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Technical Support and Implementation of AI

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Abstract: *Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the acquisition of information and rules for using the information), reasoning (using rules to reach approximate or definite conclusions) and self-correction. Particular applications of AI include expert systems, speech recognition and machine vision. Nowadays lots of research is going on towards the development of application based on the artificial intelligence. In older days, traditional and successful programming languages were using for the development of AI. But, there is efforts to have the new tools and programming language for the AI implementation. This paper summarises the various programming languages available for the implementation of AI. It also discuss various system for the study of AI.*

Keywords: *Artificial Intelligence, Robotics, Lisp, Programming, Machine Learning.*

I. Introduction

In computer science, artificial intelligence (AI), sometimes called machine intelligence, is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans and animals. Computer science defines AI research as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals.[1] Colloquially, the term "artificial intelligence" is used to describe machines that mimic "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving".[2]

As machines become increasingly capable, tasks considered to require "intelligence" are often removed from the definition of AI, a phenomenon known as the AI effect. A quip in Tesler's Theorem says "AI is whatever hasn't been done yet."[3] For instance, optical character recognition is frequently excluded from things considered to be AI, having become a routine technology.[4] Modern machine capabilities generally classified as AI include successfully understanding human speech,[5] competing at the highest level in strategic game systems (such as chess and Go),[6] autonomously operating cars, intelligent routing in content delivery networks, and military simulations.

Artificial intelligence can be classified into three different types of systems: analytical, human-inspired, and humanized artificial intelligence.[7] Analytical AI has only characteristics consistent with cognitive intelligence; generating a cognitive representation of the world and using learning based on past experience to inform future decisions. Human-inspired AI has elements from cognitive and emotional intelligence; understanding human emotions, in addition to cognitive elements, and considering them in their decision making. Humanized AI shows characteristics of all types of competencies (i.e., cognitive, emotional, and social intelligence), is able to be self-conscious and is self-aware in interactions with others.

Artificial intelligence was founded as an academic discipline in 1956, and in the years since has experienced several waves of optimism,[8][9] followed by disappointment and the loss of funding (known as an "AI winter"),[10][11] followed by new approaches, success and renewed funding.[9][12] For most of its history, AI research has been divided into subfields that often fail to communicate with each other.[13] These sub-fields are based on technical considerations, such as particular goals (e.g. "robotics" or "machine learning"),[14] the use of particular tools ("logic" or artificial neural networks), or deep philosophical differences.[15][16][17] Subfields have also been based on social factors (particular institutions or the work of particular researchers).[13]

The traditional problems (or goals) of AI research include reasoning, knowledge representation, planning, learning, natural language processing, perception and the ability to move and manipulate objects.[14] General intelligence is among the field's long-term goals.[18] Approaches include statistical methods, computational intelligence, and traditional symbolic AI. Many tools are used in AI, including versions of search and mathematical optimization, artificial neural networks, and methods based on statistics, probability and economics. The AI field draws upon computer science, information engineering, mathematics, psychology, linguistics, philosophy, and many other fields.

The field was founded on the claim that human intelligence "can be so precisely described that a machine can be made to simulate it".[19] This raises philosophical arguments about the nature of the mind and

the ethics of creating artificial beings endowed with human-like intelligence which are issues that have been explored by myth, fiction and philosophy since antiquity.[20] Some people also consider AI to be a danger to humanity if it progresses unabated.[21] Others believe that AI, unlike previous technological revolutions, will create a risk of mass unemployment.[22]

In the twenty-first century, AI techniques have experienced a resurgence following concurrent advances in computer power, large amounts of data, and theoretical understanding; and AI techniques have become an essential part of the technology industry, helping to solve many challenging problems in computer science, software engineering and operations research.[23][12]

Figure 1: *Talos, an ancient mythical automaton with artificial intelligence (Source: wiki)*

II. AI Based Programming Language

Artificial Intelligence is a branch of engineering, which basically aims for making the computers which can think intelligently, in the similar manner the intelligent humans think. Here are the top languages that are most commonly used for making the AI projects:

1. Python

Python is considered to be in the first place in the list of all AI development languages due to the simplicity. The syntaxes belonging to python are very simple and can be easily learnt. Therefore, many AI algorithms can be easily implemented in it. Python takes short development time in comparison to other languages like Java, C++ or Ruby. Python supports object oriented, functional as well as procedure oriented styles of programming. There are plenty of libraries in python, which make our tasks easier. For example: Numpy is a library for python that helps us to solve many scientific computations. Also, we have Pybrain, which is for using machine learning in Python.

2. R

R is one of the most effective language and environment for analysing and manipulating the data for statistical purposes. Using R, we can easily produce well-designed publication-quality plot, including mathematical symbols and formulae where needed. Apart from being a general purpose language, R has numerous of packages like RODBC, Gmodels, Class and Tm which are used in the field of machine learning. These packages make the implementation of machine learning algorithms easy, for cracking the business associated problems.

3. Lisp

Lisp is one of the oldest and the most suited languages for the development in AI. It was invented by John McCarthy, the father of Artificial Intelligence in 1958. It has the capability of processing the symbolic information effectively.

It is also known for its excellent prototyping capabilities and easy dynamic creation of new objects, with automatic garbage collection. Its development cycle allows interactive evaluation of expressions and recompilation of functions or file while the program is still running. Over the years, due to advancement, many of these features have migrated into many other languages thereby affecting the uniqueness of Lisp.

4. Prolog

This language stays alongside Lisp when we talk about development in AI field. The features provided by it include efficient pattern matching, tree-based data structuring and automatic backtracking. All these features provide a surprisingly powerful and flexible programming framework. Prolog is widely used for working on medical projects and also for designing expert AI systems.

5. Java

Java can also be considered as a good choice for AI development. Artificial intelligence has lot to do with search algorithms, artificial neural networks and genetic programming. Java provides many benefits: easy use, debugging ease, package services, simplified work with large-scale projects, graphical representation of data and better user interaction. It also has the incorporation of Swing and SWT (the Standard Widget Toolkit). These tools make graphics and interfaces look appealing and sophisticated.

III. Tools Of AI

AI has developed a large number of tools to solve the most difficult problems in computer science. A few of the most general of these methods are discussed below

- **Search and optimization**

Many problems in AI can be solved in theory by intelligently searching through many possible solutions: Reasoning can be reduced to performing a search. For example, logical proof can be viewed as searching for a path that leads from premises to conclusions, where each step is the application of an inference rule.Planning algorithms search through trees of goals and sub-goals, attempting to find a path to a target goal, a process called means-ends analysis.Robotics algorithms for moving limbs and grasping objects use local searches in configuration space. Many learning algorithms use search algorithms based on optimization.

- **Logic**

Logic is used for knowledge representation and problem solving, but it can be applied to other problems as well. For example, the satplan algorithm uses logic for planning and inductive logic programming is a method for learning.

Several different forms of logic are used in AI research. Propositional logic involves truth functions such as "or" and "not". First-order logic adds quantifiers and predicates, and can express facts about objects, their properties, and their relations with each other. Fuzzy set theory assigns a "degree of truth" (between 0 and 1) to vague statements such as "Alice is old" (or rich, or tall, or hungry) that are too linguistically imprecise to be completely true or false. Fuzzy logic is successfully used in control systems to allow experts to contribute vague rules such as "if you are close to the destination station and moving fast, increase the train's brake pressure"; these vague rules can then be numerically refined within the system. Fuzzy logic fails to scale well in knowledge bases; many AI researchers question the validity of chaining fuzzy-logic inferences.

- **Probabilistic methods for uncertain reasoning**

Many problems in AI (in reasoning, planning, learning, perception, and robotics) require the agent to operate with incomplete or uncertain information. AI researchers have devised a number of powerful tools to solve these problems using methods from probability theory and economics.

- **Classifiers and statistical learning methods**

The simplest AI applications can be divided into two types: classifiers ("if shiny then diamond") and controllers ("if shiny then pick up"). Controllers do, however, also classify conditions before inferring actions, and therefore classification forms a central part of many AI systems. Classifiers are functions that use pattern matching to determine a closest match. They can be tuned according to examples, making them very attractive for use in AI. These examples are known as observations or patterns. In supervised learning, each pattern belongs to a certain predefined class. A class can be seen as a decision that has to be made. All the observations combined with their class labels are known as a data set. When a new observation is received, that observation is classified based on previous experience.

- **Artificial neural networks**

Neural networks, or neural nets, were inspired by the architecture of neurons in the human brain. A simple "neuron" N accepts input from multiple other neurons, each of which, when activated (or "fired"), cast a weighted "vote" for or against whether neuron N should itself activate. Learning requires an algorithm to adjust these weights based on the training data; one simple algorithm (dubbed "fire together, wire together") is to increase the weight between two connected neurons when the activation of one triggers the successful activation

of another. The net forms "concepts" that are distributed among a subnetwork of shared[j] neurons that tend to fire together; a concept meaning "leg" might be coupled with a subnetwork meaning "foot" that includes the sound for "foot". Neurons have a continuous spectrum of activation; in addition, neurons can process inputs in a nonlinear way rather than weighing straightforward votes. Modern neural nets can learn both continuous functions and, surprisingly, digital logical operations. Neural networks' early successes included predicting the stock market and (in 1995) a mostly self-driving car.[k] In the 2010s, advances in neural networks using deep learning thrust AI into widespread public consciousness and contributed to an enormous upshift in corporate AI spending; for example, AI-related M&A in 2017 was over 25 times as large as in 2015.

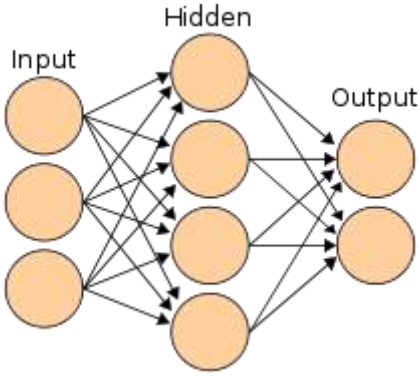

Figure 2: *Artificial Neural Network*

- **Evaluating progress**

AI, like electricity or the steam engine, is a general purpose technology. There is no consensus on how to characterize which tasks AI tends to excel at. While projects such as Alpha Zero have succeeded in generating their own knowledge from scratch, many other machine learning projects require large training datasets. Researcher Andrew Ng has suggested, as a "highly imperfect rule of thumb", that "almost anything a typical human can do with less than one second of mental thought, we can probably now or in the near future automate using AI." Moravec's paradox suggests that AI lags humans at many tasks that the human brain has specifically evolved to perform well.

IV. Applications Of AI

AI is relevant to any intellectual task.Modern artificial intelligence techniques are pervasive and are too numerous to list here. Frequently, when a technique reaches mainstream use, it is no longer considered artificial intelligence; this phenomenon is described as the AI effect.

High-profile examples of AI include autonomous vehicles (such as drones and self-driving cars), medical diagnosis, creating art (such as poetry), proving mathematical theorems, playing games (such as Chess or Go), search engines (such as Google search), online assistants (such as Siri), image recognition in photographs, spam filtering, predicting flight delays, prediction of judicial decisions and targeting online advertisements.

With social media sites overtaking TV as a source for news for young people and news organisations increasingly reliant on social media platforms for generating distribution, major publishers now use artificial intelligence (AI) technology to post stories more effectively and generate higher volumes of traffic.

- **Healthcare**

Artificial intelligence is breaking into the healthcare industry by assisting doctors. According to Bloomberg Technology, Microsoft has developed AI to help doctors find the right treatments for cancer. There is a great amount of research and drugs developed relating to cancer. In detail, there are more than 800 medicines and vaccines to treat cancer. This negatively affects the doctors, because there are too many options to choose from, making it more difficult to choose the right drugs for the patients. Microsoft is working on a project to develop a machine called "Hanover". Its goal is to memorize all the papers necessary to cancer and help predict which combinations of drugs will be most effective for each patient. One project that is being worked on at the moment is fighting myeloid leukemia, a fatal cancer where the treatment has not improved in decades. Another study was reported to have found that artificial intelligence was as good as trained doctors in identifying skin cancers. Another study is using artificial intelligence to try and monitor multiple high-risk patients, and this is done by asking each patient numerous questions based on data acquired from live doctor to patient interactions. One study was done with transfer learning, the machine performed a diagnosis similarly to a

well-trained ophthalmologist, and could generate a decision within 30 seconds on whether or not the patient should be referred for treatment, with more than 95% percent accuracy.

- **Automotive**

Recent developments in autonomous automobiles have made the innovation of self-driving trucks possible, though they are still in the testing phase. The UK government has passed legislation to begin testing of self-driving truck platoons in 2018. Self-driving truck platoons are a fleet of self-driving trucks following the lead of one non-self-driving truck, so the truck platoons aren't entirely autonomous yet. Meanwhile, the Daimler, a German automobile corporation, is testing the Freightliner Inspiration which is a semi-autonomous truck that will only be used on the highway.

- **Finance and Economics**

Banks use artificial intelligence systems today to organize operations, maintain book-keeping, invest in stocks, and manage properties. AI can react to changes overnight or when business is not taking place. In August 2001, robots beat humans in a simulated financial trading competition. AI has also reduced fraud and financial crimes by monitoring behavioral patterns of users for any abnormal changes or anomalies.

- **Research**

Artificial is having big scope in research. AI use in many part of robotics. AI use for the problem solving, image recognition, machine learning, etc.

V. Future Aspects Of AI

Artificial Intelligence is used by one another after the company for its benefits. Also, it's fact that artificial intelligence is reached in our day-to-day life. Moreover, with a breakneck speed.
On the basis of this information, arises a new question:

- Is it possible that artificial Intelligence outperforms human performance?
- If yes, then is it happens and how much does it take?
- Only when Artificial Intelligence is able to do a job better than humans.

According to the survey results:

- Machines are predicted to be better than humans in translating languages;
- Running a truck;
- Working in the retail sector, and can completely outperform humans by 2060.

As a result, MI researchers believed that AI will become better than humans in the next 40-year time frame.

- To build AI smarter, companies have already acquired around 34 AI startups. It was acquired in the first quarter of 2017. These companies are reinforcing their leads in the world of Artificial Intelligence.
- In every sphere of life, AI is present. We use AI to organize big data into different patterns and structures. Also, patterns help in a neural network, machine learning, and data analytics.
- From 80's to now, Artificial intelligence is now part of our everyday lives, it's very hard to believe. Moreover, it is becoming more intelligent and accepted every day. Also, with lots of opportunities for business.

VI. Conclusion

AI is provide the very high dimensions to work across multiple platforms. We are having many examples of AI applications life Sophia. AI and ML will be the new development method for solving the all kinds of the problems.

AI works across all branches of robotics. It also serve for the human related problems like business decision, health system, etc. It's a good support to decision support system.

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