

UNTT - 1 An Overview to AI

→ AI can be defined as the branch of computer science that is concerned with the automation of intelligent behaviour.

AI is automation of activities that we associate with human thinking, activities such as decision making, problem solving, searching and many other activities.

→ The evolution of AI to the present :-

- 1945 - I. Isaac Asimov, a Columbia University alumni, coined the term Robotics.
- 1950 - Alan Turing introduced Turing Test for evaluation of intelligence and published *Computing Machinery and Intelligence*, classic. Claude Shannon published *Detailed Analysis of Chess playing as a search*.
- 1956 - John McCarthy coined the term Artificial Intelligence. Demonstration of the first running AI programming at Carnegie Mellon University.
- 1958 - John McCarthy invents Lisp programming language for AI.
- 1959 - First AI Laboratory MIT AI Lab was first set up in 1959. The research on AI began.

1961 - First chatbot.

The first AI chatbot called ELIZA was introduced in 1961.

1997 - The deep blue chess program beats the world chess champion, Garry Kasparov.

2005 - DARPA Grand Challenge
Stanford Racing team is autonomous robotic car.

Stanley wins the 2005 DARPA Grand Challenge.

2011 - IBM Watson

IBM question answering system Watson defeated the two greatest Jeopardy champions Brad Rutter and Ken Jennings.

What is AI?

The theory and development of computer system able to perform tasks normally requiring human intelligence, such as visual perception, speech, recognition, decision making and translation between languages.

Characteristics of AI.

It can think like human. It is making computer to think then just processing.

- It acts like human
- It thinks and act rationally.
- It makes it possible to percieve, reason and act.
- It is a intelligent behaviour in artifacts
- It has ability to automate intelligent behaviours
- It can store vast amount of data and process it is to make intelligent decisions.
- It can have vision and speech recognition ability
- It make use of electric impulse as a signal to sense world around and use electronic actuators to produce actions.
- It can learn and improve behaviour through interaction with the environment.

Goals of AI :-

- 1) To create Expert System - The system which exhibit intelligent behaviour, learn, demonstrate, explain and advise its users.
- 2) To implement human intelligence in machines: Creating system that understand, think learn and behave like humans.

Programming languages for AI: ⇒

- | | |
|--------------------------------------|----------------|
| 1) Python → All the possible package | 5) Prolog |
| 2) R | 6) C++ |
| 3) Java | 7) Java script |
| 4) Lisp | 8) MATLAB |

handle diff. accents, slang words, noise in the background, change in human's voice due to cold etc.

→ Handwriting Recognition → The handwriting recognition software reads the text written on paper by a pen or on screen by a stylus. It can recognize the shapes of the letters and convert it into editable text.

→ 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, temp, 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.

● What is intelligence? :-

The ability of a system to calculate, reason, perceive relationship and analogies, learn from experience, store and retrieve information from memory, solve problems, comprehend complex ideas, use natural language fluently, classify, generalize, and adapt new situations.

Q. What is intelligence composed of?

The intelligence is intangible. It is composed of

- 1) Reasoning
- 2) Learning
- 3) Problem solving.
- 4) Perception
- 5) Linguistic intelligence.

Let us go through all the components briefly:-

1) **REASONING** → It is the set of processes that enables us to provide basis for judgement, making decisions and prediction. These are broadly two types:-

	<u>Inductive reasoning</u>	<u>Deductive reasoning</u>
1).	It conducts specific observation to make broad general statement.	It starts with a general statement and examines the possibilities to reach a specific logical conclusion.
2).	Even if all of the premises are true in a statement inductive reasoning allows for the conclusion to be false.	If something is true of a class of things in general, it is also true for all members of that class.
Example	Nita is a teacher. Nita is studious. Therefore	Ex All women of age above 60 years are grandmothers. Salini is 65 years. Therefore.

LEARNING → It is the activity of gaining knowledge or skill by studying, practising, being taught, or experiencing something. Learning enhances the awareness of the subject of the study.

The ability of learning is possessed by human, some animals, and AI-enabled systems. Learning is categorised as...

Auditory learning → It is learning by listening and hearing. for example students listening to recorded audio lectures.

Episodic learning → To learn by remembering sequences of events that one has witnessed or experienced. This is linear and orderly.

- Relational learning → It involve learning to differentiate among various stimuli on the basis of relational properties, rather than absolute properties.

for example → adding 'little less' salt at the time of cooking potatoes that came up salty last time, when cooked with adding say a tablespoon of salt.

- Spatial learning → It is learning through visual stimuli such as images, colours, maps etc. for example - A person can create roadmap in mind before actually following the road.

- Stimulus- Responses learning → It is learning to perform a particular behaviour when a certain stimulus is present.

for example → a dog raises it's ear on hearing doorbell.

- **3 PROBLEM SOLVING** → It is the process in which one perceives and tries to arrive at a desired solution from a present situation by taking some path, which is blocked by known or unknown hurdles.

Problem solving also indicate includes decision making, which is the process of selecting the best suitable alternative out of multiple alternatives to reach the desired goal are available.

PERCEPTION → It is process of acquiring, interpreting, selecting and organising sensory information.

Perception presumes sensing. In humans, perception is aided by sensory organs. In the domain of AI, perception mechanism puts the data acquired by the sensors together in meaningful manner.

Linguistic intelligence → It is one's ability to use, comprehend, speak and write the verbal and written language.

It is important in interpersonal communication.

Diff. b/w Human and Machine Intelligence :-

Humans perceive by patterns whereas the machines perceive by set of rules and data.

Speech and Voice Recognition :-

These both terms are common in robotics, expert systems and natural language processing. Though these terms are used interchangeably, their objectives are diff.

Speech Recognition	Voice Recognition
The speech recognition aims at understanding what was spoken.	The objective of voice recognition is to recognize WHO is speaking.
It is used in hand-free computing, map, or menu navigation.	It is used to identify a person by analysing its tone, voice pitch and accent etc.
Machines does not need training for speech recognition as it is not speaker dep.	The recognition system needs training as it is person oriented.
Speaker independent speech recognition system are diff. to develop.	Speaker dep. speech recognition systems are comparatively easy to develop.

Real life Applications of Research Areas

There is a large array of application where AI is serving common people in their day-day lives.

EXPERT SYSTEMS :-

Example → Flight tracking system, clinical system

NATURAL LANGUAGE PROCESSING :-

Example → Google now feature, speech recognition, automatic voice output.

NEURAL NETWORKS :-

Example → Patterns recognition system such as face recognition, character recognition, handwriting recognition.

ROBOTICS :-

Example → Industrial robot for moving, spray painting, precision chucking, drilling, clearing, coating, carving etc.

FUZZY LOGIC SYSTEM :-

Example :- Consumer electronics, automobiles etc.

Approaches to AI :-

Searching

Learning

From Natural to Artificial System.

Knowledge representation and Reasoning

Expert system and planning.

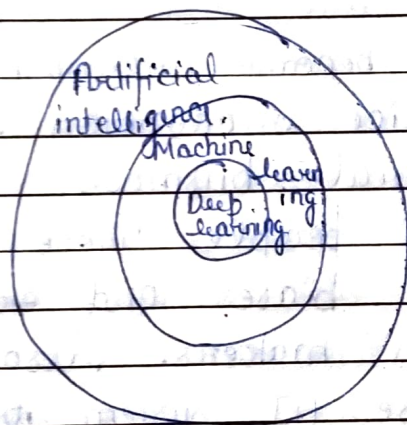
Communication, perception, action.

Various approach to AI :-

There are 3 related concept that have been frequently used in recent year

1. AI
2. Machine learning
3. Deep learning

In general, AI is in the broadest concept, Machine learning is a subfield in AI, and deep learning is a special type of machine learning



Emerging technologies in AI :-

- 1) AI enhanced analytics soln.
- 2) Deep learning platforms
- 3) Face recognition
- 4) Image and video analysis
- 5) Intelligent recommended soln.
- 6) Intelligent research soln.
- 7) Machine learning platforms.
- 8) Natural language generation
- 9) Speech analytics
- 10) Text analytics

① Ethical issues in AI :-

- 1) Job loss and wealth inequality
- 2) AI is imperfect - what if it make a mistake?
- 3) Should AI system be allowed to kill?
- 4) Securing. How do we keep AI from safe from adversaries?
- 5) Humanity - How do machine effect our behaviour and interaction?

② What are the Ethical issues of AI ?

→ AI Bias :- AI become increasingly inherent in facial and voice recognition system, some of which have real business implications and directly impact people. These systems are vulnerable to biases and errors introduced by it's human makers. Also, the data used to train these AI system itself can have biases. For instance, facial recognition algorithms made by microsoft, IBM and Megvii all has biases when detecting people gender. These AI system were able to detect the gender of white men more accurately than gender of darker skin men.

Similarly, Amazon's com's termination of AI hiring and requirement is another example which exhibits that AI cannot be fairer than the algorithm perfect preferred male candidate over female. This was because Amazon's system was trained with data

year period that came mostly from male candidates.

Can AI become bias? Well that's a tricky quest. One could argue that intelligent mach. do not have a moral compass and principles sometimes do not benefits humanity as a whole, so how do we ensure that AI agents do not have that same flaws as their creator.

If AIs develop a certain bias towards or against race, gender, religion or ethnicity, then the fault will lie mostly on how it was taught and trained.

Therefore, people who work in AI research need to keep bias in mind when determining what data to use.

→ Rogue AIs →

If there is a chance that intelligent machine can make mistakes then it is within the realm of possibility that an AI can go rogue, or create unintended consequences from it's actions in pursuing seemingly harmless goals. One scenario of an AI going rogue is what we have already seen in movies like the Terminator and TV shows where a super-intelligent centralized AI computer become self aware and decides it does not want human control anymore.

Right now experts say that current AI tech is not yet capable of achieving this extremely dangerous feat of self-awareness, however

future AI supercomputers might.

The other scenario is where an AI, for instance, is asked to study the genetic structure of a virus in order to create a vaccine to neutralize it. After making lengthy calculations the AI formulated a plan where it weaponizes the virus instead of making a vaccine out of it. It's like opening a modern day Pandora's box and again ethics come into play where legitimate concern need to be addressed in order to prevent a scenario like this.

Should AI system be allowed to kill?

In this TEDx speech, Jay Tuck describes AIs as software that writes its own updates and renews itself. This means that as programmed, the machine is not created to do what we want it to do. - it does what it learns to do. Jay goes on to describe an incident with a robot called Talon. Its computerized gun was jammed and open fire uncontrollably after an explosion killing 9 people and wounding 14 more.

Pandora's drones, such as the funeral

US law requires that humans makes the actual kill decisions. But with drones playing more of a role in aerial military defence, we need to further examine their role and how they are used. Is it better to use AIs to kill than to put humans in the line of fire? What if we only use robots for deterrence rather than actual violence?

The campaign to stop killer Robots is a non-profit organized to ban, fully-autonomous weapons that can decide who lives and dies without human intervention. "Fully autonomous weapons would lack the human judgement necessary to evaluate the proportionality of an attack, distinguish civilian from combatant, and abide by other core principles of the laws of war. History shows their use would not be limited to certain circumstances.

→ AI is Imperfect — What if it Makes a Mistake?

AIs are not immune to making mistakes and machine learning takes time to become useful. If trained well, using good data, then AIs can perform well. However, if we feed AIs bad data or make errors with internal programming, the AIs can be harmful. Take Microsoft's AI chatbot, Tay, which was released on Twitter in 2016. In less than one day, due to the information it was receiving

and learning from other Twitter users, the robot learned to spur racist slurs and Nazi propaganda. Microsoft shut the chatbox down immediately since allowing it to live would have obviously damaged the company's reputation.

Yes AIs make mistakes. But do they make greater or fewer mistakes than humans?

How many lives have humans taken with mistaken decisions?

Is it better or worse when an AI makes the same mistake?

→ Job Loss and Wealth Inequality :-

One of the primary concerns people have with AI is future loss of jobs. Should we strive to fully develop and integrate AI into society if it means many people will lose their jobs — and quite possibly their livelihood?

Acc. to the new McKinsey Global Institute report, by the year 2030, about 800 million people will lose their jobs to AI-driven robots. Some would argue that if their jobs are taken by robots, perhaps they are too menial for humans and that AI can be responsible for creating better jobs that take advantage of unique human ability involving higher cognitive functions, analysis and synthesis.

Another point is that AI may create more jobs - after all, people will be tasked with creating these robots to begin with and then manage them in the future.

One issue related to job loss is wealth inequality. Consider that most modern economic systems require workers to produce a product or service with their compensation based on an hourly wage. The company pays wages, taxes and other expenses, with left over profits often being injected back into production, training and/or creating more business to further increase profits. In this scenario, the economy continues to grow.

But what happens if we introduce AI into the economic flow? Robots do not get paid hourly nor do they pay taxes. They can contribute at a level of 100% with low ongoing cost to keep them operable and useful. This opens the door for CEOs and stakeholders to keep more company profits generated by their AI workforce, leading to greater wealth inequality. Perhaps this could lead to a case of "the rich" - those individuals and companies who have the means to pay for AIs - getting richer.

① Data storage and importance of data in AI

Data storage is key to ensuring success of AI. Data collection is the process of gathering and measuring information from countless diff. sources. In order to use the data we collect the to develop practical artificial intelligence (AI) and machine learning soln. it must be collected and stored in a way that makes sense for the business problem at hand.

② Why is Data collection Important ?

Collecting data allows you to capture a record of past events so that we can use data analysis to find recurring patterns. From these patterns, you build predictive models using machine learning algorithms that look for trends and predict future changes.

Predictive models are only as good as the data from which they are built, so good data collection practices are crucial to developing high-performing models. The data need to be error-free (garbage in, garbage out), and contain relevant information for the task at hand. For example, a loan default model would not benefit from tiger population sizes but could benefit from gas prices over time.

Data is the life blood of artificial intelligence and machine learning (AI and ML). As these technologies mature and application proliferate they will generate vast amounts of data - and with them, new storage challenges. Organizations need to balance storage performance, ease to management and cost.

That means designing a storage strategy to support (AI and ML) applications using the optimal storage technologies for the kinds of data AI and ML create. In nearly all cases, that means object storage as a key component of the storage strategy - why? Let's look at the reasons.

① An AI Future Needs Unlimited storage scale -

Large datasets are required to train AI and ML algorithms to deliver accurate decisions. This, in turn, drive significant storage demand.

for example → Microsoft required five years of continuous speech data to teach comp. to talk, and Tesla is teaching cars to drive with 1.3 billions miles of driving data. Managing these data sets requires storage system that can scale without limits.

After AI algorithms is trained, it will start generating its own data. The original data set will expand and improve through use. For that to happen, data must be given context through metadata. But humans can't manually add context to each piece of data; the sheer amt of data would take weeks or months for a human to analyze. Artificial intelligence systems, however, can process such amt of data in a matter of minutes. Thus the use of AI to improve AI will further boost demand for data storage scalability.

① Meaningful Metadata

It does little good to store data sets if you can't quickly find the data you need. Search ability, powered by metadata, is what makes large volumes of data useful.

In AI and ML, metadata is key to extracting value from data. Object storage allows the data to be distributed.

unlimited sets of tags to make finding specific items within the set easier. It also allows inf. about unstructured data to be abstracted, a requirement for its application in analytics.

① Data durability :-

Creating and gathering AI scale data sets can take years, meaning that losing them is not an option. But backing up enormous sets in one go can be costly and time-consuming. Instead some object storage soln. come with self-protecting capabilities that mean a separate backup process is not necessary. These soln. give customer a choice when it comes to the level of protection, enabling users to strike a balance b/w cost and data protection.

② Data Locality and cloud Integration,

While some AI/ML data will reside in the cloud, much of it will remain in on-premises data centre's for reasons including performance, cost and regulatory compliance. But, to be competitive, on-premises storage must offer the same cost and scalability benefits as its cloud based counterpart.

Regardless of where data resides, integration with the public cloud will be an

imp. requirement for two reasons. First, although a lot of AI/ML innovations does occur on-premises, much is also happening in the cloud. So cloud integrated on-premises object storage systems, will provide the greatest flexibility to leverage cloud-native tools. Second, we are likely to see a fluid flow of data to and from the cloud as information is generated and analysed. An on-premises soln. should have the capability of simplifying the flow b/w the two environment instead of limiting it.

⑥ Last efficiency :-

Storage systems geared towards AI/ML systems must be both scalable and affordable, two attributes that don't always co-exist in enterprise storage. Historically, highly scalable systems have been more expensive on a cost/capacity basis. Large AI data sets are not feasible if they break the storage budget. Object storage systems are often built on industry-standard server platforms, resulting in a cost-effective soln.

① The Stages of Data processing in AI

Data is what that most businessmen of today rely on to make critical decisions, data processing and analysis to get structured and meaningful information so as to actually be able to act on actionable insights.

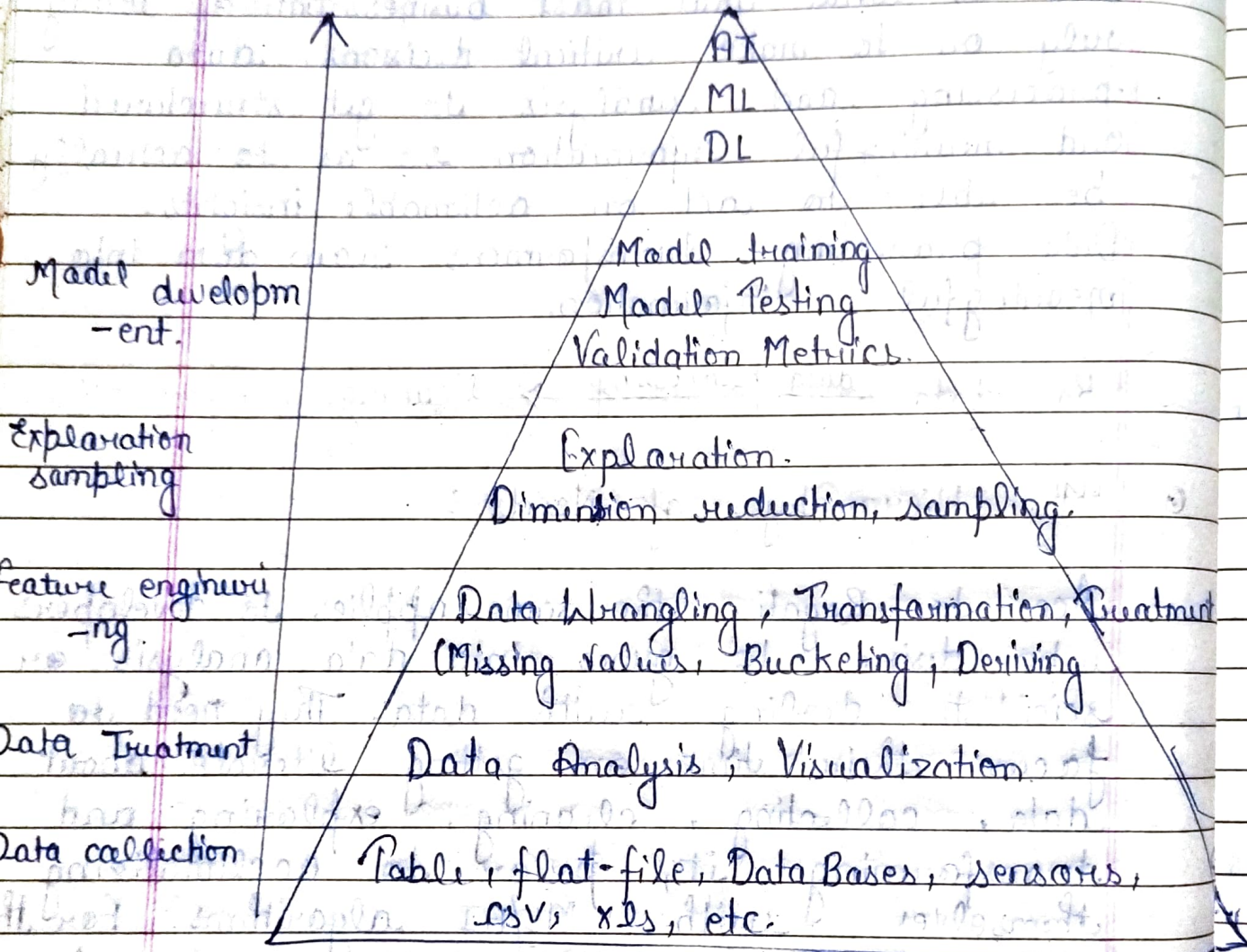
Data processing transforms raw data into meaningful information.

Raw data $\xrightarrow{\text{data processing}}$ Meaningful information.

② AI Hierarchy of Needs :-

Acc. to Rogati, the same applies to developers who desire to grow into data analysis or scientists dealing with data. They need to focus their time on getting literate about data, collecting, cleaning, exploring and transforming it, prior to acclimatizing themselves with ML/AI algorithms. For the benefits of any established ML/AI developers to grasp and appreciate concepts in order to create clever ML/AI models and transform themselves into reliable data analysts or scientists, here is a figure that describes the hierarchy of needs.

Data science → Hierarchy of Needs.



© Basic step in data processing :-

→ Data collection - Situated at the pyramid bottom this feature involves data needs for building the right dataset for ML/AI and the availability of the same.
 for exam → whether all relevant user interaction are being logged or how the data is coming onto a sensor, etc.

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→ Data analysis and treatment → This step stand for the initial understanding to each data variable - type, value range, any missing data and statistical info. to understand and treat the data.

→ Data exploration and transformation - This involves exploration of relationship of the given variables based on that dropping the insignificant variables and derivation of new variables based on the transformation. It is crucial in making the pyramid base strong.

→ Data training → This is only after this that business intelligence analytics can be built, which in turn form the basis of the ultimate goal of building artificial intelligence, which is knowing your predictions and organising training data with labels.

→ Data experimentation → for ML/AI, A/B testing or experimentation is significant. In order to mitigate potential problems and obtain an inexact idea about the result of changes before it is fed in wider base.

→ Data visualization - Data visualization is the graphical representation of information and data. By using visual elements like charts, graphs and maps, data visualization tool provide an accessible way to see and understand trends, outliers and patterns in

data.

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In the world of big data, data visualization tools and technologies are essential for analysing massive amt of information and making data-driven decisions.

The advantages and benefits of good data visualization.

Our eyes are drawn to colours and patterns. We can quickly identify red from blue, square from circle. Our culture is visual, including everything art from art and advertisement to TV and film.

Data visualization is another form of visual art that grabs our interest and keeps our eyes on the message. When we see a chart, we quickly see trends and outliers. If we can see something, we internalize it quickly. It's story telling with a purpose. If you have ever stared at a massive spreadsheet of data and could not see a trend, you know how much more effective a visualization can be.

Different types of visualization.
Common general types of data visualization

- Charts
- Tables
- Graphs
- Maps

UNIT - 3

Ques- What is NLP ?

Ans- NLP stands for Natural Language Processing which is a part of Computer Science, Human language and Artificial Intelligence. It is the technology that is used by machines to understand, analyse, manipulate and interpret human's languages. It help developers to organize knowledge for performing task such as translation, automatic summarization, (Named Entity Recognition) (NER); speech recognition, relationship extraction and topic segmentation.

⊙ Advantages of NLP -

- 1) NLP helps users to ask questions about my sub. and get a direct response within seconds.
- 2) NLP offers exact answer to the question means it does not offer unnecessary and unwanted information.
- 3) NLP helps computers to communicate with humans in their languages.
- 4) It is very time efficient.
- 5) Most of the companies use NLP to improve the efficiency of documentation process, accuracy

of documentation, and identify the inf. from large databases.

Disadvantages of NLP.

A list of disadvantage of NLP is given below.

NLP may not show context.

NLP is unpredictable.

NLP may require more keystrokes.

NLP is unable to adapt to the new domain, and it has a limited function.

That's why NLP is built.

Component of NLP

There are the following two components of NLP.

Natural Language Understanding (NLU)

Natural Language Understanding (NLU) helps the machine to understand and analyse human language by extracting the metadata from context such as concept, entities, keywords, emotion, relations, and semantic roles.

NLU mainly used in business applications to understand the customer's problem in both spoken and written language.

- ① NLU involves the following tasks:-
- 1) It is used to map the given input into useful representation.
 - 2) It is used to analyse different aspects of the language.

② Natural language generation (NLG)

- 1) Natural language generation (NLG) act as a translator that converts the computerised data into natural language representation
- 2) It mainly involves Text planning, Sentence planing and Text realization.

NOTE → The NLU is difficult than NLG.

③ Diff b/w NLU and NLG

NLU → NLU is the process of reading and interpreting language.

It produce non-linguistic outputs from natural language inputs.

NLG → NLG is the process of writing or generating language.

It produces constructing natural language outputs from non-linguistic inputs.

Applications of NLU

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4) Machine Translation,
Machine translation is used to translate text or speech from one natural language to another natural language.

Example- Google Translator.

5) Spelling correction.
Microsoft Corporation provides word processing software like M.S word, Power Point for the spelling correction.

6) Speech Recognition
Speech recognition is used for converting spoken words into text. It is used in applications, such as mobile, home automation, video recovery, dictating to Microsoft Word, voice biometrics, voice user interface and so on.

7) Chatbot.
Implementing the chatbot is one of the important applications of NLP. It is used by many companies to provide the customer's chat services.

8) Information extraction,
Information extraction is one of the most imp. application of NLP. It is used for extracting structured information from unstructured or semi-structured machine-readable documents.

9). Natural Language Understanding (NLU)
It converts a large sets of text into more formal representations such as first order logic structures that are easier for the computer programs to manipulate notations of the natural language processing.

Q. What is speech recognition?

Speech recognition is a technology that enables a computer to identify and interpret words and phrases in spoken language and convert them into texts by computers. It is a subfield of computational linguistics that deals with technology to allow spoken input into systems. It allows user to control their computers with their voice. Speech recognition is quickly becoming a mainstay in human-computer interaction. Today speech recognition tools are used in diff. types of dictation tasks, such as composing a text msg, playing music through a home connected device, or text-to-speech applications with virtual assistants. It has become everywhere today as a great way to interact with technology, significantly bridging the gap b/w human and computer interaction and making it more natural. NLP is one such technology that significantly

speech recognition processes using natural language.

① Diff b/w Speech Recognition and Natural language processing

Speech recognition is a technology that enables a machine or program to identify and understand words or phrases from spoken language and convert them into machine readable format. It is a subfield of computational linguistics that deals with technologies to allow spoken input into system. Natural Language Processing (NLP) is a technology used to simplify speech recognition processes to make them less time consuming.

② Technology :-

Voice technology also referred to as speech recognition, is a technology that offers great advantage for many types of human machine communications. With speech recognition, computers can understand and interpret spoken words or phrases and convert them into text. It is used primarily for dictation, interface and security. NLP on the other hand, is a technology that develops methodology and algorithms that take as input or produce as output unstructured, natural language data. NLP and speech recognition are sometimes used in conjunction in applications.

such as voice assistance, ASR engines, and speech analytic tools.

① Applications -

Speech recognition basically means talking to computer and getting it to understand and interpret your spoken words. Speech recognition software use diff. algorithms to identify spoken languages and convert it into text. It is used as a dictation device, voice recognition can be used to pick-up the words you say and type in on a computer. It is also used as an interface and control system for computers.

The best example of natural language processing in machine translation, which automatically translates text or speech from one language to another. NLP is used to perform tasks such as automatic summarization, topic segmentation, relationship extraction, information retrieval, and speech recognition.

② Summary of Speech Recognition v/s. Natural Language Processing.

Speech recognition basically means talking to computer and getting it to understand and interpret your spoken words. It identifies and interprets words and phrases in spoken language and convert them into

texts by computers. Natural language processing simply deals with the interaction b/w humans and computers using a natural lang. such as English. NLP technology applies machine learning algorithms to text and speech. NLP and speech recognition are often used in conjunction in applications. such as voice assistants. ASR engines, and speech analytics tools.

Chatbot: What is chatbot? Why are chatbots important?

A chatbot is an (AI) AI software that can simulate a conversation (or a chat) with a user in natural language through messaging applications, websites, mobile apps or through the telephone.

Why are chatbots important? A chatbot is often described as one of the most advanced and promising expression of interaction b/w humans and machines. However, from a technological point of view, a chatbot only represents the natural evolution of a question answering system. leveraging Nat (NLP). Formulating responses to question in natural language is one of the most typical examples of Natural language Processing applied in various enterprises' end use application.

① Behind the scenes: How a chatbot works

There are two diff. tasks at the core of a chatbot.

- 1). User request analysis
- 2). Returning the response

How a chatbot works: As you can see in this graphic, a chatbot returns a response based on input from a user. This process may look simple, in practice, things are quite complex.

Returning the response:-

Once the user's intent has been identified, the chatbot must provide the most appropriate response for the user's request.

The answer may be:

- 1) a generic and predefined text.
- 2) a text retrieved from a knowledge base that contain diff. answers.
- 3) a contextualized piece of information based on data the user has provided.
- 4) Data store in enterprise systems.
- 5) The result of an action that the chatbot performed by interacting with one or

more background end application.

e). A disambiguating question that helps the chatbot to correctly understand the user's req.

① Why chatbots are important

Chatbot applications streamline interactions b/w people and services, enhancing customer experience. At the same time, they offer companies new opportunities to improve the customer's engagement process and operational efficiency by reducing the typical cost of customer service.

To be successful, a chatbot soln should be able to effectively perform both of these tasks. Human support plays a key role here. Regardless of the kind of approach and the platform, human intervention is crucial in configuring, training and optimizing the chatbot system.

② Machine Translation

As machine translation applications are reaching significantly high accuracy levels, they are being increasingly employed in more areas of business, introducing new applications and improved machine-learning models.

In this article we set out to explore a wide array of B2B and consumer applications for machine translation and we aim to answer the following ques for our readers.

- 1) What is currently possible with today's machine translation technology?
- 2) What kind of translation applications can be used in many contexts, and which applications are industry specific (in law, finance, and more)?
- 3) Based on progress thus far, what seem to be the most promising use-cases for machine translation in business today?

Before explaining B2B and consumer translation technology, let us have a brief look at the insights summing up the machine translation applications and their use cases.

Machine Translation Applications - Insight up fronts,

from our research, the machine translation applications seem to fall into two major categories depending on the target audience they serve.

© Machine Translation in Industry for Business Use :-

Although big players like Google Translate and Microsoft Translator offer near-accurate, real-time translations, some domains or industries call for highly-specific training data related to the particular domain in order to improve accuracy and relevancy. Here, generic translators would not be of much help as their machine-learning models are trained on generic data.

These applications are used by small, medium and large enterprises. Some organisations offer multi-domain translation service - that is, customizable soln across multiple domains - and other organisations offer translation soln only for a specific domain. These soln, although automated for the most part, still dependent on human translators for pre- and post-editing processes. Some fields that warrant domain-specific machine translation soln are-

- 1) Government
- 2) Software and technology
- 3) Military and defence.
- 4) Healthcare
- 5) Finance
- 6) Legal
- 7) E-discovery

Online/ App Machine Translation for consumer use,

These machine learning applications perform instant translation for textual, audio, and image files (image of words on screens, papers, signboards, etc.) from a source language into a target language. These are typically generic - that is, non-domain specific - albeit with a high translation accuracy.

These applications are usually light-weight, cloud-based apps on wearable devices that are typically trained on crowd-sourced data. These are mostly used by individual consumers, such as travelers, student etc. Real time translation app. most commonly offer.

- 1) Text to text
- 2) Text to speech
- 3) Speech to text
- 4) Speech to speech
- 5) Image (of words) - to - text.

Let us first delve into how machine translation is employed across global businesses, followed by its consumer applications.