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Case Study

Objective:-

To understand Future Emerging computing [industry 4.0] and need of Society Implementation applications.

Areas   Hospitality Agriculture Industry Real Estate Education etc.

Prepare 2 to 3 pages report for each case study

CASE STUDY:

1. To study Artificial Intelligence its needs & Applications in various domain.

1.1 Artificial Intelligence

John McCarthy is the father of Artificial Intelligence, According to them AI is "The science and engineering of making intelligent machines, especially intelligent computer programs".

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."

Artificial Intelligence is a way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think.

AI is accomplished by studying how human brain thinks, and how humans learn, decide, and work while trying to solve a problem, and then using the outcomes of this study as a basis of developing intelligent software and systems.

Artificial intelligence (AI) has received increased attention in recent years. Innovation, made possible through the Internet, has brought AI closer to our everyday lives. These advances, alongside interest in the technology's potential socio-economic and ethical impacts, brings AI to the forefront of many contemporary debates. Industry investments in AI are rapidly increasing , and governments are trying to understand what the technology could mean for their citizens.

The collection of "Big Data" and the expansion of the Internet of Things (IoT) , has made a perfect environment for new AI applications and services to grow. Applications based on AI are already visible in healthcare diagnostics, targeted treatment, transportation, public safety, service robots, education and entertainment, but will be applied in more fields in the coming years. Together with the Internet, AI changes the way we experience the world and has the potential to be a new engine for economic growth.
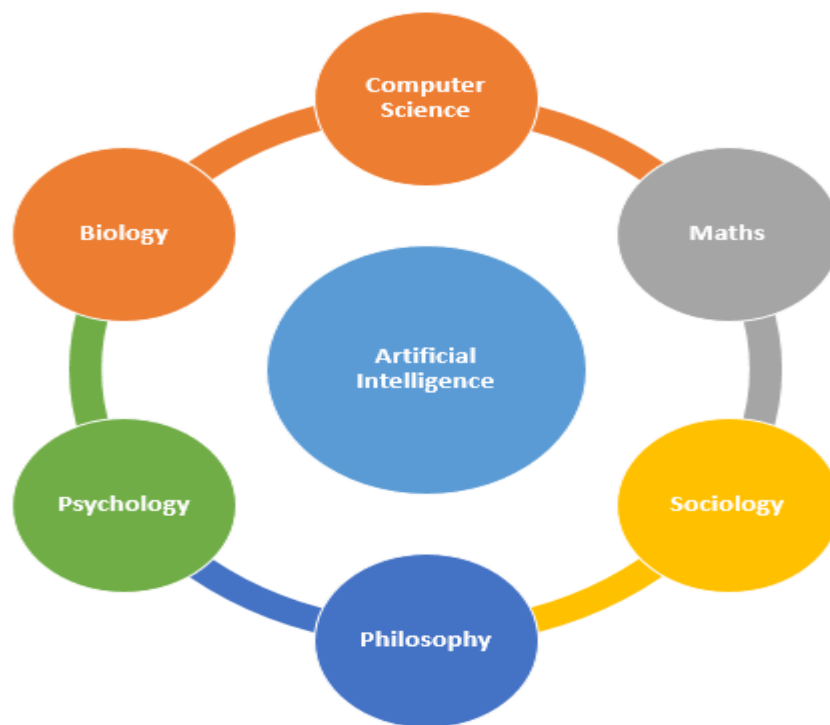

fig 1.1 Artificial Intelligence

1.2 Needs of Artificial Intelligence:

Artificial Intelligence is the simulation of the human process by machines (computer systems). These processes include the learning, reasoning, and self-correction.

We need Artificial Intelligence (AI) because the work that we need to do is increasing day-to-day. So it's a good idea to automate the routine work.

We are growing at huge rate, say it in terms of population, scripted knowledge, tasks etc. Increasing in scale also increase entropy in system, demanding huge number of tasks to be automated, and centralized. AI in simple words is implementing human senses in machines. Humans will surely benefit from UI. Though we are seeing automation of tasks is leading to job cutting, in long term it is going to turn out to be a major benefit.

AI can surely process all trivial tasks at huge pace compared to humans.Traffic Control, Automating Support, Automating Manufacturing, Fraud Detection, Imposing Laws without corruption etc. It has many good uses.

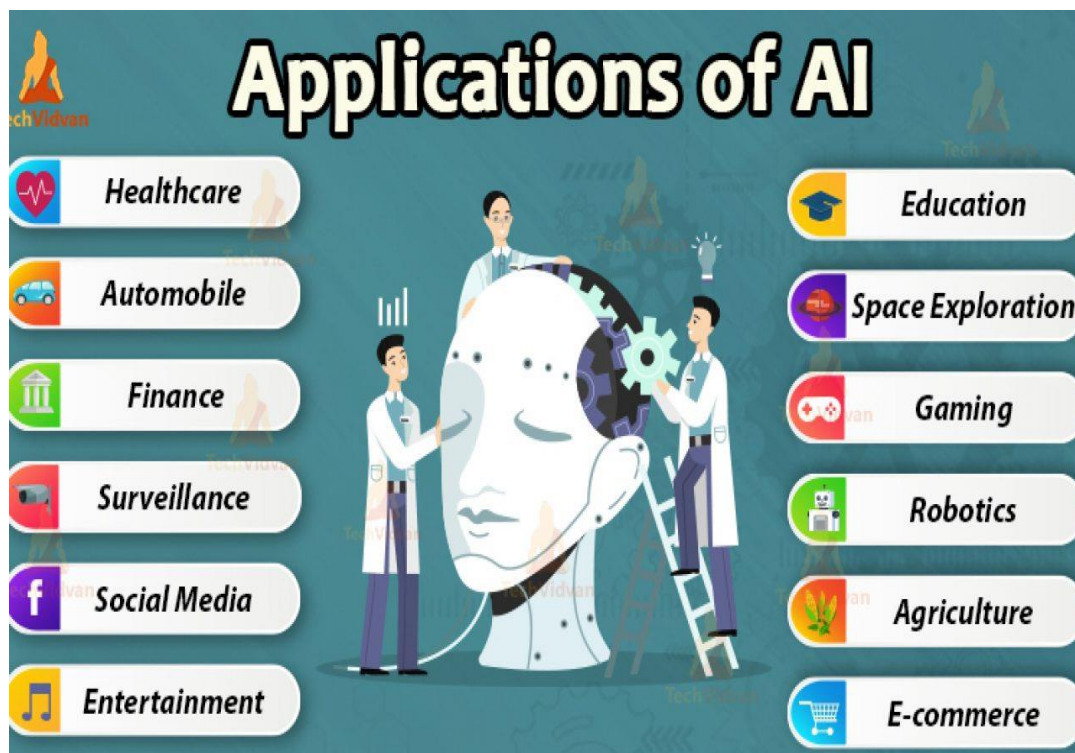## 1.3 Applications of Artificial Intelligence:

Fig 1.3 Applications of AI.

2. To study 3D Printing Technology its needs & Applications in various domain.

2.13D Printing Technology:

3D printing or additive manufacturing is a process of making three dimensional solid objects from a digital file.

The creation of a 3D printed object is achieved using additive processes. In an additive process an object is created by laying down successive layers of material until the object is created. Each of these layers can be seen as a thinly sliced horizontal cross-section of the eventual object.

3D printing is the opposite of subtractive manufacturing which is cutting out / hollowing out a piece of metal or plastic with for instance a milling machine.3D printing enables you to produce complex shapes using less material than traditional manufacturing methods.

In the 1980s, 3D printing techniques were considered suitable only for the production of functional or aesthetic prototypes, and a more appropriate term for it at the time was rapid prototyping.As of 2019, the precision, repeatability, and material range of 3D printing has increased to the point that some 3D printing processes are considered viable as an industrial-production technology, whereby the term *additive manufacturing* can be used synonymously with *3D printing*. One of the key advantages of 3D printing is the ability to produce very complex shapes or geometries that would be otherwise impossible to construct by hand, including hollow parts or parts with internal truss structures to reduce weight. Fused deposition modeling, or FDM, is the most common 3D printing process in use as of 2018.

There are many different branded 3D printing processes, that can be grouped into seven categories:

- Vat photopolymerization

- Material jetting

- Binder jetting

- Powder bed fusion

- Material extrusion

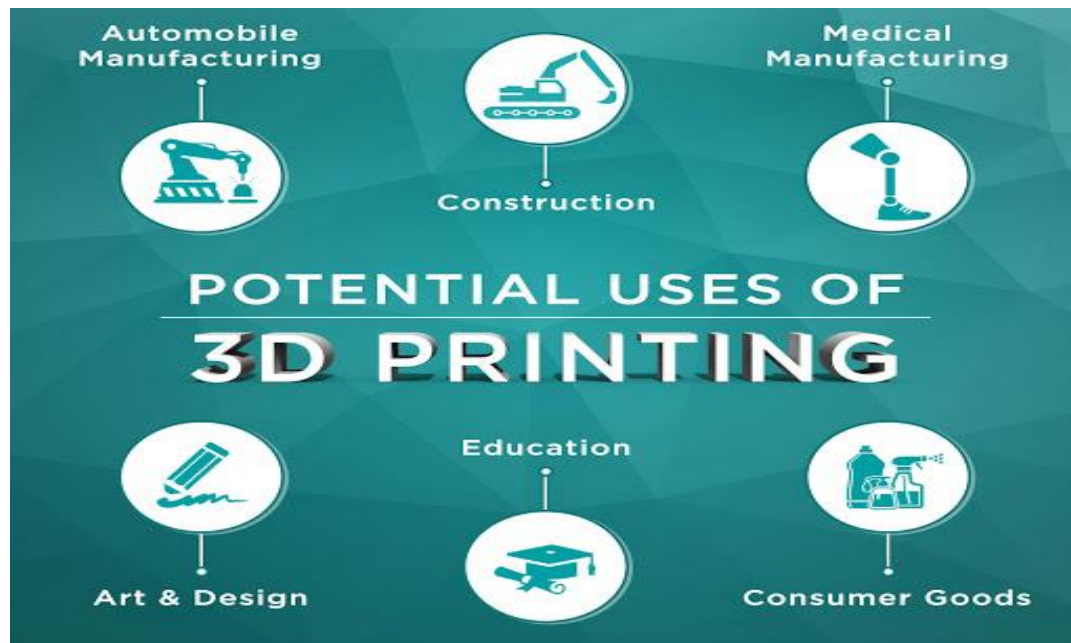- Directed energy deposition

- Sheet lamination

Fig 2.1 3D Printing Technology.

2.2 Needs of 3D Printing :

3D printing is inexpencive prodthetics,creating spare parts,rapid prototyping,creating personalized items and manufacturing with minimum waste.

The technology is useful and thanks to its widewspread availability as well as further development will be even more useful in the future.

2.3 3D Printing Applications:

There are top five 3D Printing Applications are as follows:

- **Education:** More and more schools are incorporating 3D printing into their curriculum as tools to better prepare kids for the future.
  Most universities have at least one (if not several) 3D printers for students to use for classes or their own projects.

- **Medicine:** In recent years, there's been a lot of 3D printing applications to the world of medicine, from bioprinting and surgery preparation to prosthetics. This field is still under a lot of research, so it'll be exciting to see where it goes in the future!

- **Construction:** Concrete 3D printing has been in development for years as a fast and cheaper way to build buildings.

- **Prototyping and Manufacturing:** An injection-molded prototype might cost hundreds of thousands and take weeks to make a single mold. That's not good if you're trying to iterate and improve on each design. Invest in a 3D printer, however, and your prototype can be sitting on your desk in hours, at a fraction of the cost.

- **Art and Jewelry:** One unexpected application of 3D printing is in the fashion industry. 3D printed jewelry has become a popular niche for those searching for a unique look.

3. To Study Internet of Things its needs & Applications in various domain.

3.1 Internet of Things:
The Internet of things (IoT) is a system of interrelated computing devices, mechanical and digital machines provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

The Internet of Things, refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data. Thanks to the arrival of super-cheap computer chips and the ubiquity of wireless networks, it's possible to turn anything, from something as small as a pill to something as big as an aeroplane, into a part of the IoT. Connecting up all these different objects and adding sensors to them adds a level of digital intelligence to devices that would be otherwise dumb, enabling them to communicate real-time data without involving a human being. The Internet of Things is making the fabric of the world around us more smarter and more responsive, merging the digital and physical universes.
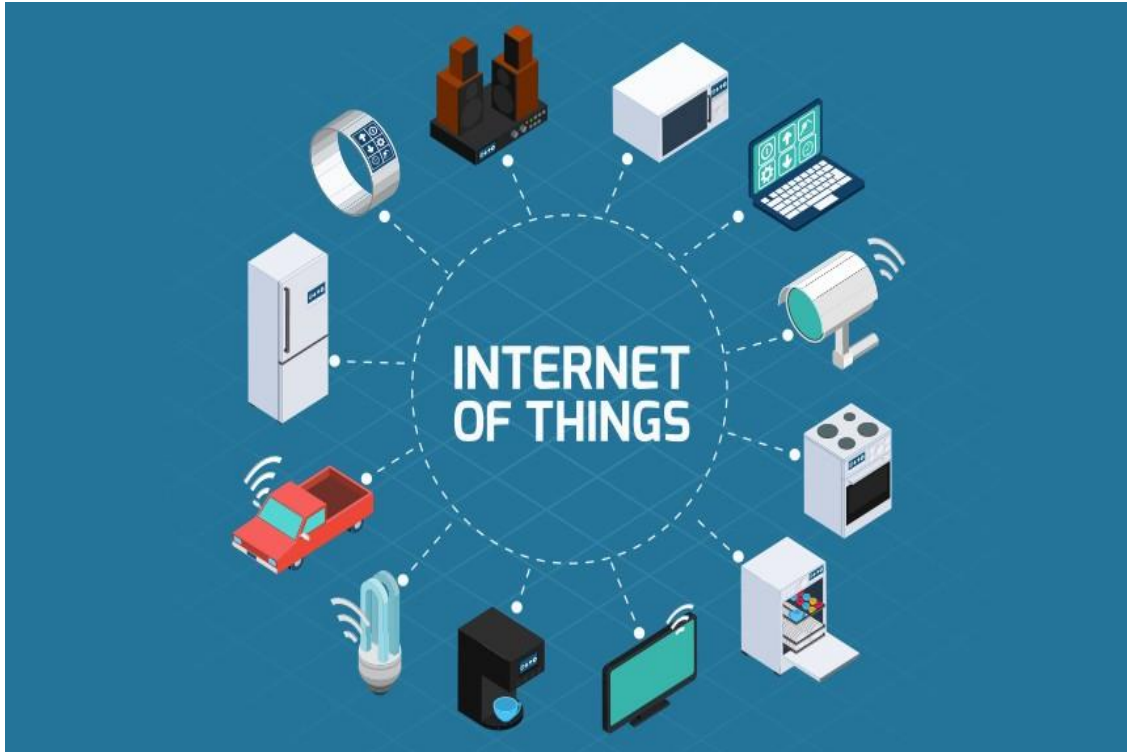
Fig 3.1 Internet of things.

3.2 Needs of IoT:

The internet of things helps people live and work smarter, as well as gain complete control over their lives. In addition to offering smart devices to automate homes, IoT is essential to business. IoT provides businesses with a real-time look into how their systems really work, delivering insights into everything from the performance of machines to supply chain and logistics operations.

IoT enables companies to automate processes and reduce labor costs. It also cuts down on waste and improves service delivery, making it less expensive to manufacture and deliver goods, as well as offering transparency into customer transactions.

As such, IoT is one of the most important technologies of everyday life, and it will continue to pick up steam as more businesses realize the potential of connected devices to keep them competitive.
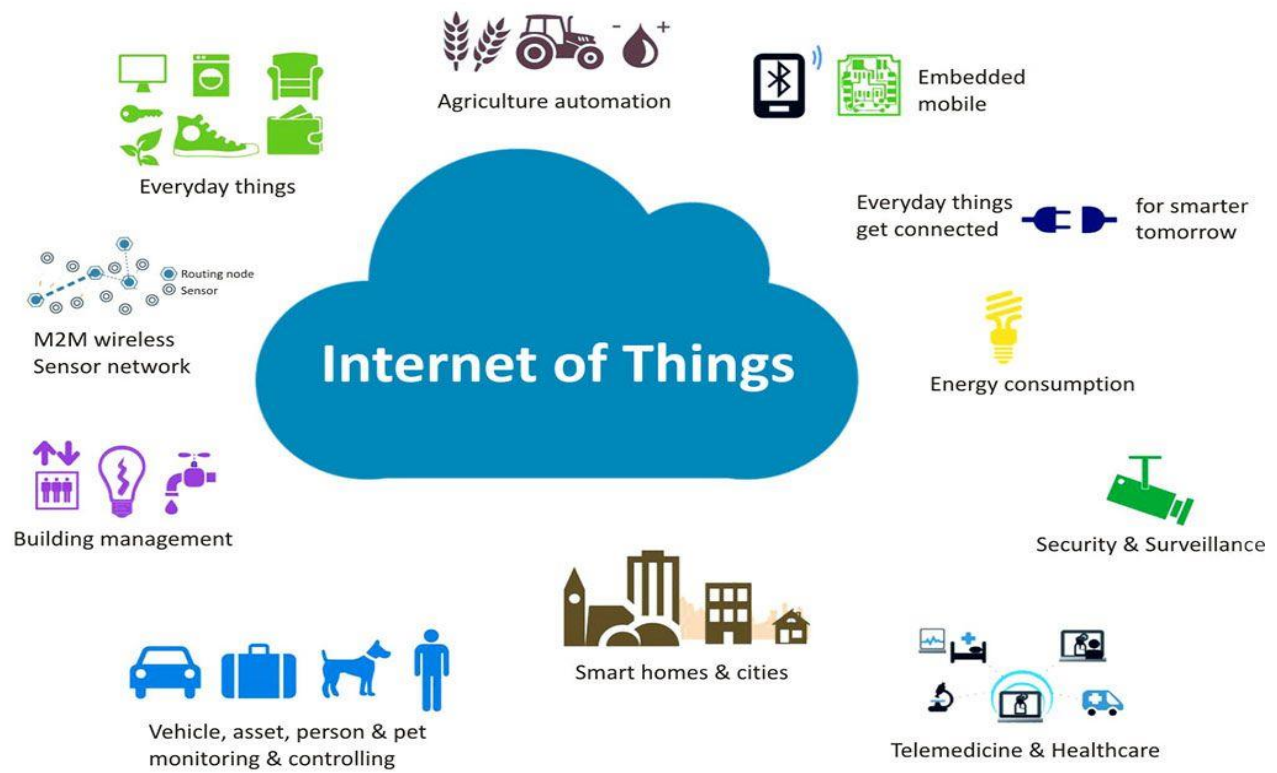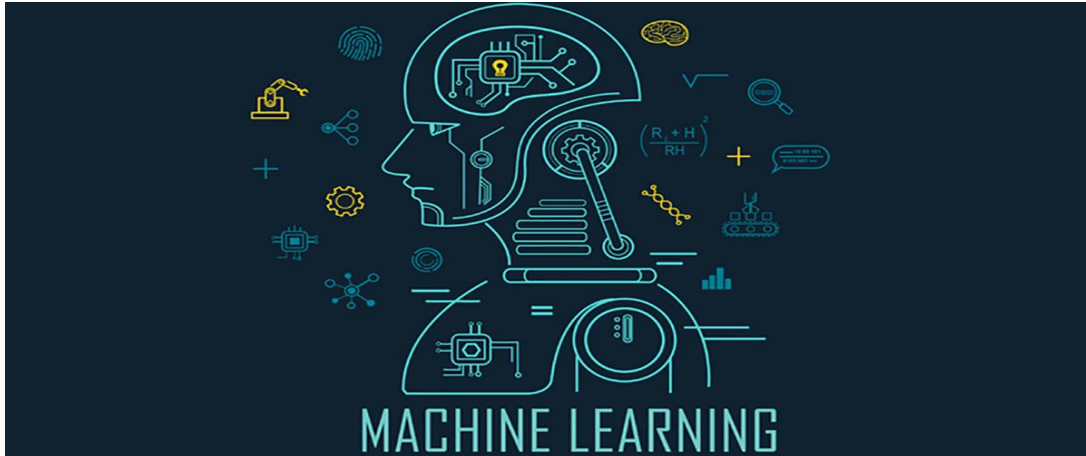
3.3 Applications of IoT:

Fig 3.3 Application of IoT

4 To Study Machine Learning its needs & Application in various domain.

4.1 Machine Learning:

The term Machine Learning was coined by Arthur Samuel in 1959, an American pioneer in the field of computer gaming and artificial intelligence and stated that "it gives computers the ability to learn without being explicitly programmed".

Machine learning is the science of getting computers to act without being explicitly programmed. In the past decade, machine learning has given us self-driving cars, practical speech recognition, effective web search, and a vastly improved understanding of the human genome.

Machine Learning evolved from computer science that primarily studies the design of algorithms that can learn from experience. To learn, they need data that has certain attributes based on which the algorithms try to find some meaningful predictive patterns. Majorly, ML tasks can be categorized as concept learning, clustering, predictive modeling, etc. The ultimate goal of ML algorithms is to be able to take decisions without any human intervention correctly. Predicting the stocks or weather are a couple of applications of machine learning algorithms.

There are various machine learning algorithms like Decision trees, Naive Bayes, Random forest, Support vector machine, K-nearest neighbor, K-means clustering, etc.

A machine can learn to solve a problem by following any one of the following three approaches. These are the ways in which a machine can learn:

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning

4.2 Needs of Machine Learning:

Data is the lifeblood of all business. Data-driven dicisions increasingly make the difference between keeping up with competition or falling further behind. Machine learning can be the key to unlocking the value of corporate and customer data and enacting the dicisions that keep a company ahead of the competition.

Simply put , machine learning allows the user to feed a computer algorithem and immence amount of data and have the computer analyze and make data-driven recommendations and decisions based on the input data.

Training is the most important part of the machine learning. Choose your features and hiper parameters carefully. Machine don't take decisions , people do. Data cleaning is the most important part of the machine learning .

Also, the goal of mechanics is to put up the production and earning sales with less time and expences. Machine are necessary in our life, because , all society needs them. Sometimes, the machine are dangerous and replaced labour but without these we cannot live; for this reason a mechanical engineer is very important.
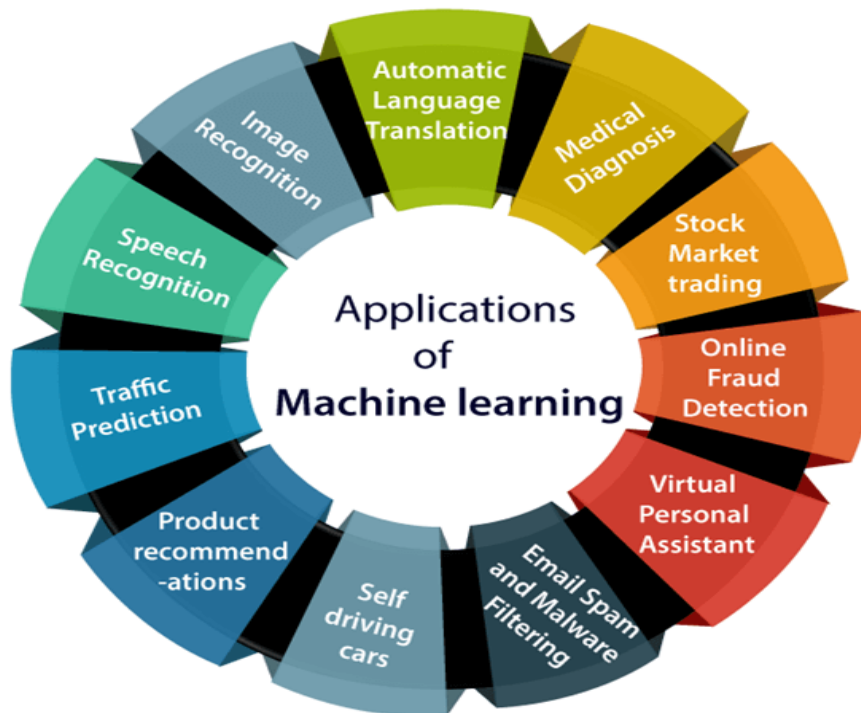
4.3 Applications of Machine Learning:

Fig 4.3 Applications of Machine Learning

5   To Study Data Science its needs & Applications in various domain.

5.1 Data Science:

Data science continues to evolve as one of the most promising and in-demand career paths for skilled professionals. Today, successful data professionals understand that they must advance past the traditional skills of analyzing large amounts of data, data mining, and programming skills. In order to uncover useful intelligence for their organizations, data scientists must master the full spectrum of the data science life cycle and possess a level of flexibility and understanding to maximize returns at each phase of the process.

Data science is an inter-disciplinary field that uses scientific methods, processes, algorithms and systems to extract knowledge and insights from many structural and unstructured data.Data science is related to data mining, machine learning and big data.

Data science is a "concept to unify statistics, data analysis, machine learning, domain knowledge and their related methods" in order to "understand and analyze actual phenomena" with data. It uses techniques and theories drawn from many fields within the context of mathematics, statistics, computer science, domain knowledge and information science. Turing award winner Jim Gray imagined data science as a "fourth paradigm" of science (empirical, theoretical, computational and now data-driven) and asserted that "everything about science is changing because of the impact of information technology" and the data deluge.

5.2 Needs of Data Science:

Companies need to use data to run and grow their everyday business. The fundamental goal of data science is to help companies make quicker and better decisions, which can take them to the top of their market, or at least – especially in the toughest red oceans – be a matter of long-term survival.

Data is one of the important features of every organization because it helps business leaders to make decisions based on facts, statistical numbers and trends. ... Data science is an extension of various data analysis fields such as data mining, statistics, predictive analysis and many more.

5.2 Applications of Data Science:

Some applications that build upon the concepts of Data Science, exploring various domains such as the following:

- Fraud and Risk Detection
- Healthcare
- Internet Search
- Targeted Advertising
- Website Recommendations
- Advanced Image Recognition
- Speech Recognition
- Airline Route Planning
- Gaming
- Augmented Reality

6 To Study Data Analytics its needs & Applications in various domain.

6.1 Data Analytics:

Data analysis is a process of inspecting, cleansing, transforming and modeling data with the goal of discovering useful information, informing conclusions and supporting decision-making. Data analysis has multiple facets and approaches, encompassing diverse techniques under a variety of names, and is used in different business, science, and social science domains. In today's business world, data analysis plays a role in making decisions more scientific and helping businesses operate more effectively.

Whenever we take any decision in our day-to-day life is by thinking about what happened last time or what will happen by choosing that particular decision. This is nothing but analyzing our past or future and making decisions based on it. For that, we gather memories of our past or dreams of our future. So that is nothing but data analysis. Now same thing analyst does for business purposes, is called Data Analysis.

6.2 Needs of Data Analytics:

Data analytics is important because it helps businesses optimize their performances. Implementing it into the business model means companies can help reduce costs by identifying more efficient ways of doing business and by storing large amounts of data.

The main role of data analysts in an organization is to help decision-makers by identifying interesting and important patterns in data and providing quick answers buried in tons of tables, graphs, and log files.

Data is core to the business and has always been core to it. There is a saying, you can't improve what you can't measure. so, businesses have been trying to setup metrics for their core business parameters. Traditionally most of this data was structured data, stored in sort of relational databases in the controlled business environment. Businesses were clearly governed by the reports based on this structured data.

With the advancements of new technologies, like social media evolution, mobile technologies, big data storage and processing, cloud technology and machine learning — Data got a completely new dimension. Data came outside, or at least the presence was felt outside of its four boundaries of the enterprises. Now, the data is present everywhere. Every second, someone, somewhere is collecting a lot of data about us. Every action is producing some data. Lot of this data is unstructured. There is a huge volume of this data, there is variety in this data and it comes in burst.

6.3 Applications of Data Analytics:

Some of the different data analytics applications that are currently being used in several organizations across the globe are:

- Security
- Transportation
- Risk detection
- Risk Management
- Delivery
- Fast internet allocation
- Reasonable Expenditure
- Interaction with customers
- Planning of cities
- Healthcare

7   To Study Blockchain Technology its needs & Applications in various domain.

7.1 Blockchain Technology:

A blockchain is, in the simplest of terms, a time-stamped series of immutable records of data that is managed by a cluster of computers not owned by any single entity. Each of these blocks of data (i.e. block) is secured and bound to each other using cryptographic principles (i.e. chain).

So, what is so special about it and why are we saying that it has industry-disrupting capabilities?

The blockchain network has no central authority — it is the very definition of a democratized system. Since it is a shared and immutable ledger, the information in it is open for anyone and everyone to see. Hence, anything that is built on the blockchain is by its very nature transparent and everyone involved is accountable for their actions.

"Blocks" on the blockchain are made up of digital pieces of information. Specifically, they have three parts:

1. Blocks store information about transactions like the date, time, and dollar amount of your most recent purchase from Amazon. (NOTE: This Amazon example is for illustrative purchases; Amazon retail does not work on a blockchain principle as of this writing)
2. Blocks store information about who is participating in transactions. A block for your splurge purchase from Amazon would record your name along with Amazon.com, Inc. (AMZN). Instead of using your actual name, your purchase is recorded without any identifying information using a unique "digital signature," sort of like a username.
3. Blocks store information that distinguishes them from other blocks. Much like you and I have names to distinguish us from one another, each block stores a unique code called a "hash" that allows us to tell it apart from every other block. Hashes are cryptographic codes created by special algorithms. Let's say you made your splurge purchase on Amazon, but while it's in transit, you decide you just can't resist and need a second one. Even though the details of your new transaction would look nearly identical to your earlier purchase, we can still tell the blocks apart because of their unique codes.

7.2 Needs of Blockchain Technology:

Blockchain is a better, safer way to record activity and keep data fresh, while maintaining a record of its history. The data can't be corrupted by anyone or accidentally deleted, and you benefit from both a historical trail of data, plus an instantly up-to-date record.

Blockchain can also give people a digital identity, which is portable and can prove who they are, removing the need for, say, a passport or social security number, which can be forged or tampered with as we've seen with many cases of identity theft.

By spreading its operations across a network of computers, blockchain allows Bitcoin and other cryptocurrencies to operate without the need for a central authority. This not only reduces risk but also eliminates many of the processing and transaction fees.

7.3 Applications of Blockchain Technology:

There are following some Applications of Blockchain Technology:

1. **Banking:**

In Banking it is used to avoid risk of payment losses involved in transactions by adopting secure distributed ledger platform. Also reduces transactions fee across cross-borders, corporate payments and remittances.

2. **Healthcare**:

In this case it Helps to prioritize patient health at all costs without compromising the quality of the health care service.

Establishes a secure chain of network to handle patient records, consent forms, billings and public health monitoring.

3. **Data Sharing:**

Cryptocurrency IOTA launched a beta version of its Data Marketplace in November, demonstrating that blockchain could be used as a marketplace to share or sell unused data. Since most enterprise data goes unused, blockchain could act as an intermediary to store and move this data to improve a host of industries. While still in its early stages, IOTA has more than 35 brand-name participants (with Microsoft being one) offering it feedback.

4. **Digital Voting:**

Blockchain offers the ability to vote digitally, but it's transparent enough that any regulators would be able to see if something were changed on the network. It combines the ease of digital voting with the immutability (i.e., unchanging nature) of blockchain to make your vote truly count.

5. **Food Safety:**

Yet another intriguing use for blockchain could be in tracing food from its origin to your plate. Since blockchain data is immutable, you'd be able to trace the transport of food products from

their origin to the supermarket. What's more, should there be a food-borne illness, blockchain would allow the source of the contaminant to be found considerably quicker than it can be now.

6. Weapons Tracking:

One of the hot-button topics on any news network at the moment is gun control and/or weapons accountability. Blockchain could create a transparent and unchanging registry network that allows law enforcement and the federal government to track gun or weapon ownership, as well as keep a record of weapons sold privately.

8 To Study of Cyber Security its needs & Applications in various domain.

8.1 Cyber Security:

Cyber security refers to the body of technologies, processes, and practices designed to protect networks, devices, programs, and data from attack, damage, or unauthorized access. Cyber security may also be referred to as information technology security.

Computer security, cybersecurity or information technology security (IT security) is the protection of computer systems and networks from the theft of or damage to their hardware, software, or electronic data, as well as from the disruption or misdirection of the services they provide.

The field is becoming more important due to increased reliance on computer systems, the Internet and wireless network standards such as Bluetooth and Wi-Fi, and due to the growth of "smart" devices, including smartphones, televisions, and the various devices that constitute the "Internet of things". Owing to its complexity, both in terms of politics and technology, cybersecurity is also one of the major challenges in the contemporary world.

8.2 Needs of Cyber Security:

For an effective cyber security, an organization needs to coordinate its efforts throughout its entire information system. Elements of cyber encompass all of the following:

- **Network security:** The process of protecting the network from unwanted users, attacks and intrusions.
- **Application security:** Apps require constant updates and testing to ensure these programs are secure from attacks.

- **Endpoint security:** Remote access is a necessary part of business, but can also be a weak point for data. Endpoint security is the process of protecting remote access to a company's network.

- **Data security:** Inside of networks and applications is data. Protecting company and customer information is a separate layer of security.

- **Identity management:** Essentially, this is a process of understanding the access every individual has in an organization.

- **Database and infrastructure security:** Everything in a network involves databases and physical equipment. Protecting these devices is equally important.

- **Cloud security:** Many files are in digital environments or "the cloud". Protecting data in a 100% online environment presents a large amount of challenges.

- **Mobile security:** Cell phones and tablets involve virtually every type of security challenge in and of themselves.

- **Disaster recovery/business continuity planning:** In the event of a breach, natural disaster or other event data must be protected and business must go on. For this, you'll need a plan.End-user education: Users may be employees accessing the network or customers logging on to a company app. Educating good habits (password changes, 2-factor authentication, etc.) is an important part of cybersecurity.

The most difficult challenge in cyber security is the ever-evolving nature of security risks themselves. Traditionally, organizations and the government have focused most of their cyber security resources on perimeter security to protect only their most crucial system components and defend against known treats. Today, this approach is insufficient, as the threats advance and change more quickly than organizations can keep up with. As a result, advisory organizations promote more proactive and adaptive approaches to cyber security. Similarly, the National Institute of Standards and Technology (NIST) issued guidelines in its risk assessment framework that recommend a shift toward continuous monitoring and real-time assessments, a data-focused approach to security as opposed to the traditional perimeter-based model.

8.3 Applications of Cyber Security in various domain:

- Business protection against malware, ransomware, phishing and social engineering.
- Protection for data and networks.
- Prevention of unauthorized users.
- Improves recovery time after a breach.
- Protection for end-users.
- Physical Ssecurity
- Legal, Regulation, Investigations and Compliance.
- Business Continuity and Disaster recovery.
- Operations Security.
- Access Control.
- Telecommunication and Network Security.
- Software Development.
- Crpytography.

9 To Study of Cloud computing its needs & Application in various domain.

9.1 Cloud Computing:

What is cloud computing, in simple terms?

Cloud computing is the delivery of on-demand computing services -- from applications to storage and processing power -- typically over the internet and on a pay-as-you-go basis.

How does cloud computing work?

Rather than owning their own computing infrastructure or data centers, companies can rent access to anything from applications to storage from a cloud service provider.

One benefit of using cloud computing services is that firms can avoid the upfront cost and complexity of owning and maintaining their own IT infrastructure, and instead simply pay for what they use, when they use it.

In turn, providers of cloud computing services can benefit from significant economies of scale by delivering the same services to a wide range of customers.

What cloud computing services are available?

Cloud computing services cover a vast range of options now, from the basics of storage, networking, and processing power through to natural language processing and artificial

intelligence as well as standard office applications. Pretty much any service that doesn't require you to be physically close to the computer hardware that you are using can now be delivered via the cloud.

Why is it called cloud computing?

A fundamental concept behind cloud computing is that the location of the service, and many of the details such as the hardware or operating system on which it is running, are largely irrelevant to the user. It's with this in mind that the metaphor of the cloud was borrowed from old telecoms network schematics, in which the public telephone network (and later the internet) was often represented as a cloud to denote that the just didn't matter -- it was just a cloud of stuff.

9.2 Needs of Cloud Computing:

Many reasons are there why we need cloud computing today! Here, not going into too deep, I have come up with few points that will be useful for giving reason: One of the significant reasons why huge number of little scale and large scale business parts from everywhere throughout the world are utilizing cloud today, is because of huge impact on cost saving. Yes, cloud computing has also changed significantly in hardware and software costs and the lack of other server resources.

- ➢ We can run all our workload data of applications and procedures online over the internet remotely instead of utilizing physical hardware and software
- ➢ Day to day issues related to server upkeep or installation of software/ hardware or whether it is renewal of license, each one of those variables are attempted by means of cloud computing service providers.
- ➢ With the help of cloud we can get to any information, applications whenever and wherever we need to, over the internet. 100 pre-configured applications can be installed and updated.
- ➢ Cloud not only handles data storage remotely but it also protects and recovers all crashed or loss data, so we don't need to stress about crashed or loss of data, it gives you high security.
- ➢ With the upcoming new technology in cloud computing, , numerous providers offers accessing and paying option with the ease of use, where clients can switch the applications effectively as indicated by the utilization and have pay just for the utilized resources. Ideally suitable for developing business, where the demand of bandwidth are high.
- ➢ If you want to learn cloud computing, Cloud computing training in Chandigarh best for you. Nowaday a technology era, Cloud computing play a essential role in various sector.
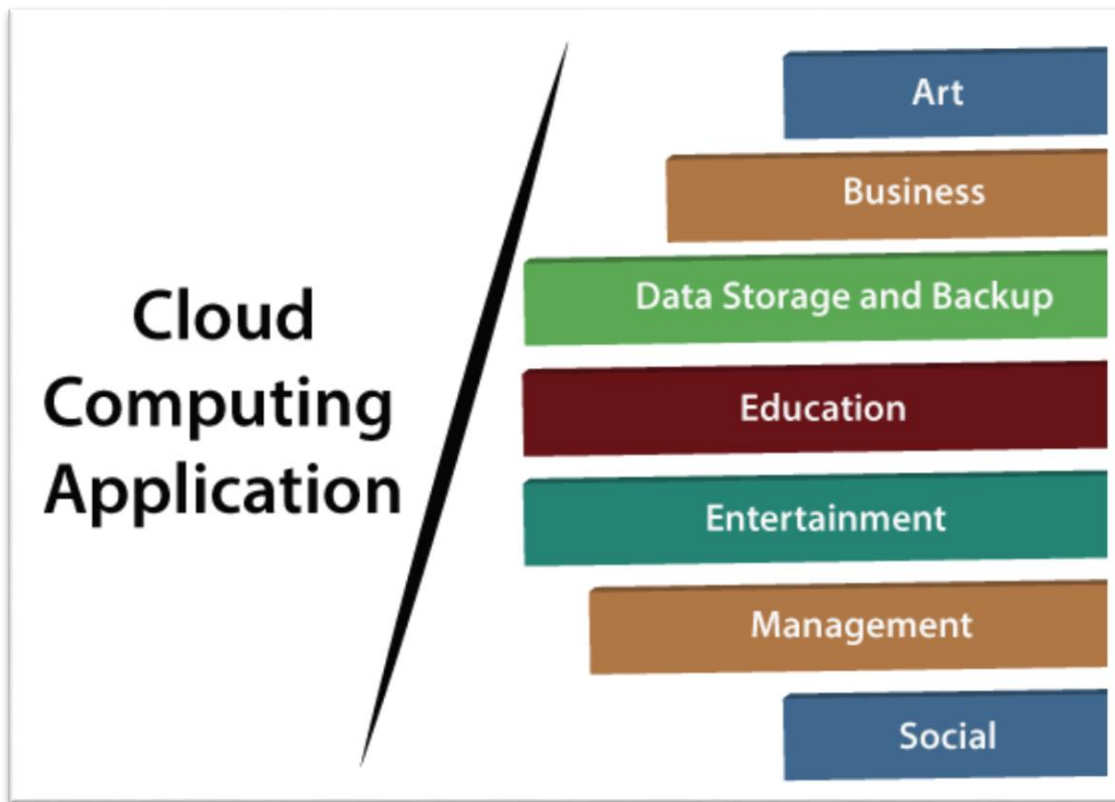
9.3 Applications of Cloud Computing:

fig 9.3 Application of Cloud Computing

10 To Study Industry 4.0 its needs & List Minimum 20 IT Product based & Service based Industry.

10.1 Industry 4.0:

Industry 4.0 is the digital transformation of manufacturing/production and related industries and value creation processes. Industry 4.0 is used interchangeably with the fourth industrial revolution and represents a new stage in the organization and control of the industrial value chain.

We're in the midst of a significant transformation regarding the way we produce products thanks to the digitization of manufacturing. This transition is so compelling that it is being called Industry 4.0 to represent the fourth revolution that has occurred in manufacturing. From the first industrial revolution (mechanization through water and steam power) to the mass

production and assembly lines using electricity in the second, the fourth industrial revolution will take what was started in the third with the adoption of computers and automation and enhance it with smart and autonomous systems fueled by data and machine learning.Even though some dismiss Industry 4.0 as merely a marketing buzzword, shifts are happening in manufacturing that deserves our attention.

10.2   Needs of Industry 4.0:

The reasons why industry 4.0 is important are the benefits. It helps manufacturers with current challenges by becoming more flexible and reacting to changes in the market easier. It can increase the speed of innovation and is very consumer centered, leading to faster design processes.

Workers can become coordinators at the center of production, possibly improving the work-life balance of employees. Industry 4.0 is sustainable long-term, assisting in finding solutions for any challenge that arises.

So, why Industry 4.0? Because we can help you incorporate it, and all of these benefits, into your current manufacturing, leading you into a sustainable and profitable future.

What's truly interesting is that the manufacturing sector as a whole is far behind many other industries in terms of their adoption of new technology. Digital transformation is by no means a simple transition for an organization, but it is a necessity as the leaders in the industry adopt new practices that lead to increased efficiency and greater profits.
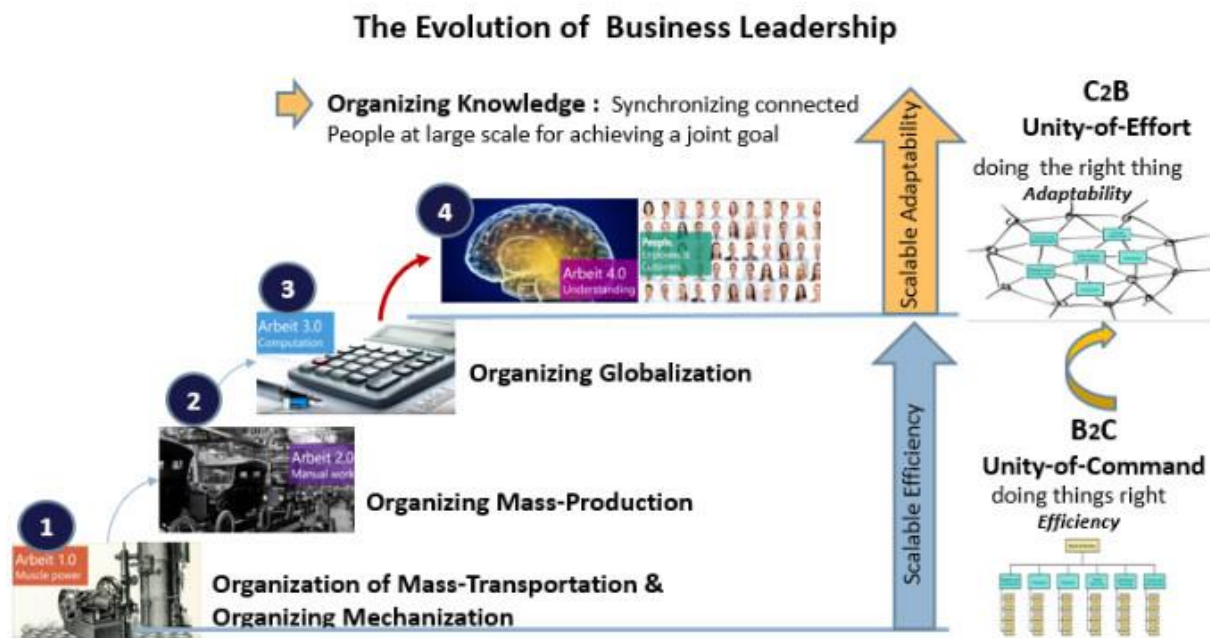
10.3 Industry 4.0 companies that stand out in both IT Product Based & Service Based Industry:

1. Hosting: Microsoft:

2. Industrial IoT Platforms: Microsoft, GE, PTC.

4. Microchips**:** Nvidia

5. Sensors: Festo

6. Connectivity Hardware: HMS

7. Cybersecurity: Claroty

8. Systems Integrators: Accenture

9. Additive Manufacturing: General Electric

10. Augmented and Virtual Reality: Upskill

11. Collaborative Robots: ABB

12. Connected Machine Vision: Cognex

13. Drones / UAVs: PINC

14. Self-Driving (material transport)

15. Siemens

16. SAP

17. ABB

18. GE Digital

19. Honeywell

20. Yokogawa

21. Danaher

22. Big Data

23. Cloud Computing

24. Advanced Robotics

25. Agumented and Virtual Reality(AR/VR).