

TEACHBOT(TEACHING ROBOT) USING ARTIFICIAL INTELLIGENCE AND NATURAL LANGUAGE PROCESSING

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Abstract:

The teaching robot is used for teaching the school students, undergraduates, postgraduates, research scholars and others. This can be designed using natural language processing and artificial intelligence. This can be helpful to the teachers, academician, educators, Research scholars and to the people who is interested to learning. Artificial intelligence is given to teachbot to fetch the specific topic from the topics stored and it tech it to the students. presentation, portable document files, text, images can also be stored in teachbot and it should have the ability to draw the pictures, diagrams, tables while teaching and explanation is given. The robot is loaded with all the documents, presentation, news etc. This robot can be used as a news reader, singer, player-any games, trainer to software people, adviser to business people. The main aim is to make a single robot for all purpose. From preparing budget to read it to the people in assembly can also be done. It can eliminate all the work or burden of a human being in future especially teaching people.

Keywords Teachbot, learning, retrieving, uses of robot

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1.Introduction

The teaching robot is used for teaching the school students, undergraduates, postgraduates, research scholars and others. This can be designed using natural language processing and artificial intelligence. This can be helpful to the teachers, academician, educators, Research scholars and to the people who is interested to learning. Artificial intelligence is given to teachbot to fetch the specific topic from the topics stored and it teach it to the students. The presentation, portable document files, text, images can also be stored in teach robot and it should have the ability to draw the pictures, diagrams, tables while teaching and explanation is given. Intelligence is to be given for robots to be able to handle identification of student/people from the speech or voice of them. It can be loaded with any kind of subjects like current affairs, general knowledge, history to computers, software, politics or any topic. In school or college if one is specialized in one area he/she is eligible to teach in that field. But a teachbot can teach any kind of subjects. The teach robot can take the lecture or class interestingly. It can be loaded with all the books, journals and all.

The robot is connected to the internet by software and it can retrieve all the information within a fraction of a second and it can deliver the lecture easily. The foreign language teaching is difficult to human. But if we give artificial intelligence to the robot learning a new language is easy and also at the same time new languages can be generated by the teachbot easily. Classrooms use robots mostly for very specific and repetitive tasks, such as vocabulary, attendance and behavior imitation. This type of Artificial Intelligence-powered technology can learn as it teaches, in tandem of creating a persona (albeit artificial) of unbridled knowledge and limitless patience.

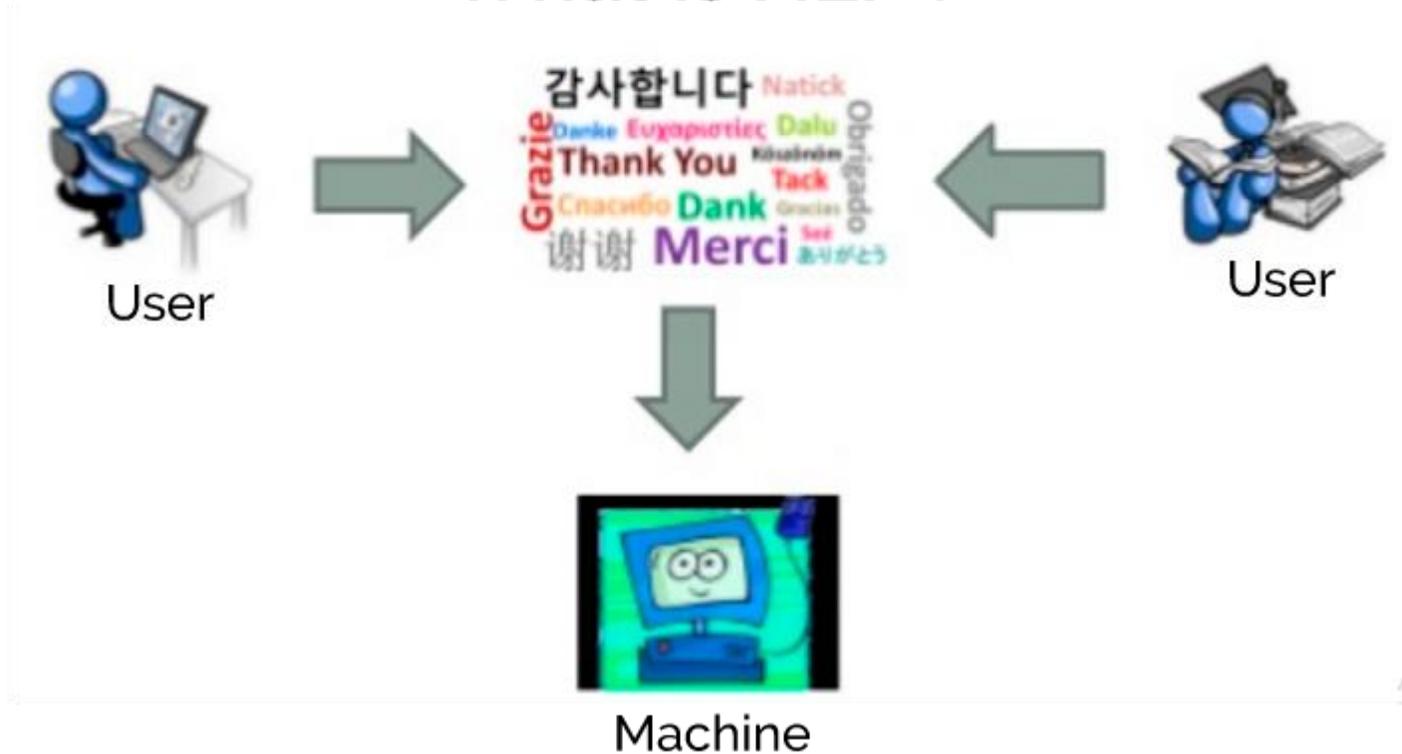
2. Natural language processing for teaching Robot (Teachbot)

2.1 What is Natural Language Processing?

Natural Language Processing (NLP) is “ability of machines to understand and interpret human language the way it is written or spoken”.

The objective of NLP is to make computer/machines as intelligent as human beings in understanding language.

What is NLP ?



The ultimate goal of NLP is to fill the gap how the humans communicate (natural language) and what the computer understands (machine language).

There are three different levels of linguistic analysis done before performing NLP -

Syntax—What part of given text is grammatically true.

Semantics—What is the meaning of given text?

Pragmatics—What is the purpose of the text?

NLP deal with different aspects of language such as

Phonology—It is systematic organization of sounds in language.

Morphology—It is a study of words formation and their relationship with each other.

Approaches of NLP for understanding semantic analysis

- **Distributional**—It employs large-scale statistical tactics of Machine Learning and Deep Learning.
- **Frame—Based**—The sentences which are syntactically different but semantically same are represented inside data structure (frame) for the stereotyped situation.

- **Theoretical**—This approach is based on the idea that sentences refer to the real world (the sky is blue) and parts of the sentence can be combined to represent whole meaning.
- **Interactive Learning**—It involves pragmatic approach and user is responsible for teaching the computer to learn the language step by step in an interactive learning environment. The true success of NLP lies in the fact that humans deceive into believing that they are talking to humans instead of computers.

Why Do We Need NLP?

With NLP, it is possible to perform certain tasks like **Automated Speech** and **Automated Text Writing** in less time.

Due to the presence of large data (text) around, why not we use the computers untiring willingness and ability to run several algorithms to perform tasks in no time.

These tasks include other NLP applications like **Automatic Summarization**(to generate summary of given text) and **Machine Translation** (translation of one language into another)

Process of NLP

In case the text is composed of speech, speech-to-text conversion is performed.

The mechanism of Natural Language Processing involves two processes:

- **Natural Language Understanding**
- **Natural Language Generation**

Natural Language Understanding

NLU or Natural Language Understanding tries to understand the meaning of given text. The nature and structure of each word inside text must be understood for NLU. For understanding structure, NLU tries to resolve following ambiguity present in natural language:

- **Lexical Ambiguity**—Words have multiple meanings
- **Syntactic Ambiguity**—Sentence having multiple parse trees.
- **Semantic Ambiguity**—Sentence having multiple meanings
- **Anaphoric Ambiguity**—Phrase or word which is previously mentioned but has a different meaning.

Next, the meaning of each word is understood by using lexicons (vocabulary) and set of grammatical rules.

However, there are certain different words having similar meaning (synonyms) and words having more than one meaning (polysemy).

Natural Language Generation

It is the process of automatically producing text from structured data in a readable format with meaningful phrases and sentences. The problem of natural language generation is hard to deal with. It is subset of NLP

Natural language generation divided into three proposed stages:-

1. **Text Planning**—Ordering of the basic content in structured data is done.
2. **Sentence Planning**—The sentences are combined from structured data to represent the flow of information.
3. **Realization**—Grammatically correct sentences are produced finally to represent text.

Difference Between NLP and Text Mining Natural Language Processing (NLP) refers to AI method of communicating with the intelligent systems using a natural language such as English.

Processing of Natural Language is required when you want an intelligent system like robot to perform as per your instructions, when you want to teach, taking decision from a variety of topics stored.

The field of NLP involves making computers to perform useful tasks with the natural languages humans use. The input and output of an NLP system can be

- Speech
- Written Text

2.1 Components of NLP

There are two components of NLP as given

2.1.1 Natural Language Understanding (NLU)

Understanding involves the following tasks –

- Mapping the given input in natural language into useful representations.
- Analyzing different aspects of the language.

2.1.2 Natural Language Generation (NLG)

It is the process of producing meaningful phrases and sentences in the form of natural language from some internal representation. In this we are making the robot to learn the language and pronounce the text and sentences to teach to the students, people.

- **Text planning** – It includes retrieving the relevant content from knowledge base.
- **Sentence planning** – It includes choosing required words, forming meaningful phrases, setting tone of the sentence.
- **Text Realization** – It is mapping sentence plan into sentence structure.
- **Speech Synthesizer**-It contains the speech modulation.
- **Document Reader**-It is mapping to read the document in a nice voice.

3. Artificial intelligence and nlp for teachbot

Natural Language Processing (NLP) refers to AI method of communicating with an intelligent systems using a natural language such as English.

Processing of Natural Language is required when you want an intelligent system like robot to perform as per your instructions, when you want to hear decision from a dialogue based clinical expert system, etc.

The field of NLP involves making computers to perform useful tasks with the natural languages humans use.

Text planning – It includes retrieving the relevant content from knowledge base.

- **Sentence planning** – It includes choosing required words, forming meaningful phrases, setting tone of the sentence.
- **Text Realization** – It is mapping sentence plan into sentence structure.

The NLU is harder than NLG.

4. Difficulties in NLU

NL has an extremely rich form and structure.

It is very ambiguous. There can be different levels of ambiguity –

- **Lexical ambiguity** – It is at very primitive level such as word-level.
- For example, treating the word “board” as noun or verb?
- **Syntax Level ambiguity** – A sentence can be parsed in different ways.
- For example, “He lifted the beetle with red cap.” – Did he use cap to lift the beetle or he lifted a beetle that had red cap?
- **Referential ambiguity** – Referring to something using pronouns. For example, Rima went to Gauri. She said, “I am tired.” – Exactly who is tired?

- One input can mean different meanings.
- Many inputs can mean the same thing.

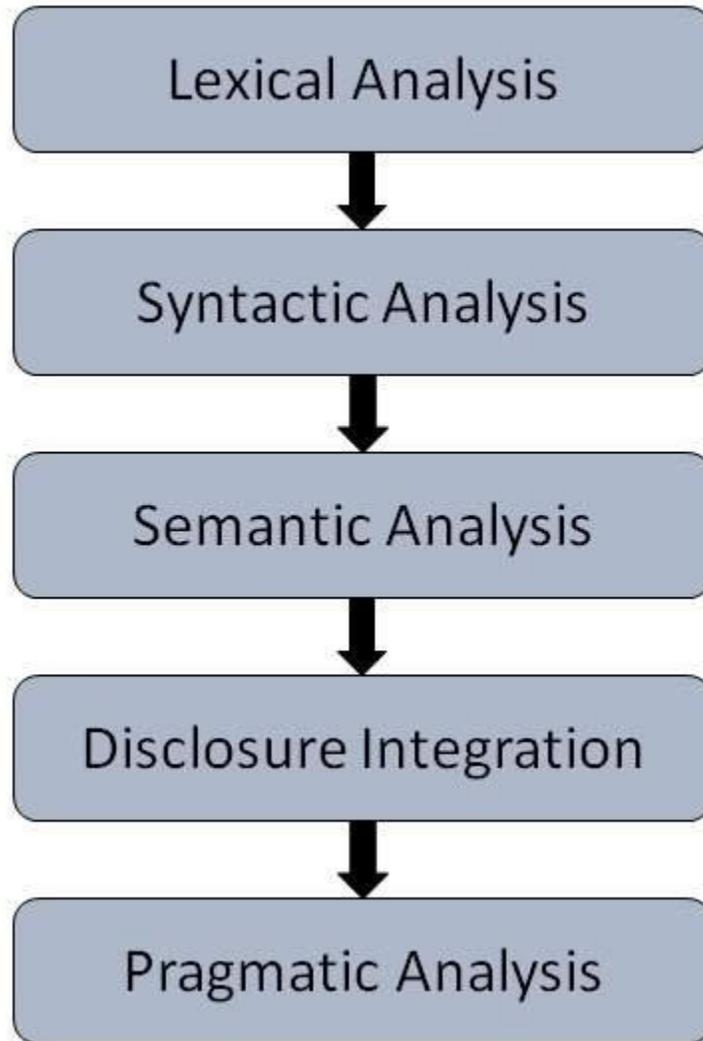
NLP Terminology

- **Phonology** – It is study of organizing sound systematically.
- **Morphology** – It is a study of construction of words from primitive meaningful units.
- **Morpheme** – It is primitive unit of meaning in a language.
- **Syntax** – It refers to arranging words to make a sentence. It also involves determining the structural role of words in the sentence and in phrases.
- **Semantics** – It is concerned with the meaning of words and how to combine words into meaningful phrases and sentences.
- **Pragmatics** – It deals with using and understanding sentences in different situations and how the interpretation of the sentence is affected.
- **Discourse** – It deals with how the immediately preceding sentence can affect the interpretation of the next sentence.
- **World Knowledge** – It includes the general knowledge about the world.

Steps in NLP

There are general five steps –

- **Lexical Analysis** – It involves identifying and analyzing the structure of words. Lexicon of a language means the collection of words and phrases in a language. Lexical analysis is dividing the whole chunk of txt into paragraphs, sentences, and words.
- **Syntactic Analysis (Parsing)** – It involves analysis of words in the sentence for grammar and arranging words in a manner that shows the relationship among the words. The sentence such as “The school goes to boy” is rejected by English syntactic analyzer.



5. Components of the teachbot

- **Electric motors (AC/DC)** – They are required for rotational movement.
- **Pneumatic Air Muscles** – They contract almost 40% when air is sucked in them.
- **Muscle Wires** – They contract by 5% when electric current is passed through them.
- **Piezo Motors and Ultrasonic Motors** – Best for industrial robots.
- **Sensors** – They provide knowledge of real time information on the task environment.

Robots are equipped with vision sensors to be to compute the depth in the environment. A tactile sensor imitates the mechanical properties of touch receptors of human fingertips.

6.Computer Vision of teachbot

This is a technology of AI with which the robots can see. The computer vision plays vital role in the domains of safety, security, health, access, and entertainment.

Computer vision automatically extracts, analyzes, and comprehends useful information from a single image or an array of images. This process involves development of algorithms to accomplish automatic visual comprehension.

Hardware of Computer Vision System of teachbot

This involves –

- Power supply
- Image acquisition device such as camera
- a processor
- a software
- A display device for monitoring the system
- Accessories such as camera stands, cables, and connectors

7.Tasks of Computer Vision of teachbot

- **OCR** – In the domain of computers, Optical Character Reader, a software to convert scanned documents into editable text, which accompanies a scanner.
- **Face Detection** – Many state-of-the-art cameras come with this feature, which enables to read the face and take the picture of that perfect expression. It is used to let a user access the software on correct match.
- **Object Recognition** – They are installed in supermarkets, cameras, high-end cars such as BMW, GM, and Volvo.
- **Estimating Position** – It is estimating position of an object with respect to camera as in position of tumor in human's body.

8..Application Domains of teachbot

- Agriculture
- Autonomous vehicles
- Biometrics
- Character recognition

- Forensics, security, and surveillance
- Industrial quality inspection
- Face recognition
- Gesture analysis
- Geoscience
- Medical imagery
- Pollution monitoring
- Process control
- Remote sensing
- Robotics
- Transport

8.Applications of teaching Robotics

The teaching Robot can also be used for the following.

The robotics has been instrumental in the various domains such as –

- **Industries** – Robots are used for handling material, cutting, welding, color coating, drilling, polishing, etc.
- **Military** – Autonomous robots can reach inaccessible and hazardous zones during war. A robot named *Daksh*, developed by Defense Research and Development Organization (DRDO), is in function to destroy life-threatening objects safely.
- **Medicine** – The robots are capable of carrying out hundreds of clinical tests simultaneously, rehabilitating permanently disabled people, and performing complex surgeries such as brain tumors.
- **Exploration** – The robot rock climbers used for space exploration, underwater drones used for ocean exploration are to name a few.
- **Entertainment**- engineers have created hundreds of robots for movie making.

9. Speech Recognition

Speech recognition is the technology where the teaching robot should understand the questions, doubts raised by the students. It take the speech or voice of the students by using a microphone. Spoken out is converted in to the digital format.This digital input is broken down into the

unit/symbol that represents sounds of speech. This is compared with the voice of the student from its database and it identifies the student's voice.

10. Artificial intelligence to Teachbot

Artificial intelligence is given to the robot to store the documents, newspaper, diagrams, tables from the books, journals etc. It should fetch the specific topic from the topics, documents, portable document files stored and it should be designed to deliver the topics neatly without any error. It is given with the knowledge to present the topic clearly when the students raise the questions from the specific topic.

11. Robot teachers (teachbot)-advantages

The teaching robot (teachbot) are programmed for their jobs and they will always obey and find the solution easily and fastly when compared to the human. They are the solution to the education, they can teach you technological skills as well as any kind of topic without any irritation and hesitation. They can teach poor kids that have no chance to ever go in contact with technology and they do not have to get paid for that. It will not beat or give any kind of punishment to the students.

The robot teachers are better than the human, they are new & they will have new methods but other-ways the teachers have the old methods while the robot teachers have up to date methods, if the robots become the teachers it will not get tired, it will teach at any time anywhere, any topic to any person including the science, technology, medical, business, software etc.

The robot teachers are mainly used as the classroom assistants in the elementary schools, some robots can transmit the video from far places, so, the teacher does not have to be in the classroom if they do not live in the country, the kids not only love the robots, but also that the robots benefit the kids in the classroom.

The scientists think that the social interaction with the live human being is crucial for learning to take place in children under 1 year, in the future, more and more of us will learn from the social

robots, especially the kids learning pre-school skills and the students of all ages studying a new language.

The social robots are being used on the experimental basis already to teach various skills to the preschool children, including the colour names, the new vocabulary words and the songs and they can save the money for the schools by not having to pay the teachers.

In the future, the robots (teachbot) will only be used to teach certain skills such as acquiring the foreign or new language, possibly in the playgroups with the children or to the individual adults, but the robot teachers can be cost-effective compared to the expense of paying the human beings. The teaching robot can take the classes, presentation without boring and it can cut many jokes in the relevant field if it is loaded with all topic.

12. Robot teacher Disadvantages

Many schools don't have a lot of money, They don't pay their teachers, So, they will not afford the robot teacher even at the cheapest price, The robots need the electricity and the electricity costs a lot.

The robot teachers do not have feelings, they are not able to help you to get over things and help you feel better but the human teachers can and the robot wouldn't know what to do.

If we converted to the robots, the teachers and staff worldwide would lose their jobs, The robots are not able to develop the personal distinctions between the students.

Implementing this technology in the classroom requires the existing infrastructure for the electricity and Internet, an instructor device (desktop/laptop/iPad) is needed to connect to and the software to enable the use of all aspects of the hardware.

The robot teachers are higher cost technologies in the developing world, the software is employed on low-cost laptops, desktops or tablets to simulate the teacher instruction.

In these classrooms, the entire curriculum can be imparted to the students through the computer program, making a quality human teacher unnecessary.

There are no inspiring robot teachers, they are all programmed to spit the knowledge out at the students and expect the students to spit it back at them,

The robot teacher cannot develop the creative or innovative ideas for teaching the material in a new way, it cannot comment on the papers to provide the students with valuable positive feedback or the critiques.

The robot teacher cannot pull the struggling student aside and determine if there are the personal issues related to his/her performance , It cannot encourage the students with the particular strength and interest in the subject to consider certain career paths .

In developing regions, employing technology as the alternative to the human instruction makes it is difficult to gauge the design specifications for the effective instructional software.

13. Minimum Requirements for Systems to be AI—Enabled

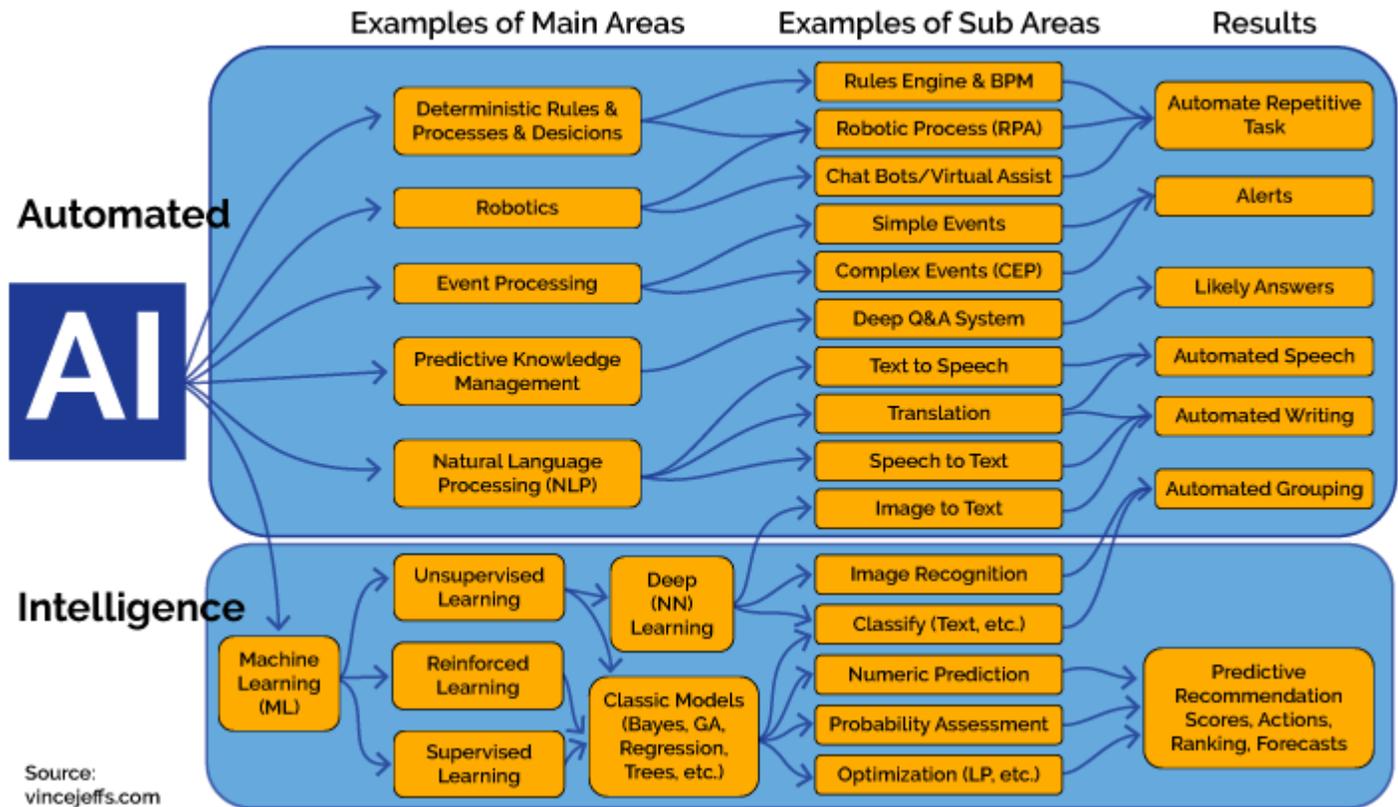
AI or Artificial Intelligence—Building systems that can do intelligent things.

NLP or Natural Language Processing—Building systems that can understand language. It is a subset of Artificial Intelligence.

ML or Machine Learning—Building systems that can learn from experience. It is also a subset of Artificial Intelligence.

NN or Neural Network—Biologically inspired network of Artificial Neurons.

DL or Deep Learning—Building systems that use Deep Neural Network on a large set of data. It is a subset of Machine Learning.



- same interpretation is coming from different sources like applications or operating systems.
- **Classification & Tagging**—Classification & Tagging of different log messages involves ordering of messages and tagging them with different keywords for later analysis.
- **Artificial Ignorance**—It is a kind of technique using machine learning algorithms to discard uninteresting log messages. It is also used to detect an anomaly in the normal working of systems.

14.Role of NLP in Teachbot

Natural Language processing techniques are widely used in log analysis and log mining.

The different techniques such as tokenization, stemming, lemmatization, parsing etc are used to convert log messages into structured form.

Once logs are available in the well-documented form, log analysis, and log mining is performed to extract useful information and knowledge is discovered from information.

The example in case of error log caused due to server failure.

Dividing into Natural Language Processing

Natural language processing is a complex field and is the intersection of artificial intelligence, computational linguistics, and computer science

Future work

In the future, this teachbot can be used to singing a song when the lyrics are given, it can compose music and also designed to create many stories and acts as a story writer for the films. The robot is loaded with all the documents, presentation, news etc. This robot can be used as a news reader, singer, player-any games, trainer to software people, adviser to business people. The main aim is to make a single robot for all purpose. From preparing budget to read it to the people in assembly can also be done. It can eliminate all the work or burden of a human being in future especially teaching people. It can be used as a news reader if the news is given in the document forms.

It also can prepare a budget for the nation with the previous figures and produce a new budget for the nation and also it will read it in the assembly. It also used to market the products in future.

Conclusion

With this teachbot human being work can be replaced in various ways. Human beings get tired when he has lot of work. But robot cannot get tired. It can do more work than a human being. IT can teach for 24/7 also. This is the new kind of teaching.

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