Chapter1:
Introduction to Artificial Intelligence

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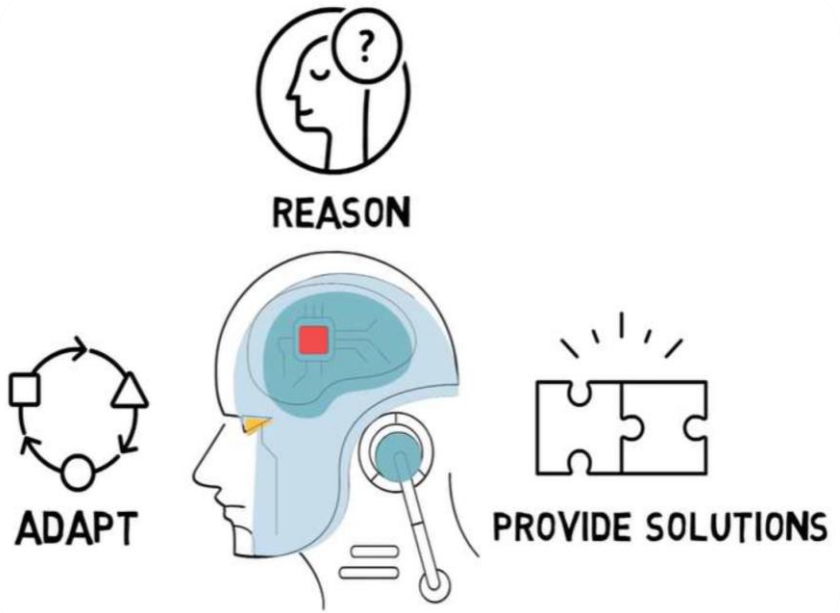
Artificial Intelligence - Introduction

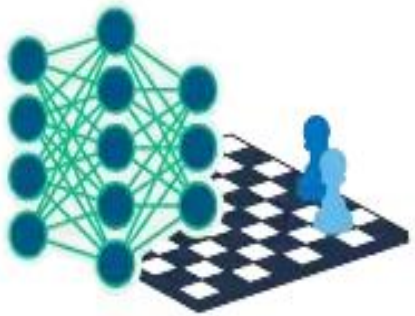
- Intelligence : “The ability to learn and solve problems.”
- Artificial Intelligence : is the simulation of human intelligence by machines.
  1. The ability to solve problems.
  2. The ability to act rationally.
  3. The ability to act like humans.
- The central principles of Al include :
  1. Reasoning, knowledge, planning, learning and communication.
  2. Perception and the ability to move and manipulate objects.

Artificial Intelligence - Definition

- AI is the science of making the machine smart.
- AI influences computers and machines to mimic the problem-solving and decision-making capabilities of the human mind.
- AI makes it possible for machines to learn from experience, adjust to new inputs and perform human-like tasks.
- Computers can be trained to accomplish specific tasks by processing large amounts of data and recognizing patterns in the data.
- Example: Self Driving Cars, Chabot.



History of Artificial Intelligence

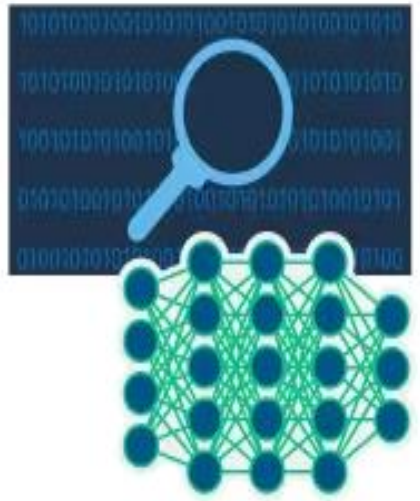


1950s–1970s

Neural Networks

1980s–2010s

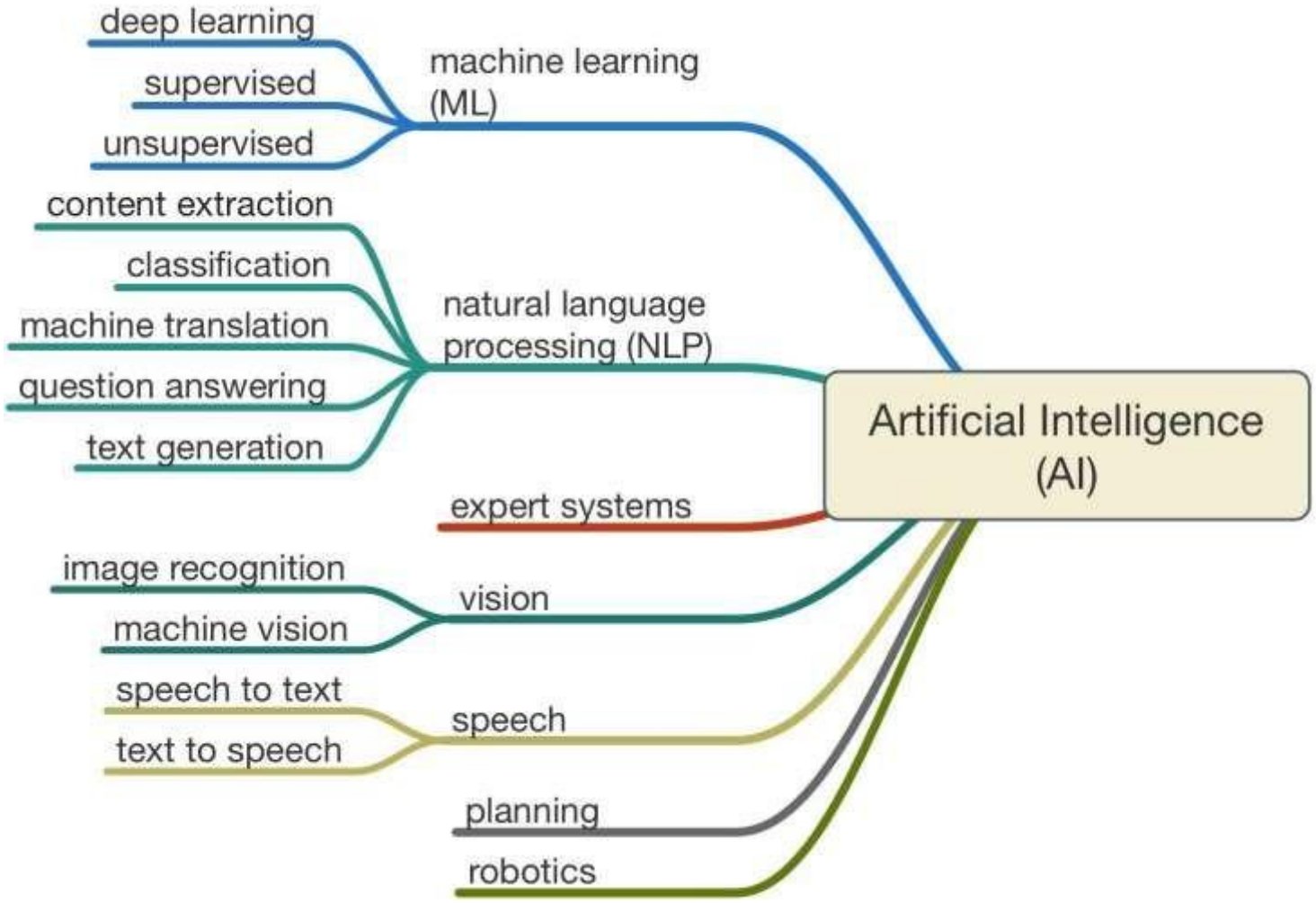
Machine Learning

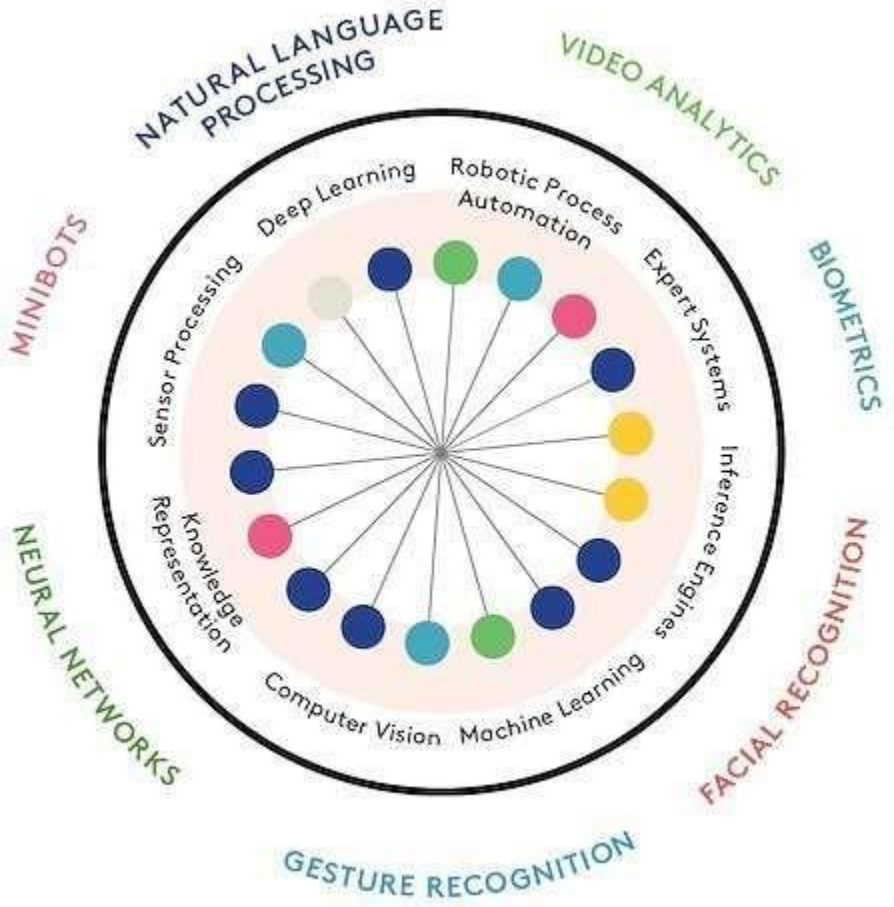


Present Day

Deep Learning

Artificial Intelligence Frameworks

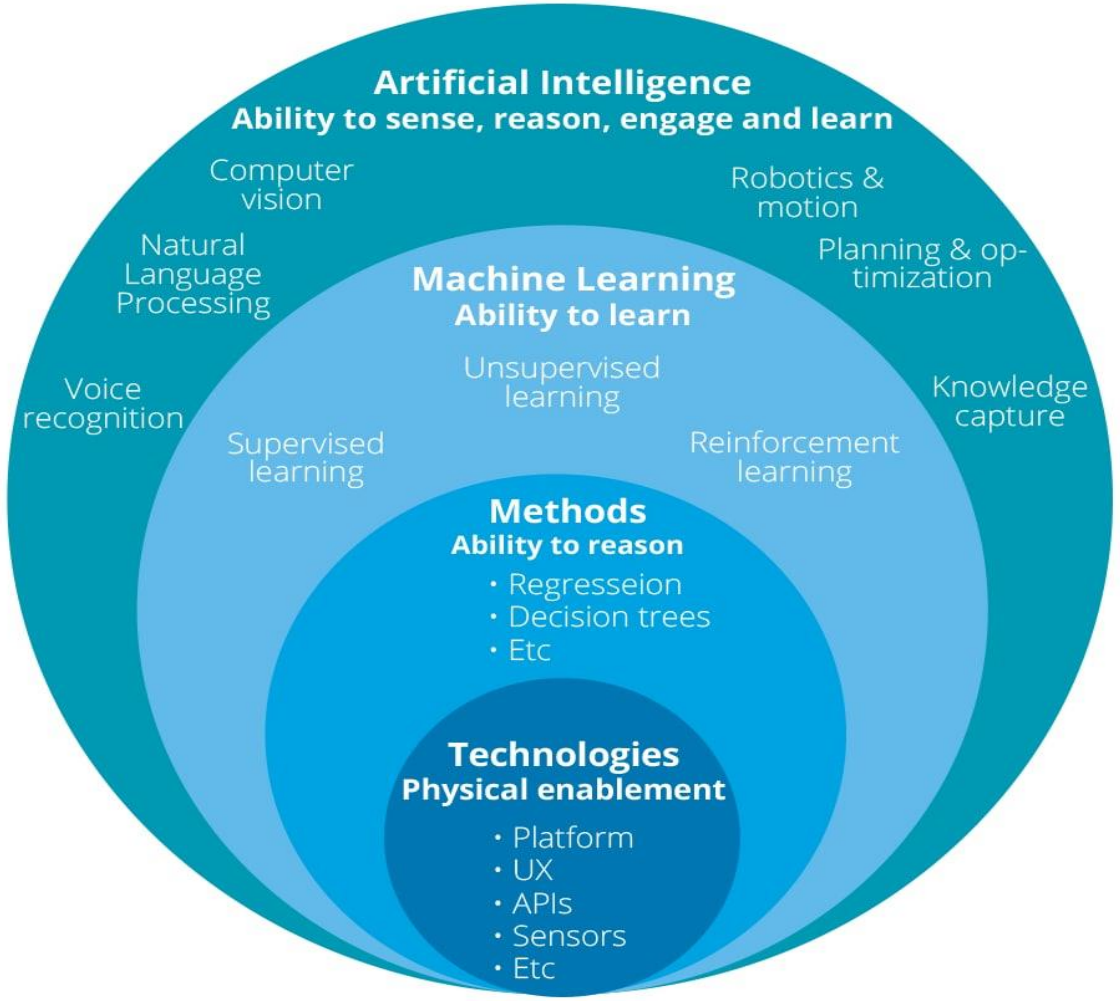




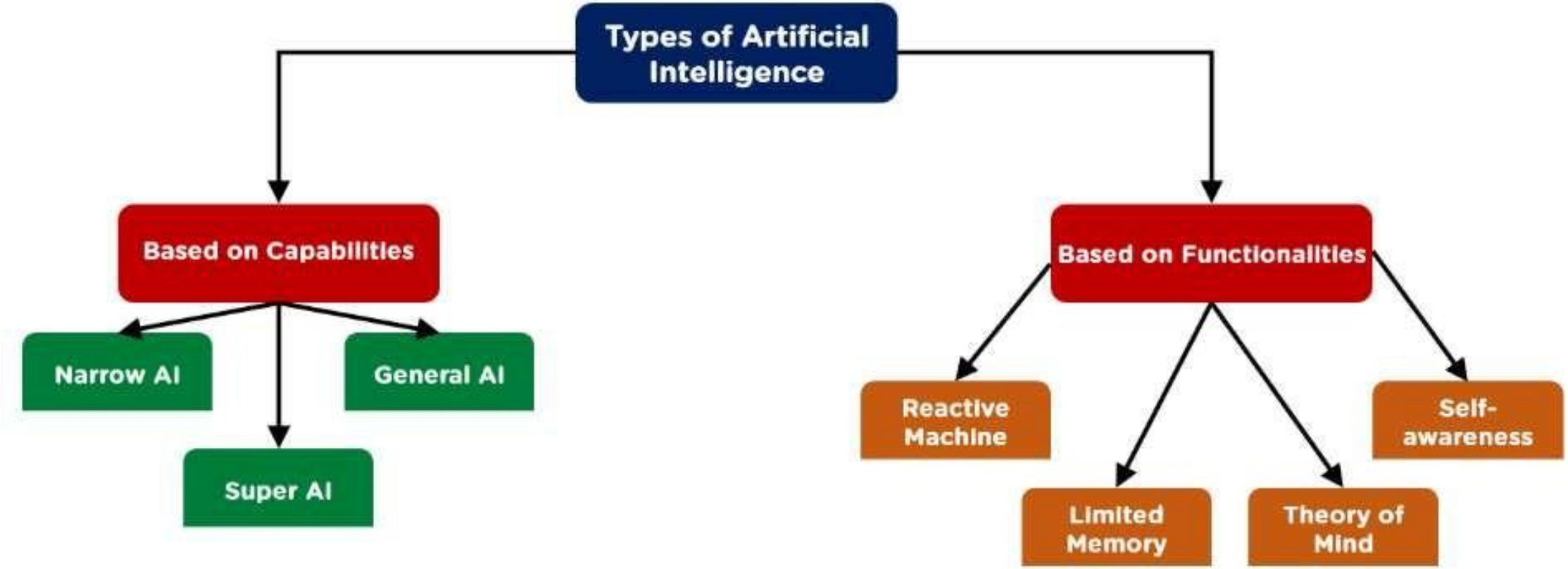
How Artificial Intelligence Works

- 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 where AI goals are : Deduction, Reasoning and Problem solving



Types of Artificial Intelligence



Types of Artificial Intelligence – Capability Based

Weak AI

- Weak AI outperforms humans in narrowly defined tasks
- Chatbot that answers customer service questions
- Facial recognition on Facebook
- Alexa, Google Assistant, and Siri

Augmented AI

- Helping humans make better decisions and improves their productivity
- Humans become faster and smarter at the tasks they're performing

Generalized AI

- Form of "Whole Brain Emulation", where a machine can think and make decisions on many different subjects
- Computers we see on science-fiction video
- Talking to humans about many subjects

Artificial Narrow Intelligence (ANI)

Stage-1

Machine Learning

- Specialises in one area and solves one problem


Siri


Alexa


Cortana

Artificial General Intelligence (AGI)

Stage-2

Machine Intelligence

- Refers to a computer that is as smart as a human across the board

Artificial Super Intelligence (ASI)

Stage-3

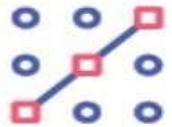
Machine Consciousness

- An intellect that is much smarter than the best human brains in practically every field

Types of Artificial Intelligence - Functionality Based

Reactive AI

- Good for simple classification and pattern recognition tasks
- Great for scenarios where all parameters are known; can beat humans because it can make calculations much faster
- Incapable of dealing with scenarios including imperfect information or requiring historical understanding

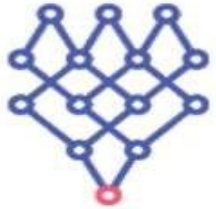


Limited memory

- Can handle complex classification tasks
- Able to use historical data to make predictions
- Capable of complex tasks such as self-driving cars, but still vulnerable to outliers or adversarial examples
- This is the current state of AI, and some say we have hit a wall

Theory of mind

- Able to understand human motives and reasoning. Can deliver personal experience to everyone based on their motives and needs.
- Able to learn with fewer examples because it understands motive and intent
- Considered the next milestone for AI's evolution



Self-aware

- Human-level intelligence that can bypass our intelligence, too

Importance of Artificial Intelligence

- **AI performs frequent, high-volume, computerized tasks.**
- **AI adds intelligence to existing products – Automation car improve driver capabilities.**
- **AI adapts through learning algorithms- teach itself to play chess.**
- **AI analyzes more and deeper data using neural networks.**
- **AI achieves incredible accuracy - AI techniques can now be used to locate cancer on medical images with improved accuracy**

Advantages and disadvantages of AI

Advantages :

- Reduction in Human Error
- Available 24×7 & never bored
- Helping in Repetitive Jobs
- More powerful and more useful computers for Digital Assistance
- New and improved interfaces.
- Faster Decisions for Solving new problems.
- Better handling of information.
- Relieves information overload.
- Conversion of information into knowledge.
- Daily useful Applications (Alexa, Siri)

Disadvantages :

- High Costs of Creation and Increased.
- Making Humans Lazy
- Software development is slow, difficult and expensive
- Few experienced programmers
- Unemployment
- No Emotions
- Lacking Out of Box Thinking

Top 10 Benefits Of Artificial Intelligence

1. **Automation**: AI can be used to automate anything from tasks that involve extreme labor
2. **Productivity**: AI is used to manage highly computational tasks that require maximum effort and time
3. **Decision Making**: AI helps in making business decision smarter.
4. **Solving Complex Problems**: such as fraud detection, medical diagnosis, weather forecasting…
5. **Strengthens Economy**: AI is estimated to increase the global GDP by up to 14% between now and 2030, an additional $15.7 trillion contribution to the world's economy.
6. **Managing Repetitive Tasks**: AI can be used for tiresome and routine tasks.
7. **Personalization**: AI can simplify overwhelming and time-consuming task for personalized store , such providing recommendations for each customer.

Top 10 Benefits Of Artificial Intelligence

8. **Global Defense:** The most advanced robots in the world are being built with global defense applications in mind such as military or police applications.

9. **Disaster Management**: such as Accurate weather forecasting which allows farmers to make critical decisions about planting and harvesting. Also It makes shipping easier and safer. And most importantly it can be used to predict natural disasters that impact the lives of millions.

10. **Enhances Lifestyle:** AI is used to the virtual assistants such as Siri, Cortana, and Alexa to interact with phones and other devices (IOT) to simplify human lives and also to predict deadly diseases.

AI major subfields

Machine learning (ML) uses methods from neural networks, statistics, operations research and physics to find hidden insights in data.

A neural network (NN) is a type of ML that is made up of interconnected neurons that processes information by relaying information between neurons.

Deep learning (DL) uses huge neural networks with many layers of processing neurons, taking advantage of advances in computing power and improved training techniques to learn complex patterns in large amounts of data.

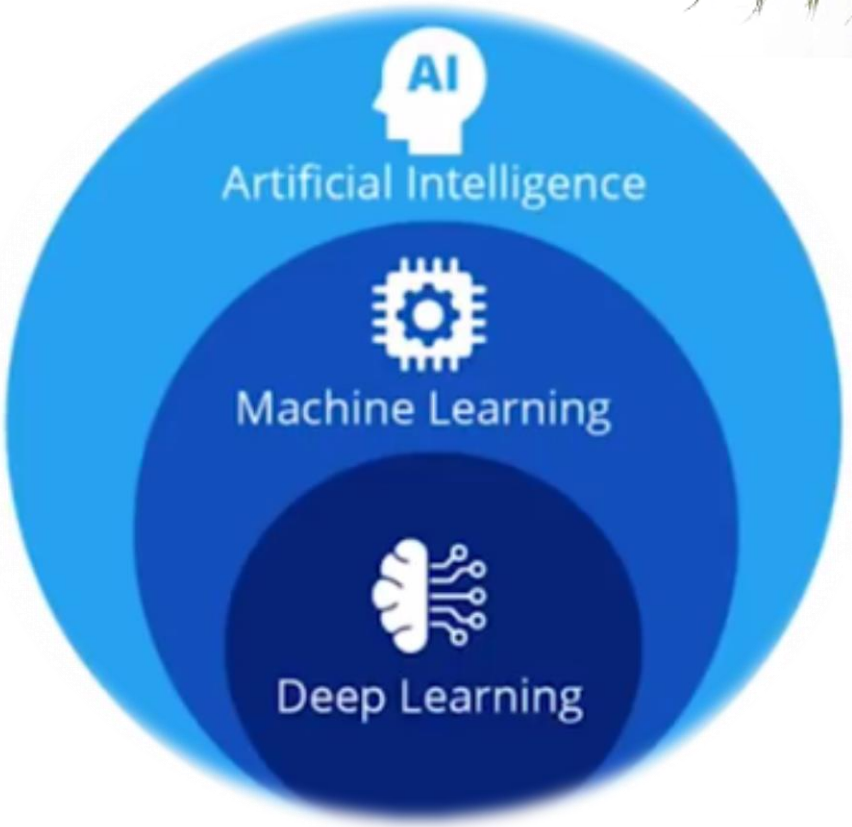
Computer vision (CV) relies on pattern recognition and DL to recognize what's in a picture or video in real time and interpret their surroundings.

Natural language processing (NLP) is the ability of computers to analyze, understand and generate human language, including speech.

Machine Learning (ML)

- **ML is a method of data analysis that automates model building.**
- **ML is a branch of AI based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention.**
- **ML uses methods from neural networks to find hidden insights in data without explicitly being programmed for where to look or what to conclude.**

- **While AI is the broad science of mimicking human abilities, ML is a specific subset of AI that trains a machine how to learn**



Deep Learning (DL)

- Deep learning is a type of ML that trains a computer to perform human-like tasks, such as recognizing speech, identifying images or making predictions.

- DL 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.

Neural Network (NN)

A 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.

Computer Vision (CV)

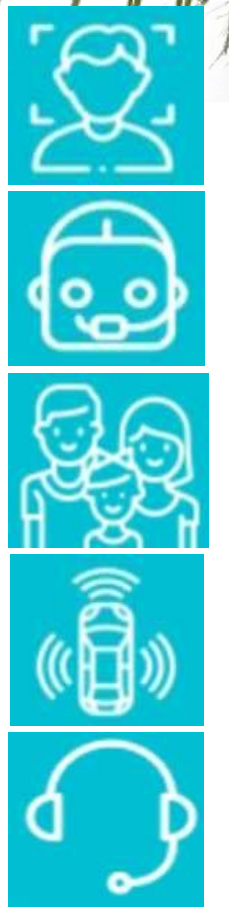
- Computer vision is a field of artificial intelligence that trains computers to interpret and understand the visual world. Using digital images from cameras and videos and deep learning models, machines can accurately identify and classify objects — and then react to what they "see."

Commercial Business uses of AI

- **Banking Fraud Detection :** From extensive data consisting of fraudulent and non-fraudulent transactions, the AI learns to predict if a new transaction is fraudulent or not.
- **Online Customer Support;** AI is now automating most of the online customer support and voice messaging systems.
- **Cyber Security:** Using machine learning algorithms and sample data, AI can be used to detect anomalies and adapt and respond to threats.
- **Virtual Assistants:** Siri, Cortana, Alexa, and Google now use voice recognition to follow the user's commands. They collect information, interpret what is being asked, and supply the answer via fetched data. These virtual assistants gradually improve and personalize solutions based on user preferences.

Commercial Business uses of AI

- **Finance sector:** Analyzing stock markets to give future predictions
- **Robotics and Manufacturing Sector :** Automating manual repetitive tasks, Surgery Aid Robots
- **Spam and Malware Filtering**
- **Automatic Language Translation**
- **Product Recommendations – Facebook ads**
- **Traffic Prediction – Google Maps**
- **Next-Generation Traffic Control**
- **Driver-less Cars - Tesla**



Google's Driverless Car

- Google car has completed over 480,000 auto-driving miles accident-free.

- Google car relies on cameras, lasers and sensors to spot obstacles, interpret signs and interact with traffic and pedestrians.

- AI eliminates the danger of distracted driving and boasts a reaction time much faster than that of any human.

Mercedes reach Level 3 Autonomous Driving Tech

- Mercedes Drive Pilot system uses cameras, sensors and GPS tracking to keep track of the conditions around the car.
- The car is paying attention on behalf of the driver like a traffic chauffeur and can pass control back to the driver within few seconds
- In-car sensors monitor the driver’s eyes and other parameters to ensure that the driver's awake and alert.
- Mercedes provides some games on the infotainment screen.

Surgical Aid Robots

- Cedars-Sinai Medical Center relies on AI to examine the heart and heart-attacks before they occur.

- Penelope, a Robotic Surgery Assistant developed at Columbia University can not only pass the correct tools to doctors, but also keep track of these tools and learn about a doctor's preferences.

- The most advanced surgical robots are programmed to perform the entire surgery on their own, except for the suturing or the cutting.

Next Generation Traffic Control

- AI seeks to improve the efficiency of traffic flow, hence improving road space utilization, reducing journey times and improving fuel efficiency.

- AI aims to creates a traffic control system that thinks like a human in directing traffic.

- The future is where all vehicles are equipped with WiFi and GPS and can transmit their positions to signalized junctions. This opens the way to the use of AI approaches to traffic control such as machine learning."

AI in Education

Education at any time

Education adapts to student needs

Personalization

Better engagement

Ability to detect weakness

Virtual mentors

Curriculum automatic formulation

Example: Little Dragon, Brainly, ThinkerMath, CTI etc..

AI in Business

Retail

AI provides virtual shopping capabilities that offer personalized recommendations and discuss purchase options with the consumer. Stock management and site layout technologies will also be improved with AI.

Manufacturing

AI can analyze factory IoT data as it streams from connected equipment to forecast expected load and demand using recurrent networks, a specific type of deep learning network used with sequence data.

AI in Banking

Artificial Intelligence enhances the speed, precision and effectiveness of human efforts. In financial institutions, AI techniques can be used to identify which transactions are likely to be fraudulent, adopt fast and accurate credit scoring, as well as automate manually intense data management tasks

Artificial Intelligence for Enterprise

Choice and Flexibility

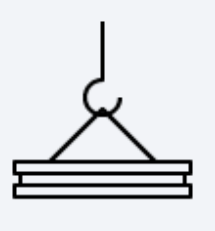
Deploy your AI applications on the cloud environment that best supports your business needs

Security and Trust

Take advantage of built-in security capabilities and AI model monitoring

Deep Industry Capabilities

Choose from a wide range of AI products, built for the specific needs of your industry



AI Platforms

- Google Cloud AI
- Amazon AI services
- Microsoft Azure AI
- H2O.ai
- IBM Watson Studio
- TensorFlow
- DataRobot
- Wipro Holmes AI and automation platform
- Salesforce Einstein
- Infosys Nia