

## Brief Concept of Artificial Intelligence

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### What is Artificial Intelligence?

1. A branch of Computer Science named Artificial Intelligence pursues creating the computers or machines as intelligent as humans.
2. According to the father of Artificial Intelligence John McCarthy, it is “The science and engineering of making intelligent machines, especially intelligent computer programs”.
3. Artificial Intelligence is a way of making a computer, a computer-controlled robot, or a
4. Software thinks intelligently, in the similar manner the intelligent humans think.
5. 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.
6. Artificial Intelligence is: the field of study that describe the capability of machine learning just like humans and the ability to respond to certain behaviours also known as (A.I.).
7. Artificial Intelligence (AI) is poised to disrupt our world. With intelligent machines enabling high-level cognitive processes like thinking, perceiving, learning, problem solving and decision making, coupled with advances in data collection and aggregation, analytics and computer processing power, AI presents opportunities to complement and supplement human intelligence and enrich the way people live and work (Niti Ayog).
8. AI is a constellation of technologies that enable machines to act with higher levels of intelligence and emulate the human capabilities of sense, comprehend and act.
9. An AI system can also take action through technologies such as expert systems and inference engines or undertake actions in the physical world.

10. A.I intelligence is the development of software that combines problem-solving and decision-making to achieve goals through replicating the process of ‘sense, decide and act’. It is developed to be used by computers and machines.
11. Artificial intelligence is used in a range of applications, including industrial robot management, smart phone speech recognition, internet search engines, computer-aided radiology and fuzzy logic in autonomous car parking.

### Goals of AI

1. **To Create Expert Systems:** systems which exhibit intelligent behavior, learn, demonstrate, explain, and advice its users.
2. **To implement Human Intelligence in Machines:** creating systems that understand, think, learn and behave like humans.

### What Contributes to AI?

- Artificial intelligence is a science and technology based on disciplines such as Computer Science, Biology, Psychology, Linguistics, Mathematics, and Engineering. A major thrust of AI is in the development of computer functions associated with human intelligence, such as reasoning, learning, and problem solving. Out of the following areas, one or multiple areas can contribute to build an intelligent system.
- Artificial Intelligence is increasing every day. Since AI was first introduced to the market, it has been the reason of the quick change in technology and business fields. Computer scientist are predicting that by 2020, “*85% of customer interactions will be managed without a human*”. This means that humans simple request will depend on computers and artificial intelligence just like when we use Siri or Galaxy to ask about the weather temperature. It is very important to be prepared for AI revelation just like UAE have by installing a state minister for AI in Dubai.

### Pros and Cons of Artificial Intelligence

1. A.I offers reliability, cost- effectiveness, solve complicated problems, and make decisions; in addition, AI restrict data from getting lost. AI is applied nowadays in most fields whether business or engineering. One of the great tools in AI is called “reinforcement learning” which is based on testing success and failure in real life to increase the reliability of applications. Unfortunately, AI is limited with its capability and functionality.

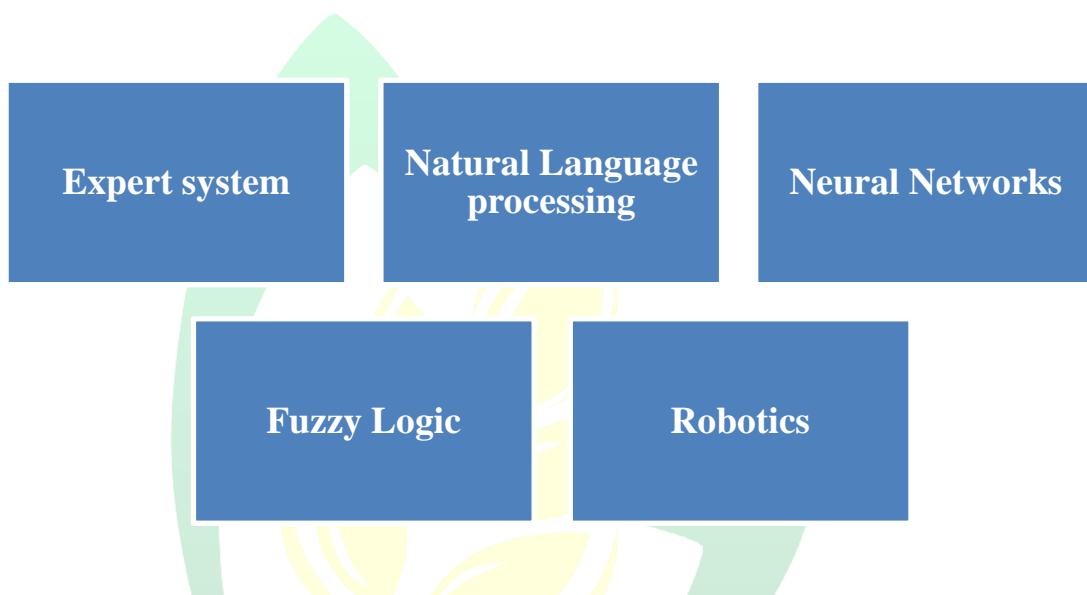
2. Although Artificial Intelligence made our lives much easier and saved us more time than ever, scientists are predicting that by the huge dependency on AI humanity could extinct. Scientists argue that by having AI machines, people will be jobless and that will conclude in losing the sense of living. Since machines are learning and doing things more efficiently and effectively in a timely manner, this could be the reason of our extinction.

### **Some Applications on Artificial Intelligence**

- a. Voice recognition
  - b. Virtual agents:
  - c. Machine learning platform
  - d. AI optimized hardware
  - e. Decision management
  - f. Deep learning platform
  - g. Bio matters
1. **Gaming:** AI plays crucial role in strategic games such as chess, poker, tic-tac-toe, etc., where machine can think of large number of possible positions based on heuristic knowledge.
  2. **Natural Language Processing:** It is possible to interact with the computer that understands natural language spoken by humans.
  3. **Expert Systems:** There are some applications which integrate machine, software, and special information to impart reasoning and advising. They provide explanation and advice to the users.
  4. **Vision Systems:** These systems understand, interpret, and comprehend visual input on the computer. For example, A spying aeroplane takes photographs which are used to figure out spatial information or map of the areas. Doctors use clinical expert system to diagnose the patient. Police use computer software that can recognize the face of criminal with the stored portrait made by forensic artist
  5. **Speech Recognition:** Some intelligent systems are capable of hearing and comprehending the language in terms of sentences and their meanings while a human talks to it. It can handle different accents, slang words, noise in the background, change in human's noise due to cold, etc.

- 6. Intelligent Robots:** Robots are able to perform the tasks given by a human. They have sensors to detect physical data from the real world such as light, heat, temperature, movement, sound bump, and pressure. They have efficient processors, multiple sensors and huge memory, to exhibit intelligence. In addition, they are capable of learning from their mistakes and they can adapt to the new environment.

### Domains of A.I



The domain of AI is classified into Formal tasks, Mundane tasks, and Expert tasks.

### Artificial Intelligence Issues

AI is developing with such an incredible speed, sometimes it seems magical. There is an opinion among researchers and developers that AI could grow so immensely strong that it would be difficult for humans to control it. Humans developed AI systems by introducing into them every possible intelligence they could, for which the humans themselves now seem threatened.

- a) **Threat to Privacy:** An AI program that recognizes speech and understands natural language is theoretically capable of understanding each conversation on e-mails and telephones.
- b) **Threat to Human Dignity:** AI systems have already started replacing the human beings in few industries. It should not replace people in the sectors where they are

holding dignified positions which are pertaining to ethics such as nursing, surgeon, judge, police officer.

- c) **Threat to Safety:** The self-improving AI systems can become so mighty than humans that could be very difficult to stop from achieving their goals, which may lead to unintended consequences.

### **Global Developments in Artificial Intelligence**

#### **Cainthus Technology:**

Canthus is a machine vision company that turns visual information into actionable data. The company's focus is on delivering technology that enables our customers to make more precise farming decisions and on improving the efficiency and overall productivity of their operations.

Irish agtech company called Cainthus would invent a way to use artificial Intelligence—the same technology developed for terrorist detection of humans to manage dairy cows. As its simplest Cainthus Technology has been described as facial recognition for cows. To be more precise, Canthus has developed a smart camera system that collects video data inside the dairy barn and uses artificial intelligence to uniquely identify and track behaviour of all the cows in the barn. That information is used to develop key animal and farm performance indicators which are delivered in the form of daily notifications and real time detailed analytics to dairy farmers' phone. Such analytics help identify and analyze inefficiencies and animal health issues that need to be addressed to improve productivity and animal welfare. The Cainthus vision system might identify aggressive behaviour by certain cows at the feeding trough or erratic feeding patterns among others. The cameras showed that animals were not drinking for more than a few seconds at a time. That led to the discovery of stray electric current, undetectable to a human touching it, running through the water trough that caused the cows to back off. The problem was fixed and as a result milk production rebounded more than two pounds the next day.

Cainthus uses various types of imaging equipment to monitor livestock operations while artificial intelligence and custom algorithms detect behaviour in individual animals to monitor their health and alert the user when an action is required. The Cainthus system is able to detect food and water intake in individual animals as well as when the animals are in heat and more. Imagery can come from drones, satellites, CCTVs and smart devices but the most

common step in cainthus trials is an installation of few dozen CCTV cameras on dairy farms. Within seconds cainthus imaging technology can identify individual cows by their features, memorize their unique identity and record individual patterns and movements.

### How Ai Is Changing Wildlife Research

Reticulated Giraffes across the regions in Northern Kenya have declined up to 70% in the past thirty years. Across Africa giraffe numbers have shrunk by 40% in the same period down to less than 100,000 individuals. Biologists are rushing to access their numbers, movements and preferred habitat to ensure protection of those areas. But the traditional way of counting giraffes using aerial survey costs time and money both of which are in short supply in Giraffe world.

Enter Wildbook, a software program developed by Portland Based conservation tech nonprofit wild me, which automatically identifies individual animals by their unique coat patterns or other hallmark features such as flukes or ear outlines. With the help of wild book and nonprofit Giraffe Conservation Foundation, Stacy Dawes a research coordinator at zoos institute for conservation research and her colleagues are able to blitz a giraffe population with photos over two days, upload the images and location data to their Giraffe spotter database.

### Types Of A.I

A.I can be classified in several ways. The first classifies the A.I as either weak A.I or Strong A.I.

- **Weak A.I** is also Known as narrow A.I, is an A.I system that is designed and trained for a specific type of task, it's the phenomena that machines which are not too intelligent to do their own work can be built in such a way that they seem smart. An example would be a poker game where a machine beats human, where in which all rules and moves are fed into the machine. Here each and every possible scenario need to be entered beforehand manually.
- **Strong A.I** also Known as artificial general intelligence is an A.I system with generalized Human cognitive abilities so that when presented with an unfamiliar task it has enough intelligence to find a solution. These are the machines that can actually think and perform tasks on its own just like human being.

- ❖ **Turing Test** developed by Mathematician, Alan Turing in 1950, is a method used to determine if a computer can think like a human

Arend Hintze, a professor of integrative biology and computer science and engineering at Michigan state university. He categorized A.I into four types and these were as follows. (Based on Functionalities)

- a. **TYPE 1: Reactive Machines.** An example is Deep Blue, an IBM chess program that can identify pieces on chess board and can make predictions accordingly. But the major fault with this is that it has no memory and cannot use past experiences. To inform future ones. It also analyzes possible moves of its own and its opponents. Deep blue were designed for narrow purposes and cannot be applied easily to any other situation. This is one of the basic forms of A.I. It doesn't have past memory and cannot use past information to inform future actions.
- b. **Type 2: Limited Memory:** These A.I systems can use past experiences to inform future decisions. Most of the decision making functions in the autonomous vehicles have been designed in this way. Some of the decision making functions in self driving cars have been designed in this way.
- c. **TYPE 3: Theory of mind:** this is a psychological term which refers to the understanding that the other have in their own beliefs and intentions that impact the decision they make. At present A.I does not exist. This type of A.I should be able to understand people's emotion, belief, thoughts, and expectations and be able to interact socially.
- d. **Type 4: Self awareness:** in this category, A.I systems have a sense of self, have consciousness, machines with self awareness understand their current state and can use the information to infer what others are feeling. It does not exist. An A.I that has its own conscious, super intelligent, self awareness and sentient (in simple words a complete human being). Of course, this kind of bot also doesn't exist and if achieved it will be milestones in field of A.I.

There are many ways A.I can be achieved some of them are as follows:

- ❖ **Machine Learning:** It is a method where the target (goal) is defined and the steps to reach that target are learned by machine itself by training (gaining experience). E.g. to

identify a simple object such as an apple or orange. The target is achieved not by explicitly specifying the details about it and coding it but it is just as we teach a child by showing multiple different pictures of it and therefore allowing the machine to define the steps to identify it like an apple or an orange.

- ❖ **Natural Language Processing (NLP) :** Natural LP is broadly defined as the automatic manipulation of natural language, like speech and text by software. E.g is email spam detection as we can see how it has improved in our mail system.
- ❖ **Vision:** it can be said as a field which enables the machines to see. Machines vision captures and analyses visual information using a camera, analog to digital conversion, and digital signal processing. It can be compared to human eyesight but it is not bound by human limitation which can enable it to see through walls. It is usually achieved through machine learning to get the best possible results so we could say that these two fields are interlinked.
- ❖ **Robotics:** it is a field of engeneering focused on the design and manufacturing of robots. Robots are often used to perform tasks that are difficult for humans to perform or perform consistently. Examples include car assembly lines, in hospitals, office cleaner, serving foods and preparing foods in hotel. Recently, machine learning has been used to achieve certain good results in building robots that interact socially (Sophia)
- ❖ **Autonomous vehicles:** this area of A.I has gathered a lot of attention the list of vehicles include cars, trucks, trains, ships, submarines etc.

#### **Focus areas of A.I Intervention:**

##### **Healthcare:**

Healthcare is one of the most dynamic, yet challenging, sectors in India, and is expected to grow to USD280 billion by 2020, at a CAGR of upwards of 16%, from the current ~USD100 billion<sup>9</sup>. Yet it faces many challenges of quality, accessibility and affordability for a large section of the population:

- a) Shortage of qualified healthcare professionals and services like qualified doctors, nurses, technicians and infrastructure:

- b) Non-uniform accessibility to healthcare across the country with physical access continuing to be the major barrier to both preventive and curative health services, and glaring disparity between rural and urban area.
- c) Affordability
- d) Reactive approach to essential healthcare largely due to lack of awareness, access to services and behavioural factors implies that majority of patients approach a hospital / physician only when a disease has reached an advanced stage, thus increasing the cost of care and reducing the chances of recovery.

Despite the obvious economic potential, the healthcare sector in India remains multi-layered and complex, and is ripe for disruption from emerging technologies at multiple levels. It is probably the most intuitive and obvious use case primed for intervention by AI driven solutions, as evidenced by the increasing activity from large corporates and startups alike in developing AI focused healthcare solutions.

The increased advances in technology, and interest and activity from innovators, provides opportunity for India to solve some of its long existing challenges in providing appropriate healthcare to a large section of its population. AI combined with robotics and Internet of Medical Things (IoMT) could potentially be the new nervous system for healthcare, presenting solutions to address healthcare problems and helping the government in meeting the above objectives.

#### Potential use cases of AI in Healthcare

- AI solutions can augment the scarce personnel and lab facilities; help overcome the barriers to access and solve the accessibility problem; through early detection, diagnostic, decision making and treatment cater to a large part of India.
- Cancer screening and treatment is an area where AI provides tremendous scope for targeted large scale interventions.
- NITI Aayog is in an advanced stage for launching a programme to develop a national repository of annotated and curated pathology images: the components of such a repository include a move towards digital pathology which entails all glass slides generated being scanned at high resolution and magnification, followed by accurate, precise and comprehensive annotation of the scanned images using various data

sources & levels of clinical & pathological (gross pathology, histopathology and molecular) information available from day-to-day patient care.

### **Imaging biobank for cancer:**

Another related project under discussions is an Imaging Biobank for Cancer. Human cancers exhibit strong phenotypic differences that may be visualised noninvasively by expert radiologists (using imaging modalities). Recent literature suggests that certain image based features may correlate to molecular and clinical features like known mutations (KRAS, EGFR, etc.), receptor status, prognostic power, intra-tumor heterogeneity, gene expression patterns, etc. Reports have shown an association between radiographic imaging phenotypes and tumor stage, metabolism, hypoxia, angiogenesis and the underlying gene and/or protein expression profiles. These correlations, if rigorously established, may have a huge clinical impact as imaging is routinely used in clinical practice. Moreover, this provides an unprecedented opportunity to use artificial intelligence to improve decision-support in cancer treatment at low cost especially in countries like India. AI based Radiomics is an emerging field that refers to the comprehensive quantification of tumor phenotypes by applying a large number of quantitative imaging features. It has resulted in improvement to existing biomarker signature panels by adding imaging features.

### **NETHRA:**

NITI Aayog is working with Microsoft and Forus Health to roll out a technology for early detection of diabetic retinopathy as a pilot project. Integrating AI capabilities to this device using Microsoft's retinal imaging APIs enables operators of 3Nethra device to get AI-powered insights even when they are working at eye checkup camps in remote areas with nil or intermittent connectivity to the cloud. The resultant technology solution also solves for quality issues with image capture and systems checks in place to evaluate the usability of the image captured.

### **Scope of AI in Agriculture**

Agriculture is seeing rapid adoption of Artificial Intelligence (AI) and Machine Learning (ML) both in terms of agricultural products and in-field farming techniques. Cognitive computing in particular, is all set to become the most disruptive technology in agriculture services as it can understand, learn, and respond to different situations (based on learning) to increase efficiency. Providing some of these solutions as a service like chatbot or other

conversational platform to all the farmers will help them keep pace with technological advancements as well as apply the same in their daily farming to reap the benefits of this service. Currently, Microsoft is working with 175 farmers in Andhra Pradesh, India to provide advisory services for sowing, land, fertilizer and so on. This initiative has already resulted in 30% higher yield per hectare on an average compared to last year.

### **Ecosystem crucial for benefits of Precision Agriculture**

Intello Labs uses A.I to help farmers get a fair price for their crops (Chris Albrecht, 2018). A.I can be used to help prevent a poorfarmer from getting screwed. Food inspection is often still done manually. One persons perfect tomato may be another persons piece of trash and these basic biases can lead to imbalance of power. A poor rural farmer may not be educated on price points or what fresh produce means to a buyer.as a result these may want to sell tomatoes at a dollar per tomato but buyers may scoff refuting the quality of those tomatoes and only offer 50% How are they to Know how much the literal fruits of their labour are actually worth. Intello labs is working to help bala nce these scales through a combination of computer vision and artificial intelligence. Using their mobile phone app,the tomato farmer could take a picture of bushel of tomatoes and upload it into intellos system. The companies alogrithm would examine the photo of tomatoesand gives it a rating based on set of government (USDA) or other criteria. With this objective, alogrithmic rating in place each party in the negotiation now knows the quality of the tomatoes being sold and they can be priced accordingly. The company started with commodities like tomatoe and potato but can be accostomed for any almost any food . it could be used to rate products like seafood and chicken or even as a tool for plant disease identification.

- **AgSHIFT:** in u.s Agshift is using similar mobile phone app to provide better data for food buyers in supply chain to help reduce food waste. Agshift is trying to digitalise the process of food inspection across various touch points. After digitalising Agshift can use machine learning alogrithms to automatically inspect the produce and commodities for any defects. Their patented methodolgy uses image recognition techniques by which we can detect the quality of produce as well as predict its quality.
- **TRITHI ROBOTICS:** Uses drone technology to allow farmers to monitor crops in real time and provide precise analysis of their soil ( see paper).

 **PEAT:** Plantix is a free mobile application which offers farmers and gardeners the possibility to receive decision support directly on their smart phone. Due to image recognition, the app is able to identify the plant type as well as the appearance of possible disease, pest or nutrient deficiency. Plantix take advantage of deep learning technology which involves neural networks. It also provides information on treatment and preventive measures. The analysis is conducted by software algorithms which correlate particular foliage patterns with certain soil defects, plant pests and diseases. The image recognition app identifies possible defects through images captured by the user's smartphone camera. Users are then provided with soil restoration techniques, tips and other possible solution..

### AI sowing app

Some of the challenges faced by farmers from seed sowing to harvesting of crops are as

1. Crop disease infestation
2. Lack of storage management
3. Pesticide control
4. Weed management
5. Lack of irrigation and drainage facilities

Potential A.I application and development areas

- a. **Predictive and Recommendation Analytics:** A.I and machine learning can help farmers by recommending the sowing dates for different crops based on weather conditions. M.L models can also suggest tweaks in cropping patterns to boost yields. Using the historic production data, weather forecasts, seed information and demand and suplly information, ML can be used to forecast the amount of seed that should be grown to fulfill the growing needs.
- b. **Supply Chain Mangement:** A.I cn be used to predict the demands by analyzing inputs like rate of population growth, historical demand patterns of food commodities, region wise staple food patterns, among other inputs. This information can be used to efficiently modify the cropping patterns and also minimize wastage of crop yields and increase profits to farmers.

- c. **Identifying Plant diseases:** crop images are analysed using computer vision technology and segmented into areas like background, healthy part and diseased part. The diseased part is then captured and sent to remote labs for further diagnosis.

