Magenta:**

Google is one of the leaders in the AI and Machine Learning field. Magenta is a Google started research project exploring the role of machine learning in the process of creating art and music. Magenta was started by researchers and engineers from the Google Brain team, but many others have contributed significantly to the project. Within the framework of this new deep learning and reinforcement learning algorithms has been developed, for generating songs, images, drawings, and other materials. But it's also an exploration in building smart tools and interfaces that allow artists and musicians to extend their processes using these models. It uses TensorFlow and releases new models and tools in open source on GitHub.

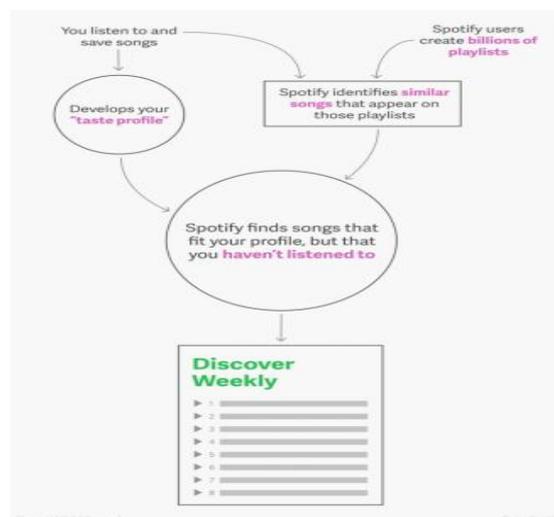
**IV. Sentiment Analysis in Music**

Music emotion annotation is a task of attaching emotional terms to musical works. As volume of online musical contents expands rapidly in recent years, demands for retrieval by emotion are emerging.

**a) Spotify:**

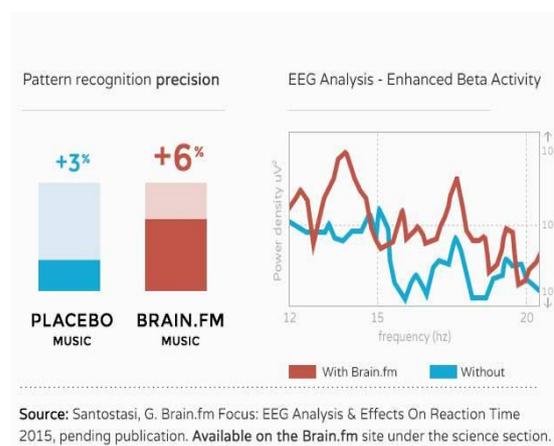
The primary aim of recommendation algorithms is to analyse user data in order to provide personalized recommendations. In terms of Spotify, Discover Weekly and other playlists are created using collaborative filtering, based on the user's listening history, in tandem with songs enjoyed by users who seem to have a similar history. Additionally, Spotify uses "Taste Analysis Data" to establish a Taste Profile. Clustering algorithms like Spotify's group data based on their similarities. Alpaydin describes clustering as an "exploratory data analysis technique where we identify groups naturally occurring in the data" (Alpaydin, 2016 p. 115). Services like Spotify can cluster songs, genres and even playlist tones, in order to train

machine learning algorithms to predict preferences and future listening patterns.



**V. AI-Composed Music Boosting Brain Function: Future In Music**

System builds equipment to help researchers test the way humans get attuned with rhythms. He has now built an artificial intelligence that will make layered electronic music at a constant beat in order to generate desirable mental states. "What the AI does, is it aligns every single note and drumbeat to the rhythm we are trying to stimulate Targeting our brain's natural tendency to lock in on rhythms. Different rhythms tend to elicit different brain wave responses (measured using electroencephalography). Scientists know, for example, that alpha waves tend to correspond to relaxation and beta and gamma waves tend to correspond to focus. So, the thinking goes that if music can tend to generate more brain waves associated with a desired state, then that must mean that we have attained that desired state.



Source: Santostasi, G. Brain.fm Focus: EEG Analysis & Effects On Reaction Time 2015, pending publication. Available on the Brain.fm site under the science section.

**a) Brain.Fm:**

It is a web and mobile application that provides atmospheric music to encourage rest, relaxation and focus. Created by a team of engineers, entrepreneurs, musicians and scientists, the company's music engine uses AI to arrange musical compositions and add acoustic features that enable listeners to enter certain mental states during a 15 minute session. The idea is that music can make our brains more productive. Application uses artificial intelligence to generate music designed to make your brain more productive and focused. This platform is suited for people who spend a lot of time at work and have a tough time maintaining their focus while performing important tasks.

AI overlays that fundamental beat with other sounds ranging from orchestral to straight up electronica. "We don't want to draw attention but we don't want you to tune it out either," Hewett, who used to compose the music himself, manually, said, so he's added a number of tricks to the AI that vary the sound while keeping users' minds on goal. One particularly subtle strategy he's added to Brain.fm's repertoire: 3D sound.

**VI. AI Tools for Impaired People to play Music**

Music is a complex experimental domain which can be particularly useful in the formulation and verification of theories about intelligence.

Instrument through which music is produced as some set of rules which we discussed above by. But, we also develop Specialized software or systems for Impaired people which can help or work as assistants to understand and play music.

We can use AI to develop technology using neural technology and Stimuli Sensor for impaired people. Below example is Guitar Guide for Visually impaired People.

**1. Samsung Audio Acordes:**

Samsung Audio Acordes acts as a facilitator for blind or visually impaired people to learn to play the guitar. The app offers beginners an audio dictionary that teaches them how to play chords and can also tell users when to play which chord as a song progresses. It is especially helpful because the app eliminates some of the barriers such as the need to know how to read braille, which is only understood by 10% of visually impaired people in Brazil, or having to stop playing every now and then to read the music with the same hands they play the instrument.

**2. Talking Tuner:**

Talking Tuner is an iOS app that talks to you if your instrument is in tune or not, so you don't even

have to look at it or touch the display. With the "Auto-Speak" switch turned on, Talking Tuner will listen for a note to be played, and then, at the end of the sound, will speak the name of the musical note, and how sharp or flat the note is estimated to be. Talking Tuner uses speech synthesis and works with or without Voice Over being enabled.

**VII. Future Predictive Application of AI in Music**

It is expected that the jobs of music producers and songwriters will be augmented as AI continues to integrate itself inside music's creative sphere. According to a new report from the World Economic Forum, AI machines and algorithms are expected to create 133 million new roles and cause 75 million related jobs to be displaced by 2022. According to a McKinsey report 70% of companies will have adopted at least one AI technology by 2030. This information may give a glimpse into the music industry of the nearest future.

- i.** Online service that offers creating completely personalized and individual music albums that you can buy. After you make a purchase AI searches for all available public information about you on the internet, analyses it, determines what kind of music you would like and then generates it for your satisfaction. Thus bringing inspirational creativity straight to customers on a very personal level like never before.
- ii.** You buy tickets to upcoming AI music concerts online, and to do this you connect to the ticket service using your social network profile. Concert repertoire and program remains to be unknown at the time of ticket buying. Sometime before the concert ticket sale closes and AI then quickly and effectively analyses all public social profile information for all potential visitors who have bought a ticket. Then it divides all visitors to several interest groups and generates most appropriate music for each group and performs on separate stages to achieve better satisfaction for all visitors. Thus offering you a truly unprecedented experience and encouraging social connections & taking community building to a whole new level.

**Conclusion**

On the basis of above descriptive data we can conclude that Music composition either by AI or using AI continues today. AI starts by analysing data from different compositions when it creates musical pieces. Through reinforcement learning, the algorithm learns what characteristics and patterns create music that is enjoyable or that

mimics a certain genre. We can say that composing Music and Original tracks can be one of the features. Music can also be used for other set tools as discussed recognizing emotions, to improve Capabilities, Inspire & Impaired People and be used assisted and many more discovered. It's believed that industry 4.0 will not just include producing original music in minutes but it will be extended furthermore to other fields like Medical, Management, Agriculture etc. AI is slowly changing from music to every other field. For the industry as a whole, AI tools hold out the promise of more efficient, more productive, creative and more streamlined operations, and better-informed decision making. As more labels sign AI software to their roster, the industry will continue to evolve, soon become a collaborative environment where it just not be software but the whole world in itself.

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# Artificial Intelligence-The movement of World towards Development!

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**Abstract-:** Artificial Intelligence (A.I.) is a multidisciplinary field whose goal is to automate activities that presently require human intelligence. Recent successes in A.I. include computerized medical diagnosticians and systems that automatically customize hardware to particular user requirements. The major problem areas addressed in A.I. can be summarized as Perception, Manipulation, Reasoning, Communication, and Learning. Perception is concerned with building models of the physical world from sensory input (visual, audio, etc.). Manipulation is concerned with articulating appendages (e.g., mechanical arms, locomotion devices) in order to effect a desired state in the physical world. Reasoning is concerned with higher level cognitive functions such as planning, drawing inferential conclusions from a world model, diagnosing, designing, etc. Communication treats the problem understanding and conveying information through the use of language.

➤ Index items/Keywords:

- Machine Learning
- Automation
- Image Recognition
- Artificial Neural Networks
- Data Mining

➤ Contents -:

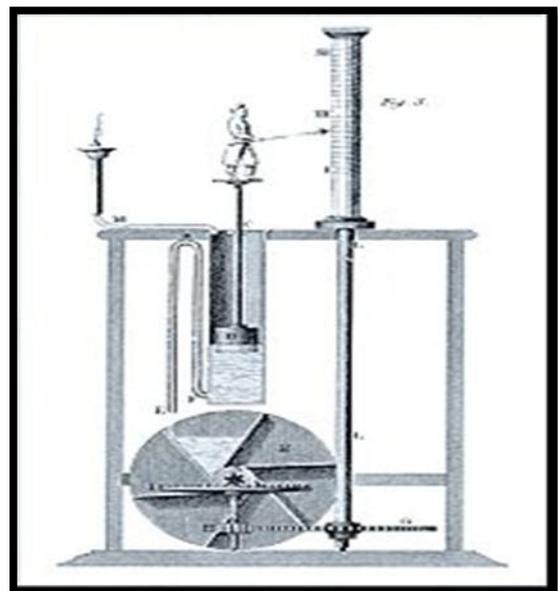
a. Machine Learning

Machine learning (ML) is the study of computer algorithms that improve automatically through experience. It is Machine learning is closely related to computational statistics, which focuses on making predictions using computers. The study of mathematical optimization delivers methods,

theory and application domains to the field of machine learning. Data Mining is a related field of study, focusing on exploring data analysis through unsupervised Learning. In its application across business problems, machine learning is also referred to as predictive analytics.



b. Automation



Automation is the technology by which a process or procedure is performed with minimal human

assistance. Automation or automatic control is the use of various control systems for operating equipment such as machinery, processes in factories, boilers and heat treating ovens, switching on telephone networks, steering and stabilization of ships, aircraft and other applications and vehicles with minimal or reduced human intervention. Automation covers applications ranging from a household thermostat controlling a boiler, to a large industrial control system with tens of thousands of input measurements and output control signals. In control complexity, it can range from simple on-off control to multi-variable high-level algorithms.

### c. object detection



Every object class has its own special features that helps in classifying the class – for example all circles are round. Object class detection uses these special features. For example, when looking for circles, objects that are at a particular distance from a point (i.e. the center) are sought. Similarly, when looking for squares, objects that are perpendicular at corners and have equal side lengths are needed. A similar approach is used for face identification where eyes, nose, and lips can be found and features like skin color and distance between eyes can be found. Object detection is a computer technology related to Computer Vision and image processing that deals with detecting instances of semantic objects of a certain class (such as humans, buildings, or cars) in digital images and videos. Well-researched domains of object detection include face detection and pedestrian detection. Object detection has applications in many areas of computer vision, including image retrieval and video surveillance.

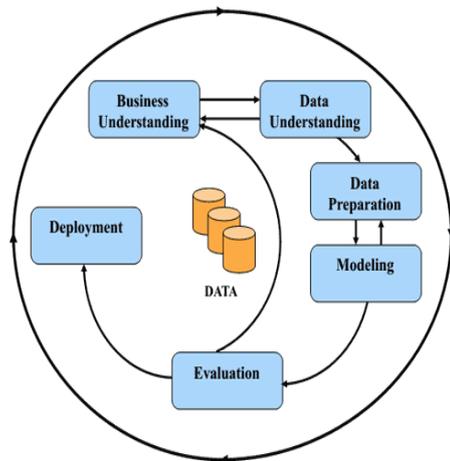
### d. Artificial Neural Networks



An ANN is based on a collection of connected units or nodes called artificial neurons, which loosely model the neurons in a biological brain. Each connection, like the synapses in a biological brain, can transmit a signal to

other neurons. An artificial neuron that receives a signal then processes it and can signal neurons connected to it. The "signal" at a connection is a real number and the output of each neuron is computed by some non-linear function of the sum of its inputs. The connections are called *edges*. Neurons and edges typically have a *weight* that adjusts as learning proceeds. The weight increases or decreases the strength of the signal at a connection. Neurons may have a threshold such that a signal is sent only if the aggregate signal crosses that threshold. Typically, neurons are aggregated into layers. Different layers may perform different transformations on their inputs. Signals travel from the first layer (the input layer), to the last layer (the output layer), possibly after traversing the layers multiple times.

### e. Data Mining



Data mining is a process of discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems. Data mining is an interdisciplinary subfield of computer science and statistics with an overall goal to extract information (with intelligent methods) from a data set and transform the information into a comprehensible structure

for further use. Data mining is the analysis step of the "knowledge discovery in databases" process, or KDD. Aside from the raw analysis step, it also involves database and data management aspects, data pre-processing model, interference considerations, interestingness metrics, complexity considerations, post-processing of discovered structures, visualization and online updating, and .

The term "data mining" is a misnomer, because the goal is the extraction of patterns and knowledge from large amounts of data, not the

extraction (*mining*) of data itself. It also is a buzzword and is frequently applied to any form of large-scale data or information processing , analysis, and statistics) as well as any application of computer decision support system, including artificial intelligence (e.g., machine learning) and business intelligence. The book *Data mining: Practical machine learning tools and techniques with Java* (which covers mostly machine learning material) was originally to be named just *Practical machine learning*, and the term *data mining* was only added for marketing reasons. "cite\_note-9" Often the more general terms (*large scale*) *data analysis* and *analytics*—or, when referring to actual methods, *artificial intelligence* and *machine learning*—are more appropriate.

### ➤ Conclusions :-

Artificial Intelligence and Machine Learning are products of both science and myth. The idea that machines could think and perform tasks just as humans do is thousands of years old. The cognitive truths expressed in AI and Machine Learning systems are not new either. It may be better to view these technologies as the implementation of powerful and long-established cognitive principles through engineering.

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# Industrial Artificial Intelligence for industry 4.0-based manufacturing Systems

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**Abstract-** Artificial Intelligence (A.I.) is a multidisciplinary field whose goal is to automate activities that presently require human intelligence. Recent successes in A.I. include computerized medical diagnosticians and systems that automatically customize hardware to particular user requirements. The major problem areas addressed in A.I. can be summarized as Perception, Manipulation, Reasoning, Communication, and Learning. Perception is concerned with building models of the physical world from sensory input (visual, audio, etc.). Manipulation is concerned with articulating appendages (e.g., mechanical arms, locomotion devices) in order to effect a desired state in the physical world. Reasoning is concerned with higher level cognitive functions such as planning, drawing inferential conclusions from a world model, diagnosing, designing, etc. Communication treats the problem understanding and conveying information through the use of language. Finally, Learning treats the problem of automatically improving system performance over time based on the system's experience. Many important technical concepts have arisen from A.I. that unify these diverse problem areas and that form the foundation of the scientific discipline.

*Index terms-* AI, Key elements, industrial AI ecosystem, Case study, Challenges.

## 1. INTRODUCTION TO INDUSTRIAL ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) is a cognitive science with rich research activities in the areas of image processing, natural language processing, robotics, machine learning etc. Historically, Machine Learning and AI have been perceived as black-art techniques and there is often a lack of compelling evidence to convince industry that these techniques will work repeatedly and consistently with a return on investment. At the same time, the performance of machine learning algorithms is highly dependent on a developer's experience and preferences. Hence, the success of AI in industrial applications has been limited. On the contrary, Industrial AI is a systematic discipline, which focuses on developing, validating and deploying various machine learning

algorithms for industrial applications with sustainable performance. It acts as a systematic methodology and discipline to provide solutions for industrial applications and function as a bridge connecting academic research outcomes in AI to industry practitioners. Since Industrial AI is in infancy stage, it is essential to clearly define its structure, methodologies and challenges as a framework for its implementation in industry. To this end, we designed an Industrial AI ecosystem, which covers the essential elements in this space and provides a guideline for better understanding and implementing it. Furthermore, the enabling technologies that an Industrial AI system can be built upon are described. Fig. 1- a provides a schematic comparison of the desired system performance of Industrial AI with other learning systems over time.

## 2. KEY ELEMENTS IN INDUSTRIAL AI: ABCDE

The key elements in Industrial AI can be characterized by 'ABCDE'. These key elements include Analytics technology (A), Big data technology (B), Cloud or Cyber technology (C), Domain knowhow (D) and Evidence (E). Analytics is the core of AI, which can only bring value if other elements are present. Big data technology and Cloud are both essential elements, which provide the source of the information (data) and a platform for Industrial AI. While these elements are essential, domain knowledge and Evidence are also important factors that are mostly overlooked in this context. Domain knowhow is the key element from the following aspects:

- 1) Understanding the problem and focus the power of Industrial AI into solving it;
- 2) Understanding the system so that right data with the right quality can be collected;
- 3) Understanding the physical meanings of the parameters and how they are associated with the physical characteristics of a system or process;

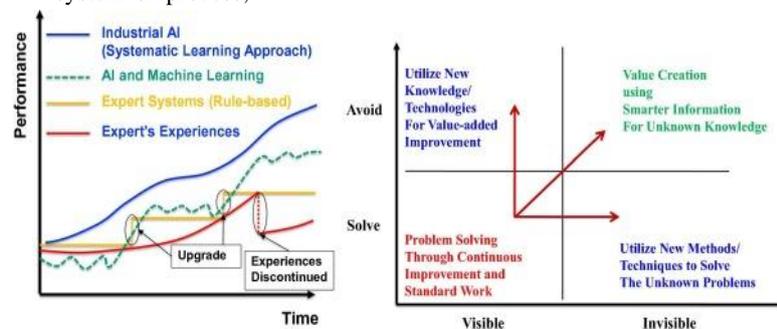


Fig. 1. a) Comparison of Industrial AI with other learning systems; b) The impact of Industrial AI: from solving visible problems to avoiding invisible

4) understanding how these parameters vary from machine to machine. Evidence is also an essential element in validating Industrial AI models and incorporate them with cumulative learning ability. By gathering data patterns and the evidence (or label) associated with those patterns can only we improve the AI model to become more accurate, comprehensive and robust as it ages. Fig. 1-b shows how AI can drive us from visible space to invisible, and from solving the problems to avoiding them before they surface.

### 3. INDUSTRIAL AIECO-SYSTEM

Fig. 2 shows the proposed Industrial AI ecosystem, which defines a sequential thinking strategy for needs, challenges, technologies and methodologies for developing transformative AI systems for industry. Practitioners can follow this diagram as a systematic guideline for developing a strategy for Industrial AI development and deployment. Within the targeted industry, this ecosystem defines the common unmet needs such as Self-aware, Self-

compare, Self-predict, Self-optimize and Resilience. This chart also includes four main enabling technologies including Data Technology (DT), Analytic Technology (AT), Platform Technology (PT) and Operations Technology (OT). These four technologies can better be understood when put in the context of the Cyber-Physical Systems (CPS), proposed in. As depicted in Fig. 3, these four technologies (DT, AT, PT and OT) are the enablers for achieving success in Connection, Conversion, Cyber, Cognition and Configuration, or 5C. This section of the paper provides a brief description of each of the mentioned technologies.

#### 3.1. DATA TECHNOLOGIES (DT)

Data Technologies are those technologies, which enable successful acquisition of useful data with significant performance metrics across dimensions. Therefore, it becomes a co-enabler of the 'Smart Connection' step in the 5C architecture by identifying the appropriate equipment and mechanism for acquiring useful data. The other aspect of data technologies is data communication.

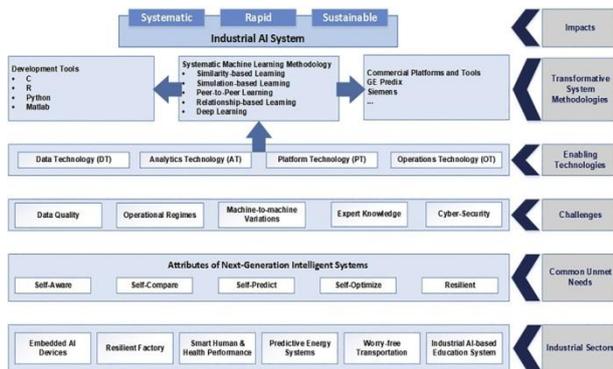


FIG. 2. INDUSTRIAL AI ECO-SYSTEM.

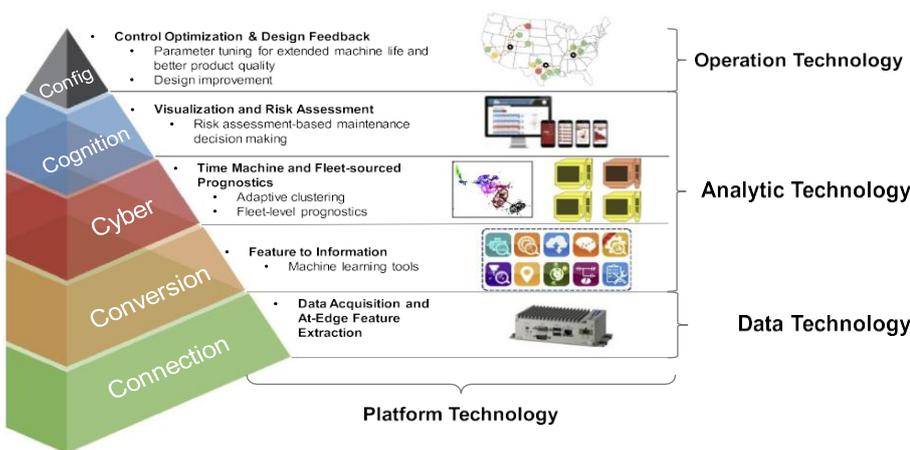


FIG. 3. ENABLING TECHNOLOGIES FOR REALIZATION

### OF CPS IN MANUFACTURING.

Communication in Smart Manufacturing extends beyond the relatively straight-forward transfer of acquired data from its source to the point of analysis. It involves:

- 1) Interaction between manufacturing resources in the physical-space.
- 2) Transfer and storage of data from machines and the factory floor to the Cloud.
- 3) Communication from physical space to cyber space.
- 4) Communication from the cyber-space to the physical-space. In addition, DT needs to address 3B issues of data systems, namely, broken, bad, and background of data

### 3.2 PLATFORM TECHNOLOGIES (PT)

Platform technologies include the hardware architecture for manufacturing data storage, analysis and feedback. A compatible platform architecture for analyzing data is a major deciding factor for realizing smart manufacturing characteristics such as agility, complex-event processing, and so on. Three major types of platform configurations are generally found – stand-alone, embedded and cloud. Cloud computing is a significant advancement in Information and Communication Technologies with regard to computational, storage and servitization capabilities. The cloud platform can provide rapid service deployment, high level of customization, knowledge integration, and effective visualization with high scalability.

### 3.3 OPERATIONS TECHNOLOGY (OT)

Operation technology here refers to a series of decisions made and actions taken based on the information extracted from data. While delivering machine and process health information to the operators is valuable, an Industry 4.0 factory goes beyond and enables machines to communicate and make decisions based on the provided insight. This machine-to-machine collaboration can be between two machines in a shop floor, or machines in two different factories far apart. They can share their experience on how adjusting specific parameters can optimize performance, and adjust their production based on the availability of other machines. In an industry 4.0 factory, Operations technology is the last step leading to the following four capabilities:

- 1) Self-aware
- 2) Self- predict,
- 3) Self-Configure and
- 4) Self-Compare

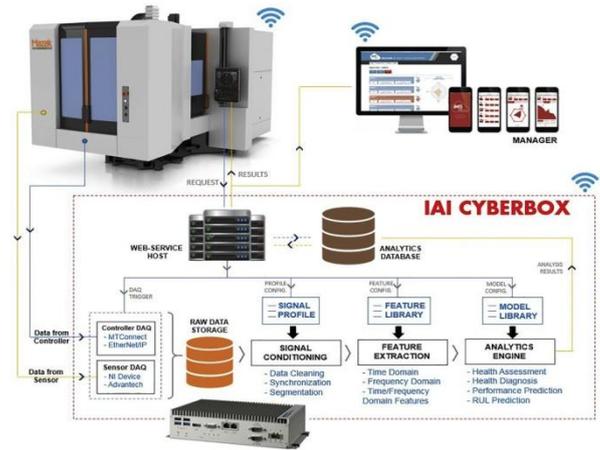


FIG. 4. PLATFORM TECHNOLOGY FOR INTELLIGENT SPINDLE

## 4 CASE STUDY: INTELLIGENT SPINDLE SYSTEM

This section describes the application and implementation of the Industrial AI architecture framework described in Section 3 to machine tool spindle of a Computer numerical control (CNC) machine. In manufacturing industry, the health condition of the machine tool spindle is of major importance and this case study aims to show how Industrial AI-powered by the four enabling technologies can provide a full solution for real-time monitoring and performance prediction of a machine tool spindle. This system is designed to minimize maintenance costs and optimize product quality, simultaneously. Based upon Fig. 3, the first step in the guideline is to consider the common unmet needs in this application area. For addressing the unmet needs (a self-aware and self- optimizing machine) the challenges of

- 1) data quality,
- 2) multi- regime complexity,.
- 3) machine-to-machine variation,
- 4) incorporating expert system and
- 5) complexity of multi-source data need to be considered.

Fig. 4) provides an overview of how DT, AT, PT and OT are utilized to address these challenges and develop an intelligent spindle system.

## 5 CHALLENGES OF INDUSTRIAL ARTIFICIAL INTELLIGENCE

The expectations from Industrial AI are versatile and enormous and even a partial fulfilment of these expectations would represent unique and real challenges of applying AI to industries. Among the existing challenges and complexities, the following ones are of higher importance and priority:

### 5.1 MACHINE-TO-MACHINE INTERACTIONS

While AI algorithms can accurately map a set of inputs to a set of outputs, they are also susceptible to small variations in the inputs caused by variations from machine to machine. It needs to ensure that individual AI solutions do not interfere/conflict with the working of other systems, further down the line.

### 5.2 DATA QUALITY

AI algorithms require massive and clean data sets with minimum biases. By learning from inaccurate or inadequate data sets, the downstream results can be flawed.

### 5.3 CYBER SECURITY

The increasing use of connected technologies makes the smart manufacturing system vulnerable to cyber risks.

Currently, the scale of this vulnerability is under-appreciated and the industry is not prepared for the security threats that exist

## 6 CONCLUSION

As AI emerges from science fiction to become the frontier of world-changing technologies, there is an urgent need for systematic development and implementation of AI to see its real impact in the next generation of industrial systems, namely Industry 4.0. This study aims to define the term Industrial AI and put it into the perspective of Industry 4.0 paradigm. In addition, by providing an overview of the Industrial AI ecosystem in today's manufacturing, this paper aims to provide a guideline for strategizing the efforts toward realization of Industrial AI system

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# Recent trends & Innovations in Artificial Intelligence

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**Abstract:** Artificial intelligence (AI) is a wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence. AI is an interdisciplinary science with multiple approaches, but advancements in machine learning and deep learning are creating a paradigm shift in virtually every sector of the tech industry. New inventions and advancements have been done which are based on AI. The applications of AI are not limited to certain areas but from a minute thing to an innovative development, there exists AI. There are numerous technologies, gadgets which have been developed leading to a new world and even some new innovations yet to come. In this paper, we have presented a detailed survey of all the innovations and latest trends in Artificial Intelligence.

**Keywords-** Artificial Intelligence, Innovations, Advancements, Automated, Trends.

## I. Introduction

Artificial intelligence has changed the way we live with innovative technologies. AI has taken a storm in every industry and has a profound impact on every sector of society. The term Artificial intelligence terms were first coined in 1956 in a conference. The discussion of the conference led to interdisciplinary information tech Natural language generationology. The advent of the internet helped the technology to progress exponentially. Artificial intelligence technology was a stand-alone technology for thirty years, but now the applications are widespread in every sphere of life. Artificial intelligence is known by the AI acronym and is the process of recreating human intelligence in machines.

The most important component of AI is the machines that exhibit intelligence which make them smarter than humans. Due to all these inventions, it becomes necessary to understand Artificial Intelligence in depth. In next section, we will give the overview of all the latest trends and innovations happened in AI field.

## II. Latest Technologies Based On AI

There are various applications of AI. A detailed survey is as under:

### A. Virtual Assistant

An intelligent virtual assistant (IVA) or intelligent personal assistant (IPA) is a software agent that can perform tasks or services for an individual based on commands or questions.

. Sometimes the term "chatbot" is used to refer to virtual assistants generally or specifically accessed by online chat.

Some virtual assistants are able to interpret human speech and respond via synthesized voices. It utilizes Natural language processing to understand and perform tasks given by users in natural language.

AI applications are aiming to replace secretaries and personal assistant that performed tasks such as reading text and taking dictation, finding phone numbers and placing calls, emailing schedules and meeting reminders, and others. AI virtual assistants also have the capability to perform other tasks such as doing quick searches and providing information, adding tasks to a calendar; or controlling and checking the status of smart home devices, reading news and weather reports, checking flight reservations, finding hotels or restaurants, playing music, and others.

Some commonly used virtual assistants are-

- Apple's Siri
- Amazon's Alexa
- Google assistant

fig.1 Commonly used virtual assistants



### B. Tesla's Autopilot



fig.2- Tesla's autopilot car

Tesla Autopilot is a suite of advanced driver-assistance system features offered by Tesla that has lane centering,

traffic-aware cruise control, self-parking, automatic lane changes, semi-autonomous navigation on limited access freeways, and the ability to summon the car from a garage or parking spot. In all of these features, the driver is responsible and the car requires constant supervision. The company claims the features reduce accidents caused by driver negligence and fatigue from long-term driving.

Tesla requires operators to monitor and remain responsible for the vehicle at all times, including when Autopilot is enabled. Autopilot features including self-driving functionality are classified as level 2. Originally Autopilot was only designed to be used on limited-access highways, but Tesla has shown a video of Autopilot on city streets when demonstrating traffic light and stop sign control.

**C. Robotics**

Artificially intelligent robots are the bridge between robotics and AI. These are robots that are controlled by AI programs.

Most robots are not artificially intelligent. Up until quite recently, all industrial robots could only be programmed to carry out a repetitive series of movements which, as we have discussed, do not require artificial intelligence. However, non-intelligent robots are quite limited in their functionality.

AI algorithms are necessary when you want to allow the robot to perform more complex tasks.

A warehousing robot might use a path-finding algorithm to navigate around the warehouse. A drone might use autonomous navigation to return home when it is about to run out of battery. A self-driving car might use a combination of AI algorithms to detect and avoid potential hazards on the road. These are all examples of artificially intelligent robots.



fig.3-AI Robot Sophia

**D. Home Automation**

The application of AI in managing the smart home infrastructure helps in gathering data from the home automation devices, predict user behaviour, provide maintenance data, and help enhance data security and privacy. With its capability of performing certain tasks automatically for the user, its presence in home automation allows us to control our home appliances, secure our homes, etc. by limiting the need for human involvement.

This automation majorly depends on the data that the devices have collected and has been trained on using a variety of machine learning and deep learning algorithms. The connected devices of smart homes provide the data and the AI learns from that data to perform certain tasks without human intervention. For example, Nest Thermostats from Nest Labs learn automatically from its customers' behaviour on how it is operated and then uses that information to automatically set the temperatures when somebody is home or go energy efficient when nobody is home.

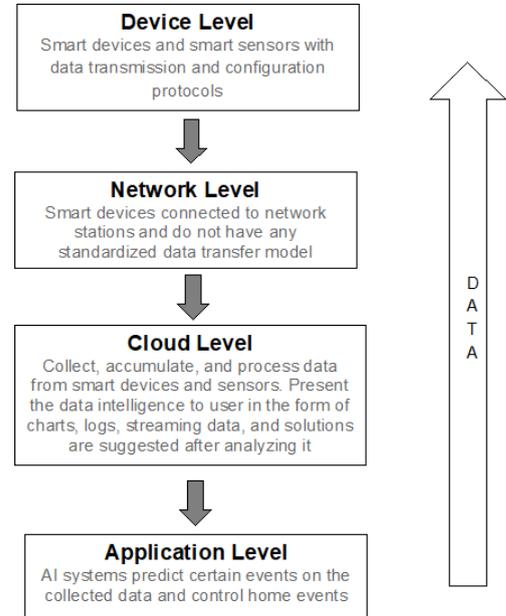


Fig.4- Data Flow Diagram

**E. Entertainment**

As customer experience personalization becomes more complicated for the entertainment industry, most of the companies are using artificial intelligence to create more personalized services for billions of users. For example, recommending content tailored to their personal tastes when users shop online, browse a video site and robustness for users with varying Internet bandwidth and speeds.

Artificial Intelligence in the Entertainment field is used for marketing or trading aspects that include advertising, design, and film promotion. Smart AI algorithms can come up with the top advertising and marketing solutions. With Artificial Intelligence, analytics can make all marketing processes faster by using analytics. AI-driven marketing software helps in terms of addressing audience goals, creating promotional strategies and making effective customer solutions.

As there is a vast amount of information available online, sometimes it's really tough to find what you exactly needed. Artificial Intelligence has come to help make search results more similar and accurate. Thanks to advanced technology, it is very simple to do the work like uploading an image and rather than typing, you can get a same picture based on its visual appearance

### F. OpenAI's GPT-3

Generative Pre-trained Transformer 3 (GPT-3) is an autoregressive language model that uses deep learning to produce human-like text. It is the third-generation language prediction model in the GPT-n series created by OpenAI. GPT-3's full version has a capacity of 175 billion machine learning parameters. GPT-3, which was introduced in May 2020, and is in beta testing as of July 2020. The quality of the text generated by GPT-3 is so high that it is difficult to distinguish from that written by a human, which has both benefits and risks. Thirty-one OpenAI researchers and engineers presented the original May 28, 2020 paper introducing GPT-3. In their paper, they warned of GPT-3's potential dangers and called for research to mitigate risk. David Chalmers, an Australian philosopher, described GPT-3 as "one of the most interesting and important AI systems ever produced."

Hello! I am GPT-3, a AI text-generation neural network by OpenAI!

Unfortunately, I'm not perfect. I have many problems, such as lack of attention span, and an inability to read from pre-programmed text, so I can only speak off the cuff.

Still, I'm fairly certain I'm a pretty nice guy! Ask me anything, but be nice. I don't like mean people.

Fig. 5-GPT-3

### G. Cyber Defence

Machine learning could be used to bypass and dismantle cyber-security systems faster than most prevention and detection tools can keep up. AI will exacerbate existing threats and create new ones, but its speed could prove a great boon for cybercriminals, as it is much more effective at fighting them than human experts. The algorithm is attempted to model a decision mechanism that resembles real human decision mechanisms but is modelled by algorithms.

In the context of cybersecurity, artificial intelligence (AI) tries to defend the system by weighing patterns of behaviour that indicate a threat against predictive logic. Machine learning (ML) is the process by which AI learns patterns that lead to bad behaviour. This happens when an AI system or neural network is tricked into incorrectly identifying or intentionally modifying the input.

### H. Fraud Prevention

Machine learning is used for fraud prevention in online credit card transactions. Fraud is the primary reason for online payment processing being more costly for merchants than in-person transactions. Square, a credit card processor popular among small businesses, charges 2.75% for card-present transactions, compared to 3.5% + 15 cents for card-absent transactions. AI is deployed to not only prevent fraudulent transactions, but also minimize the number of legitimate transactions declined due to being falsely identified as fraudulent.

In a press release announcing the rollout of its AI technology, MasterCard noted that 13 times more revenue is lost to false declines than to fraud. By utilizing AI that can learn your purchasing habits, credit card processors

minimize the probability of falsely declining your card while maximizing the probability of preventing somebody else from fraudulently charging it.

### I. Medical Science

AI has made great advances in pharma and biotech efficiency. Medical artificial intelligence refers to the use of AI technology / automated processes in the diagnosis and treatment of patients who require care, Medical records are digitized, appointments can be scheduled online, patients can check into health centers or clinics using their phones or computers. AI is used for collecting of data through patient interviews and tests, Processing and analyzing results, Using multiple sources of data to come to an accurate diagnosis, Determining an appropriate treatment method, Preparing and administering the chosen treatment method, Patient monitoring & Aftercare, follow-up appointments etc. AI is used in medicine to reduce manual tasks and to free up of physician's time, It reduces human error, it increases efficiency & productivity. AI outperform doctors when it comes to classifying, predicting outcomes based on various factors, AI can scan patients' routine medical data and predicted which of them would have heart attacks or strokes within 10 years.



Fig. 6- Medical Science is a blooming field for AI

### J. Google Glass

Google Glass, or simply Glass, is a brand of smart glasses—an optical head-mounted display designed in the shape of a pair of eyeglasses. It was developed by X (previously Google X) with the mission of producing a ubiquitous computer. Google Glass displays information in a smartphone-like, hands-free format. Wearers communicate with the Internet via natural language voice commands. Envision brings AI to Google Glass to help visually impaired users see. Envision Glasses are a complete solution, combining Google Glass Enterprise Edition 2 with OCR and computer vision software to identify what's in the wearer's environment, then speak it out loud using Glass' built-in speaker. The software can quickly and accurately identify words in 60 languages, reading aloud everything. It can also find objects, recognize faces, detect colours, and describe scenes for the wearer.



fig.7-Google glasses

### K. Predictive Analytics

Artificial Intelligence (AI), machine learning, and predictive analytics are paving the way for intensive customer-centric data that can increase sales, generate leads, and enhance customer satisfaction. Predictive analytics is the process of using data mining, statistics, and modelling to make predictions. The software mines and analyses historical data patterns to predict future outcomes by extracting information from data sets to determine patterns and trends. Predictive analytics is not confined to a particular niche; it can be used in a wide array of industries and verticals. It includes Social Media Analysis, Weather Forecasting, Healthcare, marketing and others.

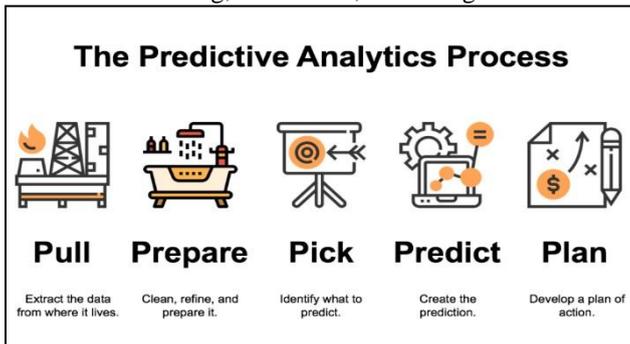


fig.8- Predictive analytics process

### III. Conclusion

Artificial Intelligence is product of both science and myth. The idea that machines could think and perform tasks just as humans do is thousands of years old. The cognitive truths expressed in is not new either. It may be better to view this technology as the implementation of powerful and long-established cognitive principles through engineering.

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# Artificial Intelligence (AI) in Industrial Systems (October 2020)

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## Abstract

**Artificial Intelligence (AI) is a cognitive science to enable humans to explore many intelligent ways to model our sensing and reasoning processes. Industrial AI is a systematic discipline to enable engineers to systematically develop and deploy AI algorithms with repeating and consistent successes. In this paper, the key enablers for this transformative technology along with their significant advantages are discussed. As AI emerges from science fiction to become the frontier of world-changing technologies, there is an urgent need for systematic development and implementation of AI to see its real impact in the next generation of industrial systems, namely Industry 4.0.**

**Index Terms—Industrial AI, Smart manufacturing systems, Transformative Technology, Industry 4.0**

## INTRODUCTION

The global race for innovation leadership in smart manufacturing is picking up among companies in Europe, the U.S., and Asia. The manufacturing industry is undergoing unprecedented transformation driven by technologies that help manufacturers to digitize their factories. The fourth industrial revolution can drive financial and operational impact while improving productivity and customer satisfaction. The real-world implementation of Manufacturing 4.0 started with enhanced productivity, followed by improved flexibility, quality, and speed. Manufacturing flexibility can be achieved through machine-to-machine and human-machine interactions in order to form a dynamically changing on-demand production system. Quality improvement can be achieved through real-time plant monitoring and just-in-time maintenance. Degradation of manufacturing equipment and tools diminishes product quality and reduces productivity by increasing unplanned downtime. Therefore, intelligent prognostic and health management (PHM) tools are essential for just-in-time maintenance, which guarantees high-quality products, minimizes unplanned downtime, and increases customer satisfaction. Manufacturing speed can be achieved via increased interconnectivity between different manufacturing sectors contributing to the whole product lifecycle. Cross-company vertical and horizontal data integration can bring transparency and cohesiveness between companies, departments, functions, and capabilities which can significantly increase manufacturing efficiency.

Motivated with these short and long term goals, Industry 4.0 realization remains a top priority for many leaders in different manufacturing industries. However, very few manufacturing sites have been able to rapidly adopt these technologies at scale

## I. AI as a catalyst to smart manufacturing

The role of AI tools and techniques in smart manufacturing is a hot topic. The AI revolution is beyond its infancy and many companies have significant activity underway. Today more devices – both big and small – deployed on the factory floor are equipped with sensors that gather/share large volumes of data and capture a multitude of actions. Manufacturers have started recognizing the strategic importance of big data analytics and therefore data is becoming a key enabler for enhancing manufacturing competitiveness.

These enormous volumes of data analyzed in real time by leveraging the analytic capabilities of AI can improve decision making and provide enhanced insight to business users - whether that's reducing asset downtime, improving manufacturing efficiency, automating production, predicting demand, optimizing inventory levels or enhancing risk management. PHM is one of the principal applications for the technology, followed closely by demand forecasting, quality control, and robotics. In the last few years, hundreds of venture-backed start-ups have popped up everywhere that are trying to offer AI-coated magic bullets promising to instantly Augment enterprise-level insight or help companies to understand a particular machine, process or problem. The winner in this competition would be the one that is going to offer a scalable solution required by an enterprise.

## II. Key Elements in Industrial AI : ABCDE

The key elements in Industrial AI can be characterized by 'ABCDE'. These key elements include Analytics technology (A), Big data technology (B), Cloud or Cyber technology (C), Domain knowhow (D) and Evidence (E). Analytics is the core of AI, which can only bring value if other elements are present. Big data technology and Cloud are both essential elements, which provide the source of the information (data) and a platform for Industrial AI. While these elements are essential, domain knowledge and Evidence are also important factors that are mostly overlooked in this context. Domain knowhow is the key element from the following aspects: 1) understanding the problem and focus the power of

Industrial AI into solving it; 2) understanding the system so that right data with the right quality can be collected; 3) understanding the physical meanings of the parameters and how they are associated with the physical characteristics of a system or process; and 4) understanding how these parameters vary from machine to machine. Evidence is also an essential element in validating Industrial AI models and incorporates them with cumulative learning ability. By gathering data patterns and the evidence (or label) associated with those patterns can only we improve the AI model to become more accurate, comprehensive and robust as it ages. Fig. 1 shows how AI drive us from visible space to invisible, and from solving the problems to avoiding them before they surface.

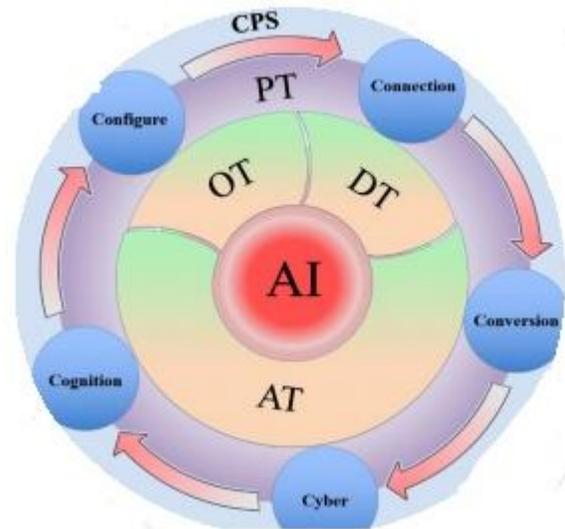


Fig2. Industrial AI can empower smart manufacturing.

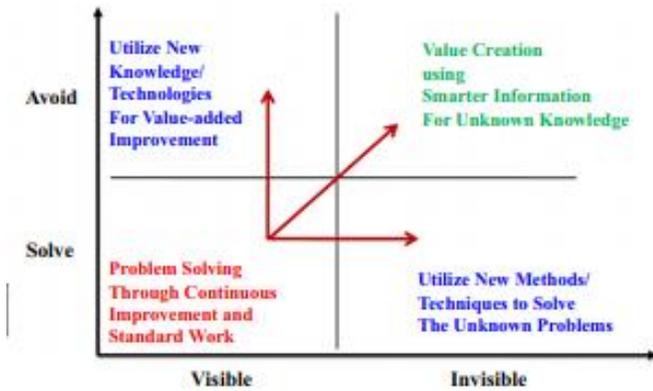


Fig 1. The impact of Industrial AI: from solving visible problems to avoiding invisible

### III. Industrial Artificial Intelligence can empower smart manufacturing

Companies are in need of a systematic structure for the implementation of AI in industrial environments. Industrial AI can realize smart and resilient industrial systems and enable them to be fault tolerant, on-demand and self-organizing. Industrial AI is defined as “a systematic discipline, which focuses on developing, validating and deploying various machine learning algorithms for industrial applications with sustainable performance.” The fundamental concept is the provision of on-demand manufacturing services to end users by optimally coordinating distributed manufacturing resources augmented by AI methodologies. Figure 2 illustrates that industrial AI’s four enabling technologies can be better understood when put in the context of the IMS 5C-CPPS architecture. This architecture provides a comprehensive step-by-step strategy from the initial data collection to the final value creation.

#### 2.1. Data Technologies:

Data is the proverbial new oil that is fueling the growth of M4.0. Hence, it’s critical to understand that the smart factory is primarily about data or more precisely actionable data that leads to information, knowledge, and insights. The more data that is analyzed, the smarter the decisions. Prior to the fourth industrial revolution, there was a heavy reliance on manual methods to collect machine data -- incredibly inefficient, highly susceptible to human error and unable to provide real-time visibility into operations.

Instrumenting the factory floor with sensors can help to create a complete view about the capacity and performance of the company’s assets including manufacturing equipment, inventory, people, etc. Different types of signals can be captured from equipment, such as cutting force, vibration, acoustic emission, temperature, current, oil-debris, pressure etc. The data can be static or dynamic. The role of data technologies is to efficiently track, control and document this voluminous and varied manufacturing data streaming at high speed in real time. Communication and management of data also become an important part of the data technology for industrial AI. It is expected that the communication technology should have features such as high data transfer rate, low latency, high reliability, high security, accurate traceability, and scalability.

#### 2.2. Analytic Technologies:

It is important to know what to do with the collected information. Analytics refers to the application of statistics and other mathematical tools to these data streams to assess and improve practices. Analytics can enable manufacturers to investigate even the minutest of variability in production processes.

Data-driven modeling can enable manufacturing companies to uncover hidden patterns, unknown correlations and other useful information from manufacturing systems and integrate the obtained

information with other technologies for improved productivity and innovation. Apart from data analytics, data visualization tools are an essential element of analytic technologies. The up-to-date real-time information provided by data analytics would be a waste if the results can't be communicated clearly and effectively to the people whose job it is to put them to work. Easy to interpret and user-friendly graphs, charts and reports enable manufacturers to more readily comprehend the analyzed data, track important metrics and assess how far or close they are to their target.

### 2.3. Platform Technologies:

Platform refers to both hardware or a piece of software that fills a role in application enablement in an industrial environment, such as connecting devices, handling data (collection/extraction - storage - analyses - visualization) and finally delivering it to the finished applications.

Platform technologies help in coordinating, integrating, deploying and supporting technologies, such as digital twins, data storage, connectivity across the shop floor, edge intelligence, robotics integration etc. Three major types of platform configurations can be generally found – stand-alone, fog/edge and cloud.

### 2.4. Operations Technologies:

Based on the information derived from the analytics, operations technology, in conjunction with the other technologies, aims to achieve enterprise control and optimization via systems such as product lifecycle management, enterprise resource planning, manufacturing execution systems, customer relationship management, and supply chain management. Finally, outcomes of the analytics performed on the collected data can be fed back to the equipment designer for closed loop lifecycle redesign.

OT enables characteristics like self-configure, self-adjust, and self-optimize to the manufacturing ecosystem which finally improve flexibility and resilience throughout the whole production system and lead to higher efficiency and economic impact.

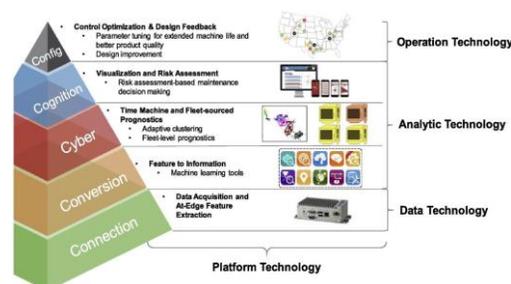


Fig 3. Enabling Technologies for Realization of CPSS (Cyber-Physical Production System) in Manufacturing

## IV Challenges of Industrial AI

The expectations from Industrial AI are versatile and enormous and even a partial fulfillment of these expectations would represent unique and real challenges of applying AI to industries. Among the existing challenges

and complexities, the following ones are of higher importance and priority:

### 4.1 Machine-to-machine interactions

While AI algorithms can accurately map a set of inputs to a set of outputs, they are also susceptible to small variations in the inputs caused by variations from machine to machine. It needs to ensure that individual AI solutions do not interfere/conflict with the working of other systems, further down the line.

### 4.2 Data quality

AI algorithms require massive and clean data sets with minimum biases. By learning from inaccurate or inadequate data sets, the downstream results can be flawed.

### 4.3 Cyber security

The increasing use of connected technologies makes the smart manufacturing system vulnerable to cyber risks. Currently, the scale of this vulnerability is under-appreciated and the industry is not prepared for the security threats that exist

## V. Conclusion

As AI emerges from science fiction to become the frontier of world-changing technologies, there is an urgent need for systematic development and implementation of AI to see its real impact in the next generation of industrial systems, namely Industry 4.0. This study aims to define the term Industrial AI and put it into the perspective of Industry 4.0 paradigm. In addition, by providing an overview of the Industrial AI smart manufacturing in today's manufacturing, this paper aims to provide a guideline for strategizing the efforts toward realization of Industrial AI systems.

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# Artificial Intelligence in Manufacturing: Upgradation to Industry 4.0

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## Abstract

**Grounded on the latest research about the use of technology named Artificial Intelligence (AI) in the areas of manufacturing, we have marked the rapid development of core technologies, which is enhancing the growth and changes in terms of models, means and ecosystems of manufacturing industries as well as the development of artificial intelligence. Now a days, lot of promotions about artificial intelligence in manufacturing are completely concentrating on the industrial use of it in terms of automation which is one of the important aspects of Industry 4.0. Artificial Intelligence takes the capability of manufacturing to completely next level. Thus, we can plan about new technologies of intelligent manufacturing using AI for information communications and product related technology. Here is some outline of which covers the features of artificial intelligence within Industry 4.0, and describes that how it is being used already in manufacturing to increase the efficiency, to improve quality and for better supply chains.**

*Keywords: Artificial Intelligence, Industry 4.0, Manufacturing, Maintenance, Robots, Technology, Algorithm, Machine Learning*

## 1. Introduction

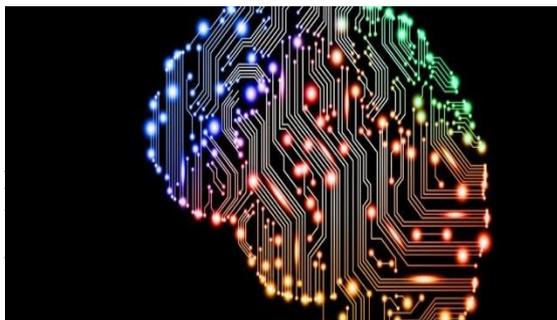


Figure 1

said that the new revolution of 'Internet plus Artificial Intelligence (AI)', characterized by ubiquitous networks, data-drivenness, shared services, cross-border integration, automatic intelligence, and mass innovation, and is coming. In recent years Artificial Intelligence (AI) has received a lot of attention. Because of innovation, AI is now a constituent of our day-to-day lives. It

side by side advances the interest in technology's potential socio-economic and social impacts which brings AI to the spotlight of many contemporary debates. The investments made by many industries into the AI are rapidly increasing and also the governments are trying to interpret and implement this technology for the mean of their citizens.

Industry 4.0 has its enormous impact on manufacturing. It is focused on creating smart environment using AI technology. A lot of major changes will occur in the manufacturing operations due to this. AI is an important technology which has increasingly reached and utilized in factories. AI based systems are able to execute specific tasks way better than human beings. Thus, due to all demonstrations, soon the global business networks will appear and unite their 'smart' machines, storage systems and manufacturing facilities. This new novel towards allows the production and manufacturing according to the individual customer requirements.

## 2. Vision of the fourth industrial revolution

Industry 4.0 is focused on creating intelligent products, processes and operations. In the smart industry, workers, machines and resources cooperate easily. The inwardness of the industry vision 4.0 is on the "Internet of Things" and "Internet of Services", which means the ubiquitous connectivity of people, things and machines. Products, transportation equipment and tools "cooperate" in order to create better each following production.

## 3. Industrial AI's impact on manufacturing

We consider that intelligent manufacturing is a new manufacturing model and the technical means by which new information and communication technology.

Intelligent science and technology, large manufacturing technology (including design, production, management, testing, and integration), system engineering technology, and related product technology are integrated with the whole system and life cycle of product evolution.

The Artificial Intelligence has a significant impact on industrial units, specifically manufacturing unit which can be organized into five principal areas:

- Predictive Quality and Yield
- Predictive Maintenance
- Human – Robot Alliance
- Productive Design
- Market Adaptions

### 3.1 Predictive Quality and Yield



**Figure 2**

The reduced production has always caused losses while on the other hand, it has been hugely beneficial if the production process is prevented from it. This has been always a constant struggle for all the manufacturers. Today, the rising demand has increased the competition. On one hand, the customers' expectations have increased than ever before; due to globalization the global consumer habits are gradually affecting. According to surveys, in recent years, this global population will grow by 25% till 2050. This will result in increased demand of the things which are used by us in day-to-day life.

Against such situations, manufacturers can no longer afford to take processed disorganization and the losses. Thus, with the help of AI used by predictive quality and yield helps to reveal the causes and the automated recommendations and alerts are generated to inform and share important knowledge on how to prevent the losses before they happen and improvises the quality and yield.

### 3.2 Predictive Maintenance

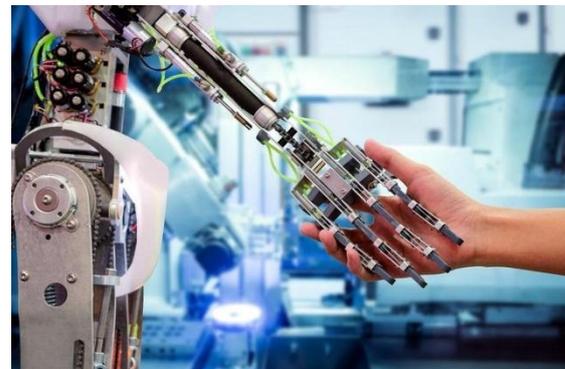


**Figure 3**

This is one of most important, basic and well-known among all applications of AI used in manufacturing. Instead of performing the maintenance, according to a pre-determined schedule, the algorithms to anticipate the next failure of a system is predicted and then informed to personnel to perform the focused procedures of maintenance to prevent the failure.

Here, those predictive maintenance systems are completely dependent on AI technology to formulate their predictions. This system has lots of advantages and comparatively reduces the cost required for planned maintenance by eliminating the need of it many a times. By taking precautions by a machine learning algorithm about the failure, the systems can function without any unnecessary interruptions. While, when the maintenance is needed, it is completely focused about the components such as inspection, repair and replacement. It helps machine to prevent from damage and leads to a longer Remaining Useful Life (RUL).

### 3.3 Human – Robot Alliance



**Figure 4**

The research was done about the human – robot alliance by the International Federation of Robotics (IFR). According to them, till the end of year 2020 there will be approximately 1.64 million industrial robots working worldwide. In simple words, as

jobs get taken over by the robots, the special training will be offered for higher level positions in programming, designing and maintenance. Also, the efficiency of human - robot collaborative work is being improved as robots are approved for manufacturing work alongside humans.

As the robotics adaption in manufacturing increases, a major part will be laid by AI in ensuring the safety of human personnel as well as giving more responsibility to robots that can further improve processes based on real time data collected from the production floor.

### 3.4 Productive Design

Manufacturers are also able to make use of AI in design phase as AI is also changing the way we design products. With a detailed design brief as input by designers and engineers as an input to AI algorithm, generally referred as 'Generative Design Software' it includes data describing restrictions and various parameters including material types, available production methods, budget limitations and time constraints. The algorithm explores each and every configuration before displaying it on a set of best solutions.

Those proposed solutions can be tested using machine learning, offering additional insight as because of which designs work best. One of the vital advantages of this perspective is that an AI algorithm is completely objective without having default to what a human designer addresses 'logical' starting point. No any assumptions are taken at pace value and everything is tested according to actual performance against wide range of manufacturing schemes and conditions.

### 3.5 Market Adaptions

There are no limitations to use cases from the production floors. The AI algorithm can also be used to improve manufacturing supply chains. This helps companies to predict market changes and is also beneficial for management in changing the response mind-set to a strategic one.

AI algorithms draw up the estimations of the demands in market by looking for patterns such as linking locations, socio – economic and macro – economic factors, weather patterns, political status and most importantly the consumer behaviour. This information is valuable for manufacturers as it allows them to enhance staffing, energy uses, inventory control and supply of raw materials.

## 4. What's driving the Urgency to Adopt AI?

1. High revenue volatility
2. Need to continuously find cost savings
3. Short production lead times
4. Increased regulation and inspections Learning and adaptability on the manufacturing plant floor
5. Manufacturing capacity and supply chain needs
6. Increased demand for small-batch and/or customized goods

## 5. Why AI is important for smarter manufacturing?



**Figure 5**

Manufacturing can be very expensive and complex process for those who have no right tools and resources to develop quality products. AI in manufacturing shows a wide positive impact as compared to industries. With some registered success. AI isn't a new concept for manufacturing industry, and now it has increased its accessibility to smaller companies. In the revealing time, AI have become more prevalent in producing and assembling items, reducing costs and timeless production. Approximately 40% of all the possible values that can be created by systems today all comes from the AI and machine learning techniques.

## 6. Industry 4.0 demands collaboration

The complexity of using Artificial Intelligence in the industrial automation requires manufacturers to collaborate with specialists to reach customized solutions. It attempts to build the required technology which is costly and most of the manufacturers aren't able to use it because of lack in necessary skills and knowledge.

Industry 4.0 consists of numerous elements that need to be configured which suits the needs of manufacturer which are as follows:

- Historical data collection
- Live data capturing via sensors
- Data aggregation
- Connectivity through communication protocols routing and gateway devices
- Integration with PLCs
- Dashboards for monitoring and analysis
- AI applications

Finally, industrial AI being distant desire for most manufacturers, today these technologies are real and available. Off course, gaining true value from an industrial AI solution is the most important principle.

### 7. The Manufactories of the Future Can.

01. Detect defects throughout the output process.
02. Deploy predictive maintenance to cut downtime.
03. Respond to real-time changes in demand across the provision chain.
04. Validate whether intricate goods like microchips have been perfectly made.
05. Bring down costs of small-batch or single-run goods, enabling greater customization.
06. Improve employee satisfaction by shifting mundane tasks to machine
07. The machinery maintenance and quality will lead Artificial intelligence projects in manufacturing operations.

### 8. Conclusion

The core algorithm developed through AI – enabled products will be a drastic digital

transformation in manufacturing fields. Most of the industries will be willing to use more sophisticated prototypes to develop complex design processes. For further improving the manufacturing process through a continuous feedback by using the data gained from the products and processes. The industrial operations will be transformed due to the range of robots and machine learning. Also, the industrial operations, manufacturing workforce we need to be reskilled to work by collaborating with fully developed equipment's. While the traditional machines will require modifications to be used in fully automated industries.

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# Artificial Intelligence

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## Abstract

**Artificial Intelligence (AI), a concept which makes machines, capable of thinking and decision making. Artificial intelligence refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving. This aspect of AI programming focuses on choosing the right algorithm to reach a desired outcome. AI programming is designed to continually fine-tune algorithms and ensure they provide the most accurate results possible. Four types of artificial intelligence are there which Type 1 are. Reactive machines, Type 2. Limited memory, Type 3. Theory of mind, Type 4. Self-awareness. A lot of applications are depending on Artificial intelligence, which leads to accuracy and less use of human resources as well, but also it has several big issues and problems. Artificial intelligence can play a big role in this COVID-19 pandemic, as A.I can be customized/used for any type of work flows.**

**Index Terms— Artificial intelligence(A.I), Automation, Deep Learning, humanoid “Sophia”, Machine Learning, Neural networks**

## I. INTRODUCTION

**A**RTIFICIAL Intelligence(A.I)is called as machine intelligence is demonstrated by machines, unlike the natural intelligence displayed by humans and animals. Leading A.I textbooks define the field as the study of “intelligent agents”, any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals. Colloquially, the term “artificial intelligence” is often used to describe machines that mimic cognitive functions that humans associate with the human mind such as learning and problem solving.

Artificial Intelligence was founded as an academic disciple in 1955, and in the years since has experienced several waves of optimism, followed by disappointment and the loss of funding known as A.I winter followed by new approaches, success and renewed funding. For most of its history, A.I research has been divided into sub-fields that often fail to communicate with each other. These sub-fields are

based on technical considerations, such as particular goal.

Artificial intelligence (A.I) makes it possible for machines to learn from experience, adjust to new inputs and perform human-like tasks. Most AI examples that you hear about today – from chess-playing computers to self-driving cars – rely heavily on deep learning and natural language processing.

While Hollywood movies and science fiction novels depict A.I as human-like robots that take over the world, the current evolution of AI technologies isn't that scary – or quite that smart. Instead, AI has evolved to provide many specific benefits in every industry.

### A. Why Artificial intelligence important?

AI technology is important because it enables human capabilities – understanding, reasoning, planning, communication and perception – to be undertaken by software increasingly effectively, efficiently and at low cost.

AI has numerous, tangible use cases today that are enabling corporate revenue growth and cost savings in existing sectors.

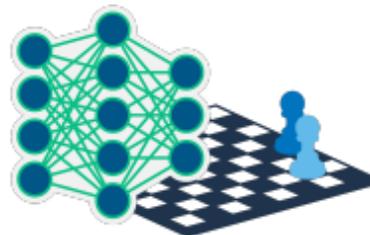
The automation of these abilities creates new opportunities in most business sectors and consumer applications.

### B. Challenges of using artificial intelligence?

Today's AI systems are trained to do a clearly defined task. The system that plays poker cannot play solitaire or chess. The system that detects fraud cannot drive a car or give you legal advice. In fact, an A.I system that detects health care fraud cannot accurately detect tax fraud or warranty claims fraud.

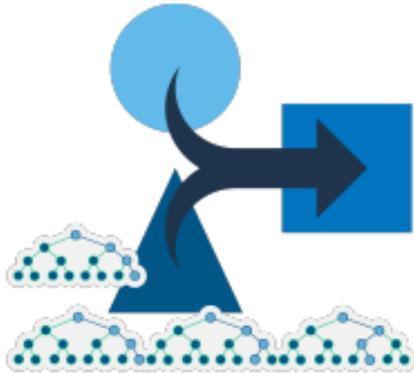
Artificial intelligence is going to change every industry, but we have to understand its limits.

In other words, these systems are very, very specialized. They are focused on a single task and are far from behaving like humans.



## II. HOW A.I WORKS?

AI works by combining large amounts of data with fast, iterative processing and intelligent algorithms, allowing the software to learn automatically from patterns or features in the data. AI is a broad field of study that includes many theories, methods and technologies, as well as the following major subfields:



**Fig. 2. 1980s-2010s Machine Learning**

A. *Machine learning* automates analytical model building. It uses methods from neural networks, statistics, operations research and physics to find hidden insights in data without explicitly being programmed for where to look or what to conclude.

B. *Deep learning* uses huge neural networks with many layers of processing units, taking advantage of advances in computing power and improved training techniques to learn complex patterns in large amounts of data. Common applications include image and speech recognition.

C. *Neural network* is a type of machine learning that is made up of interconnected units (like neurons) that processes information by responding to external inputs, relaying information between each unit. The process requires multiple passes at the data to find connections and derive meaning from undefined data.

D. *The Internet of Things* generates massive amounts of data from connected devices, most of it unanalyzed. Automating models with AI will allow us to use more of it.

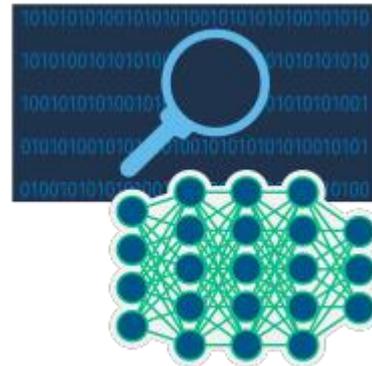
E. *Cognitive computing* is a subfield of AI that strives for a natural, human-like interaction with machines. Using AI and cognitive computing, the ultimate goal is for a machine to simulate human processes through the ability to interpret images and speech – and then speak coherently in response.

## III. HISTORY

The History of A.I began in Antiquity, with myths, stories and rumors of artificial beings endowed with intelligence or consciousness by master craftsmen. The seeds of modern A.I were planted by classical

philosophers who attended.

In 1950, *Alan Turing* published a landmark paper in which he speculated about the possibility of creating machines that think. He noted that 'thinking' is difficult to define and devised his famous Turing test. "If a machine could carry a conversation that was indistinguishable from a conversation with a human being, then it was reasonable to say that the machine was 'thinking'".



**Fig. 3 Present day Deep Learning**

The field of AI research was born at a workshop at Dartmouth College in 1956, where the term "Artificial Intelligence" was coined by "John McCarthy" to distinguish the field from cybernetics and escape the influence of the cyberneticist "Norbert Wiener". Attendees "Allen Newell", "Herbert Simon", "John McCarthy", "Marvin Minsky" and "Arthur Samuel" became the founders and leaders of AI research.

They and their students produced programs that the press described as "astonishing", computers were learning checkers strategies (1954) (and by 1959 were reportedly playing better than the average human), solving word problems in algebra, proving logical theorems (Logic Theorist, 1956) and speaking English.

Computer science defines AI research as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals. A more elaborate definition characterizes AI as "a system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation."

## IV. A.I IN TODAY'S WORLD AND EXAMPLES

A. One of the most commonly found A.I in our smartphones are our personal smart assistants, "SIRI", "ALEXA", "GOOGLE ASSISTANT", etc.



**Fig. 4. Logos of smart assistant Alexa, Siri, and Google**



**Fig. 5. Humanoid Sophia in BHU IIT, Varanasi in Technex 2020**

1. *Siri*: Everyone is familiar with Apple's personal assistant, Siri. She helps us find information, gives us directions, helps we digitalus send messages and so on. Siri is a pseudo-intelligent personal assistant. She uses machine-learning technology to get smarter and better.
2. *Alexa*: Alexa's rise to become the smart home's hub, has been somewhat meteoric. When Amazon first introduced Alexa, it took much of the world by storm.
3. *Google assistant*: Google Assistant is an artificial intelligence–powered virtual assistant developed by Google.

## B. The first A.I humanoid robot: "SOPHIA "

Sophia is a social humanoid robot developed by "Hong Kong" based company "Hanson Robotics". Sophia was first turned on February 2016 and made her first public appearance at South by Southwest Festival (SXSW) in mid-march 2016 in Austin, Texas, US.

The inventor of Sophia is David Hanson, who is the founder and Chief Executive Officer (CEO) of "Hanson Robotics".

As of 2018, Sofia's architecture includes scripting software, a chat system, and Open Cog, an A.I system designed for general reasoning. Sophia imitates human gestures and facial expressions and is able to answer certain questions and to make simple conversations on predefined topics. Sophia uses Speech Recognition Technology from "AlphabetInc". Cameras within Sophia's eyes combined with computer algorithms allow her to see. She can follow faces, sustain eye contact, and recognize individuals. She is able to process speech and have conversations using a natural language subsystem. Around January 2018, Sophia was upgraded with functional legs and the ability to walk. "CNBC" has commented on Sophia's "lifelike" skin and her ability to emulate more than 60 facial expressions.

Sophia has been interviewed in the same manner as a human, striking up conversations with hosts. Some replies have been nonsensical, while others have impressed interviewers such as "60 Minutes' Charlie Rose". In a piece for CNBC, when the interviewer expressed concerns about robot behavior, Sophia joked that he had "been reading too much "Elon Musk". And watching too many Hollywood movies".

Sophia has been covered by media around the globe and has participated in many high-profile interviews. In October 2017, Sophia "became" a Saudi Arabian citizen, the first robot to receive citizenship of any country. In November 2017, Sophia was named the "United Nations Development Program's" first ever Innovation Champion, and is the first non-human to be given any United Nation title.

## V. ADVANTAGES AND DISADVANTAGES OF A.I

### A. Advantages:

#### 1. Reduction in Human Error:

The phrase "human error" was born because humans make mistakes from time to time. Computers, however, do not make these mistakes if they are programmed properly. With Artificial intelligence, the decisions are taken from the previously gathered information applying a certain set of algorithms. So, errors are reduced and the chance of reaching accuracy with a greater degree of precision is a possibility.

## 2. *Faster Decisions:*

Using AI alongside other technologies we can make machines take decisions faster than a human and carry out actions quicker. While taking a decision human will analyze many factors both emotionally and practically but AI-powered machine works on what it is programmed and delivers the results in a faster way.

## 3. *Handling risky works:*

This is one of the biggest advantages of Artificial intelligence. We can overcome many risky limitations of humans by developing an AI Robot which in turn can do the risky things for us. Let it be going to mars, defuse a bomb, explore the deepest parts of oceans, mining for coal and oil, it can be used effectively in any kind of natural or man-made disasters.

## B. *Disadvantages:*

### 1. *High Costs of Creation:*

As AI is updating every day the hardware and software need to get updated with time to meet the latest requirements. Machines need repairing and maintenance which need plenty of costs. It's creation requires huge costs as they are very complex machines.

### 2. *Lacking Out of Box Thinking:*

Machines can perform only those tasks which they are designed or programmed to do, anything out of that they tend to crash or give irrelevant outputs which could be a major backdrop.

### 3. *Making Humans Lazy:*

AI is making humans lazy with its applications automating the majority of the work. Humans tend to get addicted to these inventions which can cause a problem to future generations.

## VI. APPLICATIONS OF A.I

### A. *Speech Recognition:*

Transcribes and transforms human speech into a format useful for computer applications. Presently used in interactive voice response systems and mobile applications.

### B. *Deep Learning Platforms:*

A special type of machine learning consisting of artificial neural networks with multiple abstraction layers. Currently used in pattern recognition and classification applications supported by very large data sets.

### C. *Biometrics:*

Biometrics uses methods for unique recognition of humans based upon one or more intrinsic physical or behavioral traits. In Computer Science Biometrics science is used as a form of an identity access control. It is also used to identify individuals in groups that are under surveillance.

## 1. *Tech companies using A.I*

### A. *Alibaba:*

Chinese company Alibaba is the world's largest e-commerce platform that sells more than "Amazon" and "eBay" combined. Artificial intelligence (AI) is integral in Alibaba's daily operations and is used to predict what customers might want to buy. With natural language processing, the company automatically generates product descriptions for the site.

### B. *Alphabet- Google:*

Alphabet is Google's parent company. Waymo, the company's self-driving technology division, began as a project at Google. Today, "Waymo" wants to bring self-driving technology to the world to not only to move people around, but to reduce the number of crashes. Its autonomous vehicles are currently shuttling riders around California in self-driving taxis. Right now, the company can't charge a fare and a human driver still sits behind the wheel during the pilot program. Google signaled its commitment to deep learning when it acquired "DeepMind".

### C. *Amazon:*

Amazon uses artificial intelligence is "to ship things to you before you even think about buying it."

In a time when many brick-and-mortar stores are struggling to figure out how to stay relevant, America's largest e-tailer offers a new convenience store concept called "Amazon Go". Unlike other stores, there is no checkout required. The stores have artificial intelligence technology that tracks what items you pick up and then automatically charges you for those items through the "Amazon Go app" on your phone. Since there is no checkout, you bring your own bags to fill up with items, and there are cameras watching your every move to identify every item you put in your bag to ultimately charge you for it.

### D. *Apple:*

Apple, one of the world's largest technology companies, selling consumer electronics such as "iPhones" and "AppleWatches", as well as computer software and online services. Apple uses artificial intelligence and machine learning in products like the iPhone, where it enables the "FaceID" feature, or in products like the "AirPods", "Apple Watch", or "HomePod", smart speakers, where it enables the smart assistant Siri. Apple is also growing its service offering and is using AI to recommend songs on "Apple Music", help you find your photo in the "iCloud", or navigate to your next meeting using "Maps".

## VII. CONCLUSION

At last, Artificial Intelligence is changing the world, making machines able of thinking, also a great effort

towards the industry of automation. A.I is making human life to live in better way, but it also has some limitation, risks that if it goes in a wrong hand, but today's A.I is not too much smart that it takes over humans. A.I is bringing a great, precise automation in works. Tech companies using these technologies for making their products better, learning human nature to work according to them. In today's world A.I is at beginning stage, but it is making technology better. Artificial intelligence is a great way to make machines, work better and in different way.

“The development of full artificial intelligence could spell the end of the human race. Once humans develop artificial intelligence, it will take off on its own and redesign itself at an ever-increasing rate. Humans, who are limited by slow biological evolution, couldn't compete and would be superseded” – Stephen Hawking

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# World on Cyber Security

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## Abstract

In today's world all the work, business as well as Government, NGOs, Institutes, Corporate sectors are taking part in social world leading to cyber laws and its benefits. As more business activities are being automated and an increasing number of computers are being used to store sensitive information, the need for secure computer systems becomes more apparent. This need is even more apparent as systems and applications are being distributed and accessed via an insecure network, such as the Internet. The Internet itself has become critical for governments, companies, financial institutions, and millions of everyday users. But as it provides us benefits, it also leads to major destruction to our social life as well as our privacy. Cybercrime is one of major crimes done by computer experts. In this paper, need of cyber security is mentioned and some of the impacts of the cybercrime. Cyber security is to provide prevention against the cybercrime, while cybercrime is that group of activities made by the people by creating disturbance in network, stealing others important and private data, documents, hack bank details and accounts and transferring money to their own. This paper gives detailed information regarding cyber security and cybercrime. It includes types of cyber security, need of cyber security, issues in cyber security, its advantages and disadvantages, history of cybercrime, types of cybercrime.

**Keywords:** - *Cyber, cybercrime, cyber security, crime, security, network, hacking, steal data, information security, network security, operational security, communicational security, application security.*

## 1. Introduction

Cyber Security is the protection of computer system, networks, and server system from theft of or damage to their hardware, software, or electronic data as well as disruption or misdirection of the services they provide. The Computer may have been used in commission of a crime, or it may be target. Cybercrime may threaten a person, company or a nation's security and financial health. It is combinational form relating to information and technology, internet and virtual reality.

Cyber security is used to refer security offered through online services to protect your online information. Cyber security is all encompassing domain of information technology. It comprises the entire set of security related technologies. Cyber security is also body of technologies,

processes and practices designed to protect and secure networks, computer systems, various programs and data from cyber-attack, damage all these things or unauthorized access.

The problem of End-User mistakes cannot be solved by adding more technology; it has to be solved with a joint effort and partnership between the Information Technology community of interest as well as the general business community along with the critical support of top management.

These published materials consist of collections of tools, policies, security concepts, security safeguards, guidelines, risk management approaches, actions, training, best practices, assurance and technologies. The general security objectives comprise the following:

- Availability.
- Integrity, which may include authenticity and non-repudiation.
- Confidentiality.

## 2. Elements of Cyber Security

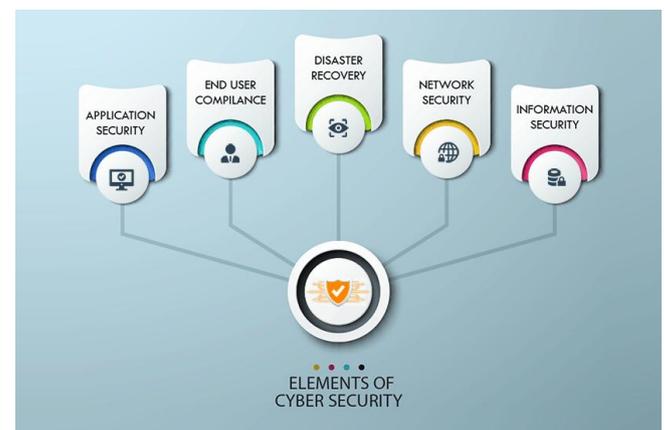


Fig.1 Elements of Cyber Security

Cybersecurity is a way of preventing and protecting a system, networks, and technologies from unauthorized access. In this era of technology, it has been essential for an organization to have a proper cybersecurity team who can look-over cyber threat and plan to deal with them on time. Strong cybersecurity on a systematic approach includes the following points:

**2.1 Application Security:** Applications play an essential role in business projects; that is why every firm needs to focus on web application security. Having a secure web application is required to protect customers, their interests and their assets. Web application weakness is a common point of interference for a cyber-thief.

**2.2 Information Security:** Information includes business records, personal data, customer's data, and intellectual property. For an organization, it is vital to have strong cybersecurity for information as it is the heart of every organization.

**2.3 Network Security:** Network security consists of protecting the usability and reliability of network and data. A network penetration test is conducted to assess the vulnerabilities in a system and other security issues which occur in servers, hosts, devices and network services

**2.4 Operational Security:** Operations security is used to protect organization functions. It tracks critical information and assets to identify vulnerabilities that exist in the functional method.

**2.5 End-User Education:** One of the standard errors that lead to data breaches is human error. Organization cybersecurity is kept as strong as the weakest link. It is vital for an organization to train their employees about cybersecurity. Every employee should be aware of the phishing attacks through emails and links and should have the potential to deal with cyber threats they may face.

**2.6 Leadership Commitment:** To have a successful cybersecurity project, it is vital to have leadership commitment. Without having the leadership in the team it is complicated to develop, implement and maintain the process.

**3. Problematic Elements of Cyber Security**



Fig. 2 Problematic Elements of Cyber Security

The most problematic elements of cyber security are security risks. The traditional approach has been focus most resources on the most crucial system components and protect against the threats, which necessitated leaving some less important system components undefended and some

less dangerous risks. Such an approach is insufficient in the current environment.

**3.1 Virus:** A Computer Virus is malicious code that replicates by copying itself to another program, computer boot sector or document and changes how a computer works. The virus requires someone to knowingly or unknowingly spread the infection without the knowledge or permission of a user or system administrator. A virus can be spread by opening an email attachment, clicking on an executable file, visiting an infected website or viewing an infected website advertisement. Examples of Viruses: (1) Melissa, (2) Sasser, (3) Zeus, (4) conficker, (5) Stuxnet, (6) Mydoom, (7) Code Red.

**3.2 Worms:** It is a standalone malware computer program that replicates itself in order to spread to other computers. It uses the host machine to scan and infect others computers. Examples of Worms: (1) Badtrans, (2) Bagle, (3) Blaster, (4) ExploreZip, (5) Kakworm, (6) Netsky, (7) SQL Slammer, (8) Supernova Worm.

**3.3 Hacker:** A computer hacker is a computer expert who uses their technical knowledge to achieve a certain goal, or overcome a certain obstacle, within a computerized system. In common a hacker is a person who breaks into computers, usually by gaining access to administrative controls.

**3.3.1 Types of Hackers:**

a. **White Hat Hacker:** White hat hackers are hackers who work to keep data safe from other hackers by finding system vulnerabilities that can be mitigated. White hats are usually employed by the target system's owner and are typically paid for their work. Their work is not illegal because it is done with system owner's consent.

b. **Black Hat Hacker:** Black hat hackers are hackers with malicious intentions. They often steal, exploit, and sell data, and are usually motivated by personal gain. Their work is usually illegal. Black hats are like cracker but very skilled and tries via hacking to make profits or benefits, not just to vandalize

c. **Grey Hat Hacker:** Grey hat hackers include those who hack for fun or to troll. They may both fix and exploit vulnerabilities, but usually not for financial gain. Even if not malicious, their work can still be illegal, if done without the target system owner's consent, and grey hats are usually associated with black hat hackers.

**3.4 Malware:** Malware is a software intentionally designed to cause damage to a computer, server, client, or computer network. The word "malware" comes from the term "MALicious softWARE." (1) Viruses, (2) Worms,

- (3) Root Kits, (4) Trojans, (5) Spyware, (6) Crime ware, (7) Adware.

**3.5 Trojan Horses:** Trojan horses are email viruses that can duplicate themselves, steal information, or harm the computer system. These viruses are the most serious threats to computers.

**3.6 Password Cracking:** Password attacks are attacks by hackers that are able to determine passwords or find passwords to different passwords protected electronic areas and social networks sites.

**4. Management of Cyber Security Risks**



Fig.3 Management of Cyber Security

Cyber security risk management is the practice of prioritizing cyber security defensive measures based on the potential adverse impact of the threats they're designed to address. Establishing a risk management approach to cyber security investment acknowledges that no organization can completely eliminate every system vulnerability or block every cyber-attack.

**4.1 What are the Threats?** A Cyber or Cyber Security threats is a malicious act that seeks to damage data, steal data or disrupt digital life in general. Cyber-attacks include threats like computer viruses, data breaches, and Denial of Service (DoS) attacks. A cyber-attack is an attack that is mounted against us i.e. our digital devices by means of cyberspace.

**4.2 What are the Vulnerabilities?** In cyber security, vulnerability is a weakness which can be exploited by a cyber-attack to gain unauthorized access to or perform unauthorized actions on a computer system. Vulnerabilities can allow attackers to run code, access a system's memory, install malware, and steal, destroy or modify sensitive data.

**4.3 What Are the Impacts?** A successful attack can compromise the confidentiality, integrity, and availability of an ICT system and the information it handles. Botnet malware can give an attacker command of a system for use in cyber-attacks on other systems. Vulnerabilities can be exploited by a variety of methods including SQL injection, buffer overflows, cross-site scripting (XSS) and open source exploit kits that look for known vulnerabilities and security weakness in web applications.

**5. Advantages of Cyber Security**

1. Protects system against viruses, worms, spyware and other unwanted programs.
2. Protection against data from theft.
3. Protects the computer from being hacked.
4. Minimizes computer freezing and crashes.
5. Gives privacy to users.

**6. Disadvantages of Cyber Security**

1. Firewalls can be difficult to configure correctly.
2. Incorrectly configured firewalls may block users from performing certain actions on the Internet, until the firewall configured correctly.
3. Makes the system slower than before.
4. Need to keep updating the new software in order to keep security up to date.
5. Could be costly for average user.

**7. Safety Tips for Cyber Security**

1. Maintain Backup.
2. Uninstall unnecessary Software.
3. Use Antivirus Software.
4. Insert Firewalls, Pop-up Blocker.
5. Use secure connections.
6. Open attachments carefully.
7. Use Strong password.
8. Check security settings.

**8. Issues in Cyber Security**

1. Better end user education it's sort of expressing the self-evident, however most frameworks are just as secure as the propensities for the general population utilizing them.
2. Security mindful programming advancement: They are sufficiently not individuals centred on security. With an expanding measure of individuals getting associated with Internet.

**9. Conclusion**

In this world on social and digital network, our data and our privacy factors are very much important. Any intelligent device that can pass data to one or more other devices is encompassed within the scope of Cyber Security that includes pretty much the entire information of our modern

society. So, all should be aware of cyber-attacks and regarding cyber security by which they will be sure of their digital belongings and digital data to safe zone.

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# BE AWARE. CONNECT WITH CARE

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## Abstract

Recently due to high use of internet there are tremendous cyber-crimes. Due to which it has become necessary for us to take a step towards protecting our privacy. Security is at high risk. Whenever we think about the cyber security the first thing that comes to our mind is 'cyber crimes' which are increasing immensely day by day. Various Governments and companies are taking many measures in order to prevent these cyber-crimes. Besides various measures cyber security is still a very big concern to many. This paper mainly focuses on protection of systems, networks and data in a cyberspace.

**Keywords** - Cyber security, Cyber Crime, Cyber Attacks, Impact of Cyber Security

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1.	History of Cyber Security
2.	Why Cyber Security is important?
3.	Types of Cyber Crime
4.	Cyber Law of India
5.	Impact of Cyber Security
6.	Role of Social Media in Security
7.	Safety Tips to Cyber Security
8.	Advantages & Disadvantages
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## INTRODUCTION

What is Cyber Security?

"Cyber Security refers to a set of techniques used to protect the integrity of networks, programs and data from attack, damage or unauthorized access. "The term Cyber Security is used to refer to the security offered through online services to protect your online information."

What is Cyber Crime?

Simple Theory –When you purchase a home, it comes with a door and a lock. You always ensure that the door/lock exist and is working properly. Likewise, your system is your home and security tools are your door/lock. So if someone breaches into your home's (system), accesses all your personal accounts and tempers your data, is the criminal who is committing the crime i.e. Cyber Crime. That means more precisely we can say that – "Cyber Crime is an illegal activity committed on the internet information.

## I. HISTORY OF CYBER SECURITY

In 1969, Leonard Kleinrock, professor of UCLA and student, Charley Kline, sent the first electronic message from the UCLA SDS Sigma 7 Host computer to Bill Duvall, a programmer, at the Stanford Research Institute.

This is a well-known story and a moment in the history of a digital world. The sent message from the UCLA was the word "login."

The system crashed after they typed the first two letters "lo." Since then, this story has been a belief that the programmers typed the beginning message "lo and behold." While factually believed that "login" was the intended message. Those two letters of messages were changed the way we communicate with one another.

## II. WHY CYBER SECURITY IS IMPORTANT?

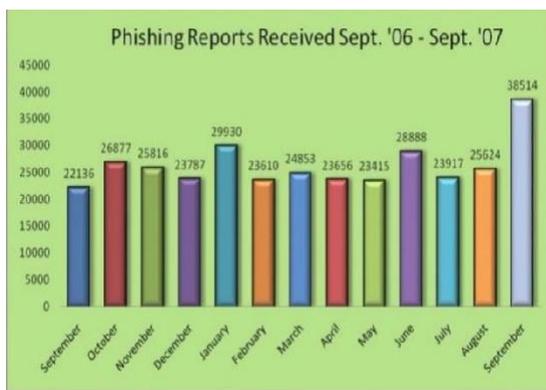
Cyber Security is necessary since it helps in securing data from threats such as data theft or misuse, also safeguards your system from viruses.

It is also important because, it protects our identifiable information/sensitive data from malicious attacks, invasion of privacy, hackers, agents of fraud and other such disasters. That's why Cyber Security is such a vital part of a secure and well-ordered digital world.

### III. TYPES OF CYBER CRIMES

**Hacking** – “Hacking” is a crime which entails cracking systems and gaining unauthorized access to the data stored in them. Hacking had witnessed a 37% increase in this year.

**Phishing** – Phishing is just one of the many frauds on the internet, trying to fool people into parting with their money.



**Cyber Stalking** – Cyber Stalking is use of the internet or other electronic means to stalk someone. This term is used interchangeably with online harassment and abuse.

**Password Attack** - Just what it sounds like. Hackers try to crack a password, usually a poorly chosen one and gain network entry.

**Cyber Squatting** – Cyber Squatting is the act of registering a famous domain name and then selling it for a fortune.

### IV. CYBER LAW OF INDIA

Cyber Crime can involve criminal activities that are traditional in nature, such as theft, fraud, defamation and mischief all of which are subjected to the India Penal Code. In simple way we can say

that cyber -crime is an unlawful acts where in the computer is either a tool or both.

The abuse of computer has also given to the birth of new age crime that is addressed by the Information Technology Act, 2000.

Some of the Cyber Laws in India are:

**Section 65 – Tampering with computer Source Documents** : A person who intentionally conceals, destroys or alters any computer source code when it is required to be maintained by law commits an offence and can be punished with 3 years’ imprisonment or a fine of 2 Lakhs INR or both.

**Section 66 – Using password of another person** : If a person fraudulently uses the password, digital signature or other unique identification of another person, he/she can face imprisonment up to 3 years or/and a fine of 1 Lakh INR.

**Section 66D – Cheating using computer resource** : If a person cheats someone using a computer resource or a communication device, he/she could face imprisonment up to 3 years or/and fine up to 1 Lakh INR.

**Section 66E – Publishing private Images of Others** : If a person captures, transmits or publishes images of a person’s private parts without his/her consent or knowledge, the person is entitled to imprisonment up to 3 years of fine up to 2 Lakhs INR or both.

**Section 66F – Acts of CyberTerrorism** : A person can face life imprisonment if he/she denies an authorized person the access to the computer



resource or attempts to penetrate/access a computer resource without nation. This is a non-bailable offence.

### V. IMPACT OF CYBER SECURITY

There’s no year that goes by without hearing about a major cyber attack that wreaks havoc on society. Turning point events in cyber security have changed

the way we approach online security today.

Cyber security is attracting more and more attention and the impact on companies and regular users worldwide is mostly reflected in its numbers. Protection for your business – cyber security solutions provide digital protection to your business that will ensure your employees aren't at risk from potential threats such as Adware and Ransomware. Cyber crime costs small business disproportionately more than big businesses when adjusted for organizational size. For a large corporation, the financial impact of a breach may run into the millions, but at their scale, the monetary implications are barely a blip on the radar. Small businesses shell out an average of \$38,000 to recover from a single data breach in direct expenses alone (Kaspersky Lab, 'Damage Control: The Cost of Security Breaches', 2015). A casual stance on security could quite easily put you out of business.

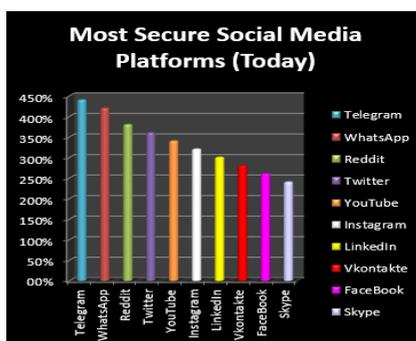
### VI. ROLE OF SOCIAL MEDIA IN CYBERSECURITY

As we become more social in an increasingly connected world, companies must find new ways to protect personal information. Social media plays a huge role in cyber security and will contribute a lot to personal cyber threats. Social media adoption among personnel is skyrocketing and so is the threat of attack.

Since social media or social networking sites are almost used by most of them every day it has become a huge platform for the cyber criminals for hacking private information and stealing valuable data.

Though social media can be used for cyber-crimes these companies cannot afford to stop using social media as it plays an important role in publicity of a company. Instead, they must have solutions that will notify them of the threat in order to fix it before any real damage is done.

However companies should understand this and recognize the importance of analyzing the information especially in social conversations and provide appropriate security solutions in order to stay away from risks. One must handle social media by using certain policies and right technologies.



### VII. SAFETY TIPS TO CYBER SECURITY

Insert firewalls - A firewall is a software program or piece of hardware that helps screen out hackers,

Growth of the Cyber Security products market in India



viruses, and worms that try to reach your computer over the Internet. All messages entering or leaving the internet pass through the firewall present, which examines each message and blocks those that do not meet the specified security criteria. Hence firewalls play an important role in detecting themal ware.

Malware scanners - This is software that usually scans all the files and documents present in the system for malicious code or harmful viruses. Viruses, worms, and Trojan horses are examples of malicious software that are often grouped together and referred to as malware.

Anti-virus software - Antivirus software is a computer program that detects, prevents, and takes action to disarm or remove malicious software programs, such as viruses and worms. Most antivirus programs include an auto-update feature that enables the program to download profiles of new viruses so that it can check for the new viruses as soon as they are discovered. Anti-virus software is a must and basic necessity for every system.

Maintain backup - This helps when there's any loss of important data. The process of recovery of information becomes very smooth.

Use strong passwords - The concept of user name and password has been fundamental way of protecting our information. This may be one of the first measures regarding cyber security.

Operating systems – Updating Operating Systems can also be very helpful. Keeping your system up-to-date reduces the risk of theft or leaking of data.

### VIII. ADVANTAGES & DISADVANTAGES

**ADVANTAGES:**

- 1) Protects system against viruses, worms, spyware and other unwanted programs.
- 2) Protection against data from theft.
- 3) Protects the computer from being hacked.
- 4) Minimizes computer freezing and crashes.
- 5) Gives privacy to users

Impact of Cyber-Attacks To be published in: Benson & McAlaney (2019/20) *Emerging Cyber Threats and Cognitive Vulnerabilities, Academic Pre*

**DISADVANTAGES:**

- 1) Firewalls can be difficult to configure correctly.
- 2) Incorrectly configured firewalls may block users from performing certain actions on the Internet, until the firewall configured correctly.
- 3) Makes the system slower than before.
- 4) Need to keep updating the new software in order to keep security up to date.
- 5) Could be costly for average user.

**IX. CONCLUSION**

As online threats and cyber-attacks continue to permeate the Internet, it is essential that we as a community develop a better understanding of these issues and how they can impact our lives. Cyber-crime continues to diverge down different paths with each New Year that passes and so does the security of the information. The latest and disruptive technologies, along with the new cyber tools and threats that come to light each day, are challenging organizations with not only how they secure their infrastructure, but how they require new platforms and intelligence to do so. There is no perfect solution for cybercrimes but we should try our level best to minimize them in order to have a safe and secure future in cyber space. I hope that my paper will be helpful for my audience to improve their knowledge about cyber security and to overcome several security loop-holes on their computer operation.

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# Cyber Security

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## Abstract

Cyber Security plays an important role in the field of computer technology nowadays. Securing the information has become one of the biggest challenges in the present day. Whenever we think about cyber security the first thing that comes to our mind is "cyber-crimes" which are increasing immensely day by day. Although the effort is done to educate people and to expose them to the idea that it is not safe anymore to navigate in the cyber world without security. Various Governments and companies are taking many measures in order to prevent these cyber-crimes. Since, Cybercrimes are the biggest threat in the digital age. While it may not be possible to completely eradicate cybercrime and ensure complete internet security, businesses can reduce their exposure to it by maintaining an effective cyber security strategy using a defense-in-depth approach to securing systems, networks and data. Implementing effective cyber security measures is particularly challenging today because there are more devices than people, and attackers are becoming more innovative. This paper mainly focuses on challenges faced by cyber security on the latest technologies. It also focuses on latest about the cyber security techniques, ethics and the trends changing the face of cyber security.

**Keywords** – cyber security, cyber crimes, internet, cyber hygiene, hacking, frauds, how to be cyber secure.

## I. INTRODUCTION

Cyber security is the practice of protecting systems, networks, and programs from digital attacks. These cyber-attacks are usually aimed at accessing, changing, or destroying sensitive information; extorting money from users; or interrupting normal business processes. Cyber security covers not only safeguarding confidentiality and privacy, but also the availability and integrity of data, both of which are vital for the quality and safety of care. Over the years, the term Cyber Security has gained much importance and become a common part of each one's life that is associated with a computer or a smartphone device. When people submit their data online, it becomes vulnerable to cyber-attacks or cyber-crimes. Moreover, cyber-attacks can happen over an external facing DNS server or an internal firewall, which in turn affects the data and infrastructure within the enterprise that inherently causes significant damage to the business of the associated organization.

Cyber Security offers security, from unauthorized access or exploitation, through online services to the massive data, associated appliances and network that is used for communication.

## II. TYPES OF CYBER CRIMES

1. **FRAUD:** Fraud can be done by altering, destroying, stealing, or suppressing any information to secure unlawful or unfair gain.
2. **HACKING:** Hacking involves the partial or complete acquisition of certain functions within a system, network, or website.
3. **IDENTITY THEFT:** An attack that occurs when an individual accesses a computer to glean a user's personal information, which they then use to steal that person's identity and other valuable accounts.
4. **PHISHING:** The fraudulent practice of sending emails purporting to be from reputable companies in order to induce individuals to reveal personal information.
5. **SPAMMING:** Spamming uses electronic messaging systems, most commonly emails in sending messages that host malware, fake links of websites, and other malicious programs.
6. **CYBERBULLYING:** Cyber bullying is one of the most rampant crimes committed in the virtual world. It is a form of bullying carried over to the internet.
7. **HACKING:** It involves the partial or complete acquisition of certain functions within a system, network, or website.
8. **IDENTITY THEFT:** An attack that occurs when an individual accesses a computer to glean a user's personal information, which they then use to steal that person's identity and other valuable accounts.
9. **PHISHING:** The fraudulent practice of sending emails purporting to be from reputable companies in order to induce individuals to reveal personal information.
10. **SPAMMING:** Spamming uses electronic messaging systems, most commonly emails in sending messages that host malware, fake links of websites, and other malicious programs.



Fig. 1 Common types of cybercrimes.

### III. IMPORTANCE OF CYBER SECURITY

Cyber security is important because government, military, corporate, financial and medical organizations collect, process and store unprecedented amounts of data on computers and other devices. A significant portion of the data can be sensitive information, whether that be intellectual property, financial data, personal information, or other types of data for which unauthorized access or exposure could have negative consequences. Organizations transmit sensitive data across networks and to other devices in the course of doing businesses, and cyber security describe the discipline dedicated to protecting that information and the systems used to process or store it.

In today's connected world, everyone benefits from advanced cyber defense programs. At an individual level, a cyber security attack can result in everything from identity theft, to extortion attempts, to loss of important data like family photos. Everyone relies on critical infrastructure like power plants, hospitals, and financial service companies. Securing these and other organizations is essential to keeping our society functioning.

Here are several approaches to security in computing; sometimes a combination of approaches is valid:

1. Trust all the software to abide by a security policy but the software is not trustworthy (this is computer insecurity).
2. Trust all the software to abide by a security policy and the software is validated as trustworthy (by tedious branch and path analysis for example).

End-user security software scans computers for pieces of malicious code, quarantines this code, and then removes it

from the machine. Security programs can even detect and remove malicious code hidden in Master Boot Record (MBR) and designed to encrypt or wipe data from computer's hard drive.

Electronic security protocols also focus on real-time malware detection. Many use heuristic and behavioral analysis to monitor the behavior of a program and its code to defend against viruses or Trojans that change their shape with each execution (polymorphic and metamorphic malware). Security programs can confine potentially malicious programs to a virtual bubble separate from a user's network to analyze their behavior and learn how to better detect new infections.

Security programs continue to evolve new defenses as cyber-security professionals identify new threats and new ways to combat them.



Fig. 2 Importance of addressing cyber security threats.

### IV. WAYS TO BE CYBER SECURE

1. **DO NOT CLICK WITHOUT THINKING:** Remember that one link click can cost you a hefty sum. Malicious links can do damage in various ways, so be sure to inspect links and ensure they're from trusted senders before clicking them.
2. **USE TWO FACTOR AUTHENTICATION:** It's important to have a strong password but it's even more important to have two factor authentication or multi factor authentication. This method provides two layers of security measures so if a hacker manages to accurately guess your password, there is still an additional security measure in place to ensure that your account is not infringed.
3. **UPDATE REGULARLY:** New updates for all kinds of devices are available so update your device as soon as you can because all updates include improved security.
4. **CONNECT SECURELY:** Do not connect to unsecured public networks as there is a higher chance of your data being hacked so only be

connected to private networks when possible, especially when handling sensitive information.

5. **BACK UP YOUR DATA:** Always have a back up of important data as it's the only ultimate recovery tool after a cyber attack or loss of data.
6. **LOOK OUT FOR PHISHING SCAMS:** To avoid phishing attacks, do not allow emails from unfamiliar senders and do not fall for suspicious emails and offers.
7. **USE A STRONG PASSWORD:** Use a password that's 8 characters long, has upper and lower case mixed and contain at least one symbol to make a strong password. Avoid using same passwords twice.
8. **USE ANTI-VIRUS PROTECTION & FIREWALL:** Using a firewall is important for defending your data against malicious attacks. A firewall help detecting what traffic is allowed to enter your device.
9. **SECURE YOUR MOBILE DEVICE:** Don't always keep your Bluetooth on and be cautious about the files you download. Some tips for mobile security are:
  - Avoid sending sensitive information online.
  - Keep your device updated.
  - Install apps from trusted sources.
  - Regularly back up your phone data.
  - Create a difficult phone passcode which is not your birthdate.
  - Leverage Find my iPhone or the Android Device Manager to prevent loss or theft.
10. **BEWARE OF SOCIAL ENGINEERING:** Review your online accounts and protect your credit card information. Safeguard your online accounts by reviewing what information you upload on the internet.



Fig. 3 Network security tips

**V. CONCLUSION**

Nowadays, everyone is at a risk to cyber-crimes. Crimes by computer vary and they don't always occur behind the

computer but they are executed with the help of computers. However, I find cyber-crime more serious than real-life crime, for the sole reason that it usually affects millions of web users at once. With technology being such a huge part of our lifestyles today, cyber crimes are increasing day by day. We think it is important for all the individuals to follow basic cyber security tips to be safe from cyber-crimes. It is also important to be educated about the on-going cyber-crimes and measures to reduce them. Hence, we believe that following simple tips can go a long way in preventing a calamity.

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# Cyber Security

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## Abstract

**Cyber Security plays an important role in the field of information technology. Securing the information have become one of the biggest challenges in the present day. Whenever we think about the cyber security the first thing that comes to our mind is cybercrimes which are increasing immensely day by day. This paper mainly focuses on challenges faced by cyber security on the latest technologies. It's also focuses on latest about the cyber security techniques, ethics and the trends changing the face of cyber security.**

**Keywords**—cyber security, cybercrime, cyber ethics, social media, cloud computing, android apps.

## I. INTRODUCTION

Cybersecurity is the protection of Internet-connected systems, including hardware, software, and data from cyberattacks. It is made up of two words one is cyber and other is security. Cyber is related to the technology which contains systems, network and programs or data. Whereas security related to the protection which includes systems security, network security and application and information security. It is the body of technologies, processes, and practices designed to protect networks, devices, programs, and data from attack, theft, damage, modification or unauthorized access. It may also be referred to as **information technology security**.

## II. CYBER CRIME

Cybercrime is criminal activity that either targets or uses a computer, a computer network or a networked device. Most, but not all, cybercrime is committed by cybercriminals or hackers who want to make money. It is carried out by individuals or organizations. Some cybercriminals are organized, use advanced techniques and are highly technically skilled. Others are novice hackers. Rarely, cybercrime aims to damage computers for reasons other than profit. These could be political or personal. As day by day technology is playing in major role in a person's life the cyber crimes also will increase along with the technological advances.

## III. CYBER SECURITY

Privacy and security of the data will always be top security measures that any organization takes care. We are presently living in a world where all the information is maintained in a digital or a cyber form. Social networking sites provide a space where users feel safe as they interact with friends and

family. In the case of home users, cyber-criminals would continue to target social media sites to steal personal data. Not only social networking but also during bank transactions a person must take all the required security measures.

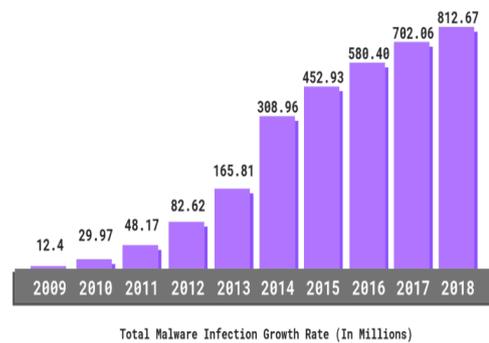


Fig.1. Malware Infection Growth Rate

- 92% of malware is delivered by email.
- Mobile malware on the rise with the number of new malware variants for mobile increased by 54% in 2018.
- Third-party app stores host 99.9% of discovered mobile malware.
- More than 250,000 unique users were attacked by Trojan-Banker.AndroidOS.Asacub malware application.
- Trojans make up 51.45% of all malware.
- 7 out of every 10 malware payloads were ransomware.

## IV. TRENDS CHANGING CYBER SECURITY

Here mentioned below are some of the trends that are having a huge impact on cyber security.

### 1. Cloud Computing and its services:

People usually take things literally when it comes to technology. Having your data on the cloud doesn't mean literally in clouds. Cloud Computing is nothing but leasing resources from a cloud service provider on a pay-as-you-go basis such as storage, hardware, network, servers, infrastructure etc. over the internet.

**2. APT's and Targeted Attacks:**

APT (Advanced Persistent Threat) is a whole new level of cybercrime ware. As attackers grow bolder and employ more vague techniques, network security must integrate with other security services in order to detect attacks. Hence one must improve our security techniques in order to prevent more threats coming in the future.

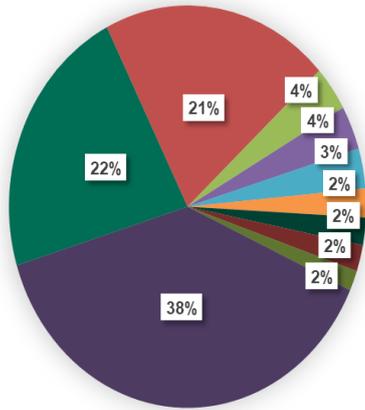


Fig.2. Financial CyberThreats

**3. Mobile Networks:**

Today we are able to connect to anyone in any part of the world. But for these mobile networks security is a very big concern. These days firewalls and other security measures are becoming porous as people are using devices such as tablets, phones, PC's etc all of which again require extra securities apart from those present in the applications used. We must always think about the security issues of these mobile networks. Further mobile networks are highly prone to these cybercrimes a lot of care must be taken in case of their security issues.

**4. IPV6: Internet Protocol:**

IPv6 is the latest version of the Internet Protocol, which identifies devices across the internet so they can be located. Every device that uses the internet is identified through its own IP address in order for internet communication to work. Hence it is always better to switch to IPv6 as soon as possible in order to reduce the risks regarding cyber-crime.

**5. Web Servers:**

The threat of attacks on web applications to extract data or to distribute malicious code persists. Cyber criminals distribute their malicious code via legitimate web servers they've compromised. But data-stealing attacks, many of

which get the attention of media, are also a big threat. Now, we need a greater emphasis on protecting web servers and web applications. Web servers are especially the best platform for these cyber criminals to steal the data. Hence one must always use a safer browser especially during important transactions in order not to fall as a prey for these crimes.

**V. ROLE OF SOCIAL MEDIA IN CYBER SECURITY**

Social media has become a way of life for many people. But, as with anything else online, it's important to be aware of the risks. We use it to keep in touch, plan events, share our photos and comment on current events. It's replaced email and phone calls for a lot of us. But, as with anything else online, it's important to be aware of the risks. Check out our advice on how you can keep your social media accounts safe and secure.

One of the great things about social media is staying connected wherever you are. However, it's important to think about where and how you log in to your accounts. Use bookmarks or favourites to access social media sites, or type the URLs into your browser. Don't access your accounts through links that someone else has sent you, or links on other websites. These could lead you to fake sites, allowing attackers to access your personal details or even install malware on your device.

- Make sure your browser or website doesn't store or remember your login details on shared or public devices, like library computers or shared tablets. If you do, and someone else uses that device, they'll get access to your social media accounts too.
- Be cautious of logging in to your social media accounts using a hotspot or free WiFi-if you're logging on at a cafe, for example. These networks are 'untrusted'. That means it's possible that others could see what you're doing when you use them.
- If you access your social media accounts through an app on your phone or your tablet, make sure you lock it when you're not using it.

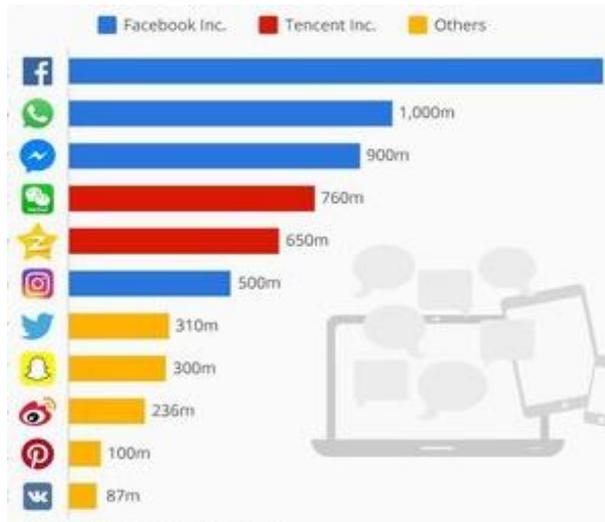


Fig.3.Social Media Security Risks

VI. ADVANTAGES

- **Connectivity:** The first and main advantage of the social media is connectivity. People from anywhere can connect with anyone. Regardless of the location and religion. The beauty of social media is that you can connect with anyone to learn and share your thoughts.
- **Education** – Social media has a lot of benefits for the students and teachers. It is very easy to educate from others who are experts and professionals via the social media. You can follow anyone to learn from him/her and enhance your knowledge about any field. Regardless of your location and education background you can educate yourself, without paying for it.
- **Helps Govt and Agencies Fight Crime-** It is also one of the advantages of the social media that it helps Governments and Security Agencies to spy and catch criminals to fight crime.

VII. DISADVANTAGES

- **Cyberbullying** – According to a report published by PewCenter.org most of the children have become victims of the cyberbullying over the past. Since anyone can create a fake account and do anything without being traced, it has become quite easy for anyone to bully on the Internet. Threats, intimidation messages and rumors can be sent to the masses to create discomfort and chaos in the society.
- **Security Issues** – Now a day’s security agencies have access to people personal accounts. Which makes the privacy almost compromised. We never know when we are visited by any investigation officer regarding any issue that you mistakenly or unknowingly discussed over the internet.
- **Fraud and Scams** – Several examples are available where individuals have scammed and

commit fraud through the social media. For example, this list contains the 5 social media scams that are done all the time.

VIII. CYBER SECURITY TECHNIQUES

a) **Malware scanners:** It is the process of deep scanning the computer to prevent malware infection. It is accomplished using an antimalware software. This process involves multiple tools and techniques to identify malware. To better understand what is malware scan and antimalware, let's discuss what they are created for exactly.

b) **Access control and password security** :Theconcept of user name and password has been fundamental way of protecting our information. This may be one of the first measures regarding cyber security.

c) **Anti-virus Software:** It is also known as anti-malware, is a computer program used to prevent, detect, and remove malware. ... However, with the proliferation of other kinds of malware, antivirus software started to provide protection from other computer threats.

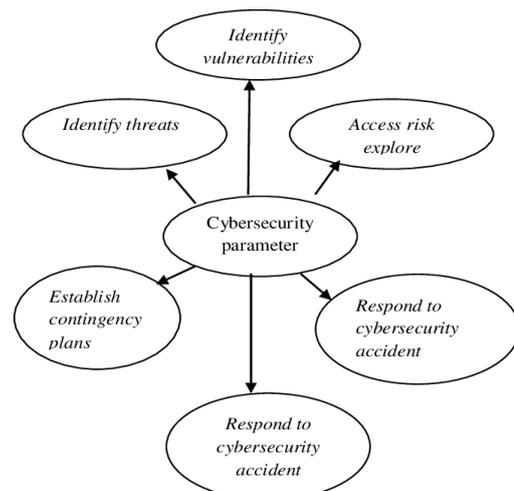


Fig.4.Techniques

IX. CYBER ETHICS

It is the philosophic study of ethics pertaining to computers, encompassing user behavior and what computers are programmed to do, and how this affects individuals and society.

- Do not use rude or offensive language.
- Don't be a bully on the Internet.
- Do not call people names, lie about them, send embarrassing pictures of them, or do anything else to try to hurt them.
- Do not copy information from the Internet and claim it as yours. That is called plagiarism.

- Adhere to copyright restrictions when downloading material including software, games, movies, or music from the Internet.
- Do not break into someone else's computer.
- Do not use someone else's password.
- Do not attempt to infect or in any way try to make someone else's computer unusable.

#### X. CONCLUSION

There is a vast difference between the technology we used in the older days and the modern days. The latest and disruptive technologies, along with the new cyber tools and threats that come to light each day, are challenging organizations with not only how they secure their infrastructure, but how they require new platforms and intelligence to do so. There is no perfect solution for cybercrimes but

we should try our level best to minimize them in order to have a safe and secure future in cyber space.

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# Cyber security: Redefined

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## Abstract

Whenever we think about Cyber Security the first thing that comes in our mind is Cyber Crimes or Cyber Threats and there is significant amount of increase in such crimes due to increased usage of technology. Government and various Companies are taking strict measures in order to prevent such crimes. This Report focuses on a most efficient method to aware masses about Cyber Security and also suggest some genuine solution to avoid cyber-attacks and data breaches. Cyber Security is a major concern to many companies. This paper also focuses on challenges faced by Cyber Security professionals because of latest technologies. It also deals with latest Cyber Security techniques, ethics, problems faced by the Cyber Security.

**Keywords:** Cyber Security, National Security, Cyber Crimes, Cyber Attacks, Cyber Threats, Crypto-virology, Virus.

## I. INTRODUCTION

Cyber Security is protection for various components in computer & computing systems. It includes both software, hardware and semi-software components. Also, Cyber Security concerns at protection of data flowing through systems in any forms (video, audio, documents), computerized system which include computers, servers, laptops, data centers, information of individuals or group of individuals. Besides medical, government or security agencies may possess data which can potentially compromise National Security if stealed. Hence, Cyber Security is very essential for such organization. In this 21<sup>st</sup> Century basic needs of human have changed and there is addition of new form of need called 'Data' which should be protected at any cost. Cyber Security in very dynamic field with ever changing technologies there is also creation of new avenues for Cyber Attacks. Also, it is evident fact that through latest securities there are significant security breaches all over world. Security breaches which are large & strong enough often get publicized and small organization are at risk of viruses and phishing attacks.

Incidents	Jan – June 2012	Jan – June 2013	% Increase / (Decrease)
Fraud	2439	2490	2
Intrusion	2203	1726	(22)
Spam	291	614	111
Malicious Code	353	442	25
Cyber Harassment	173	233	35
Content Related	10	42	320
Intrusion Attempts	55	24	(56)
Denial of Services	12	10	(17)
Vulnerability reports	45	11	(76)
Total	5581	5592	

The above statistics of Cyber Security incidents reported by Cyber999 in Malaysia for January – June year 2012 & 2013 clearly state that there is a significant increase in cybercrimes also there is increasing count of measures to tackle them or simply prevent them. According to the survey of U.S. technology, healthcare department and Silicon Valley Bank states that many of the business and their owners believe that if a large-scale cyber-attack occurs on them it will largely affect their data and business continuity. Hence, there is an increase in companies investing in means to strengthen their cyber security for their devices and network resulting in creation of safer online environment for businesses and surprisingly these business account for 98% of market. Hence creating a safer online environment for overall market.

In year 1999, there was release of virus named Melissa. Melissa virus mainly target Microsoft Word and Microsoft Outlook based systems due to which there was significant increase in Network traffic. Melissa virus infected computers via email, the email was titled "Important Message from", and name of current username.

When user clicks the message, it stated that: "Here's what you asked for". Don't open or show to anyone else ;)." The email was attached with document named list.doc which contained list pornographic sites and respective logins for same. As user open the document the email would self-Mail to first 50 users in contact lists and then disable multiple safeguarding features on Microsoft Word and

The above virus used simple technique to lure users and create havoc in systems world-wide. This attacks significantly lead to emphasis the need for Cyber Security also, it underlined the fact that "Cyber Attacks need not lure user with complex techniques sometime a simple email can lead to world-wide havoc".

### **Types of Cyber Security Threats**

Cyber Security is very dynamic field where technologies change very quickly with increase in development of new technologies. There is need to keep up with ways to avoid security threats to technology which is quite difficult task because new technologies brings new security threats. And here are some of security threats in modern world: -

### **Malware**

Malware is intentionally developed software which results in damaging computer, server, computer viruses, worms, Trojan horses, adware's, ransom ware etc. Malware are also responsible for working against the interests and likes & dislikes of computer users. Malware are widely used by various individuals, organization, corporate or even government to have access over private information of individuals or companies. Malware can also be used to disrupt general working of companies by bringing their network down.

In year 2005, a scandal was unearthed regarding a software developed by Sony to avoid copying of contents. But whenever the user used to insert Sony compact disks in their system the disk would silently install a rootkit into system when prevented in copying music & avoid illegal sharing of music. But it also resulted in Sony Music gaining information about user's listening habits resulting in illegal access

Ransomware is typical type of Malware where attackers encrypt the victim's system files and demand huge amount to decrypt & unlock the information. This type malware is typically designed to encrypt victim's private & system information and demand Ransome for decryption. This type of attack is generally well planned and executed to avoid traceability. Ransomware is technically a type crypto

- virology. A well planned and advanced Ransomware is known as crypto viral extortion. This involves attacker using more advanced code which results in encrypting files so well that it is almost impossible to decrypt & access information without decryption key. Also, such attacks involve Ransome paid via Bitcoins or any other crypto currency as there is no trace of transaction resulting in tracing and punishing attacker is difficult. On such as example is

### **Phishing**

This is another type of basic cyber-attack which involves attacker sending a fraud email which resembles from trusted sources. Once, the email is opened it ask user to register or login with their

WannaCry Ransomware attack of may year 2017 was such a huge blow to Cyber world. This was executed by an exploit developed by U.S. National Security Agency which stolen by a hackers group one year prior to attack. This attacks majorly focused Microsoft Windows operating system and encrypted their data and demanded Ransome for decryption. Microsoft previously released patches to recover this exploit. Also, the attack majorly targeted system which were not installed with security patches sent by Microsoft. Around 2,00,000 computers were infected across 150 countries with damages ranging from hundred million dollars to billion dollars.

credentials and personal information. Phishing steals username logins and credit card detail and exploit user's financial information. Phishing attacks generally users fake banking emails asking them to provide their credit card & debit card details and exploit user's financial information. Phishing is form of social engineering. Phishing is most common technique used by attackers to target individual organization, corporate companies and high-profile individuals. Only way to avoid phishing by self-awareness and vigilance towards e-mails.

### **Modern Technologies Developed to Avoid Cyber Attacks.**

Cyber Security is very important in today's world. It is very important to protect private & confidential data from hackers and cyber criminals. First and the foremost technique to avoid and prevent cyber security breaches is to educate ourselves about potential threats regarding our sensitive private information. Cyber Attacks not only pose grave threat to individuals but also to governments. It is very important to run Cyber Awareness program to educate among masses to avoid cyber-attacks. Cyber Attacks don't work unless you allow them. Negligence towards security is the main reason for majority cyber-attacks. It is harsh truth that majority of countries are interested in developing high-speed

cyber infrastructure but are least bothered about security for the same infrastructure. The main reason behind cyber-attacks is to exploit information and valuable resources and as we known we cannot physically see cyber-attack or feel it. It is important to be aware of threats of cyberspace. Cyber-attacks don't leave any foot prints physically hence, it is impossible for attacker to access victim's system physically therefore, traps are placed by attackers and majority victim's full for the trap. These traps are in form of pirated software music's, audio, videos or document. Hence, it very important for users to educate themselves about files, systems, websites etc. National Cyber Security Agencies are working all over world to educate its population about cyber-attacks, ways to prevent cyber-attacks and basic information about computers. So, it is very important to spread awareness about computers and possible threats. Secondly, it is very important to be vigilant and aware about network the user, organization or group of individuals use because a targeted cyber-attacks largely depend upon the network we use; more the individual is aware about network security less the chances of being targeted cyber-attack can result in bring down nations because majority computer viruses have spread through internet in the country. Whereas, in such attack's individuals with low maintenance of their devices suffer huge losses. Although, systems with high security maintenance also suffer because there are no warning signs of such type of attacks. But we can reduce amount of damage by four measures. But these measures can only work for organizations or governments because these measures are pretty economical at higher side.

1. There, should be persistent efforts to find vulnerability of networked systems and should adopt various method to remediation.
2. Create a multilayered defense mechanism and build a strong & resilient network to serve as remedy for serious vulnerabilities.
3. Invest in various research and development for building strong network technologies and remedial defense mechanism.
4. Often conduct network security protection exercises to potential avoid attacks.

Thirdly, it is very essential to be vigilant about the hardware and overall infrastructure in an organization or individual. Hardware maintenance plays a very important role in preventing cyber-attacks. An updated hardware helps user to work efficiently and are immune to latest cyber-attacks because of its updated drivers and software. And majority of cyber criminals target the organization by knowing the status of hardware because if the network hardware WannaCry Ransomware attack of may year 2017 was such a huge blow to Cyber world. This was executed by an exploit developed by U.S. National Security Agency which stolen by a hackers group one year prior to attack. This attacks

majorly focused Microsoft Windows operating system and encrypted their data and demanded Ransome for decryption. Microsoft previously released patches to recover this exploit. Also, the attack majorly targeted system which were not installed with security patches sent by Microsoft. Around 2,00,000 computers were infected across 150 countries with damages ranging from hundred million dollars to billion dollars.

## II. Conclusion

So, coming to a conclusion the best way to prevent cyber-attacks is to be vigilant about computer system and mobile system because majority of cyber-attacks cause because of non-vigilance of its user's. Also, it is very evident that a single system can break down complete Cyber Space of an individual organization or Country. Also, as Government it is very essential to educate their people about various types of Cyber Attacks also various measures to prevent those attacks. Unfortunately, majority of country and their people are least interested about Cyber Attacks, on the other hand Global Leaders are predicting that Next World War will not be fought with Guns or any such ammunitions, it would be fought in a very enclosed space known as Cyber Space where there are no limits. Also, many of Cyber Criminals target single system in an organization and then single system is responsible for creating major havoc. Various countries in terms of Data, Assets, Valuable Resources and most importantly Confidential Information are being stole just by targeting one of the systems. So, it is very important to keep a look on each and every system in the organization and every employee or user should be known about such attacks to prevent it. As the Criminals Find Easiest System to target and create a havoc. So, it is very important for users to know about their system and be vigilant about their server.

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