ARTIFICIAL INTELLIGENCE'S EFFECT ON NETWORKING TECHNOLOGY IN THE FUTURE

PRABHAKARA RAO . U
RESEARCH SCHOLAR, JS UNIVERSITY[1]

Dr. DYAN CHANDRA YADAV,

PROFESSOR, CSE DEPARTMENT, JS UNIVERSITY[2]

ABSTRACT

Artificial Intelligence is the science and engineering of making intelligent machines, aimed at providing machines with the ability to think, reach, and surpass human-level intelligence. In this paper, we begin with an introduction to the general field of artificial intelligence, then progress to the birth, history, and the rise of artificial intelligence. We then explore the main streams in the field, along with the advancement, evolution, and its applications for various aspects of our life. The paper will cover central and current research related to artificial intelligence, including reinforcement learning, robotics, computer vision, and symbolic logic. In parallel, we highlight the unique advantages for future technologies, focusing on opportunities, limitations, and ethical questions. To conclude, we describe several current areas of research within the field and recommendations for future research.

Keywords: *Machine Learning, Deep Learning, A.I.*

INTRODUCTION

We currently live in a world where everyone, at any time and in any location, has easy access to artificial intelligence (AI). From high-performance robotics to AI speakers, artificial intelligence (AI) is already commonplace. The fields of personalized online education, medical services (health care, prescription/treatment), transportation (autonomous vehicles, transportation services), manufacturing (process optimization, smart factory), finance (investment, trading, credit evaluation), media (content, advertisement), agriculture (weather data, farm management), energy (energy management), and transportation.

Origins and History of Artificial Intelligence

We can obtain insight into our current selves by researching our past. Understanding AI necessitates a look back at its origins in order to make educated predictions about its future.

Eleven researchers from various fields gathered at Dartmouth College in the summer of 1956 for a six-week workshop to discuss and expand their understanding of neural networks, automata theory, and artificial intelligence. The field of artificial intelligence study can be traced back to this workshop. It was the first step toward the heyday of artificial intelligence. The accomplishments made during these twenty years were very extraordinary. Some tasks, such as solving moderately difficult algebra problems and proving geometric theorems, were formerly thought to be beyond the capability of robots. It was also conceivable to develop computers that could converse in natural language. One of the most well-known systems at the time, the ELIZA robot, could carry on a lifelike conversation, tricking its users into thinking they were chatting to a real person. ELIZA had no idea what she was saying, she was simply repeating preprogrammed responses to queries and making small grammatical changes.

Many AI researchers had great aspirations for the future at the time. Herbert A. Simon, an artificial intelligence pioneer and Nobel Prize laureate in 1965, projected that "machines will be capable, within twenty years of doing any work a man can do." (Simon, 2017) AI's popularity at the time inevitably drew funding, primarily from government bodies. The Advanced Research Projects Agency (later called DARPA) began allocating millions of dollars per year to the Massachusetts Institute of Technology (MIT) to fund artificial intelligence research in 1963. Similar money was provided to Carnegie Mellon University's (CMU) AI Project and Stanford University's AI Initiative.

However, as time passed, more and more problems emerged. It became clear in 1975 that promises for the development of artificial intelligence on par with human intelligence were unachievable. Growing mistrust and decreasing government funding for AI research heralded the first AI Winter, which lasted into the 1980s and effectively stalled progress in the area. Scientists faced the following challenges:

- **Limited power:** In the 1960s and 1970s, scientists' access to computational power was severely limited. A computer just couldn't do anything "in the real world" due to its limited memory and slow processing speed. Their computers and programs could do some things, but only on a very small scale. Furthermore, the general people perceived what scientists were working on as toys rather than something with actual potential.

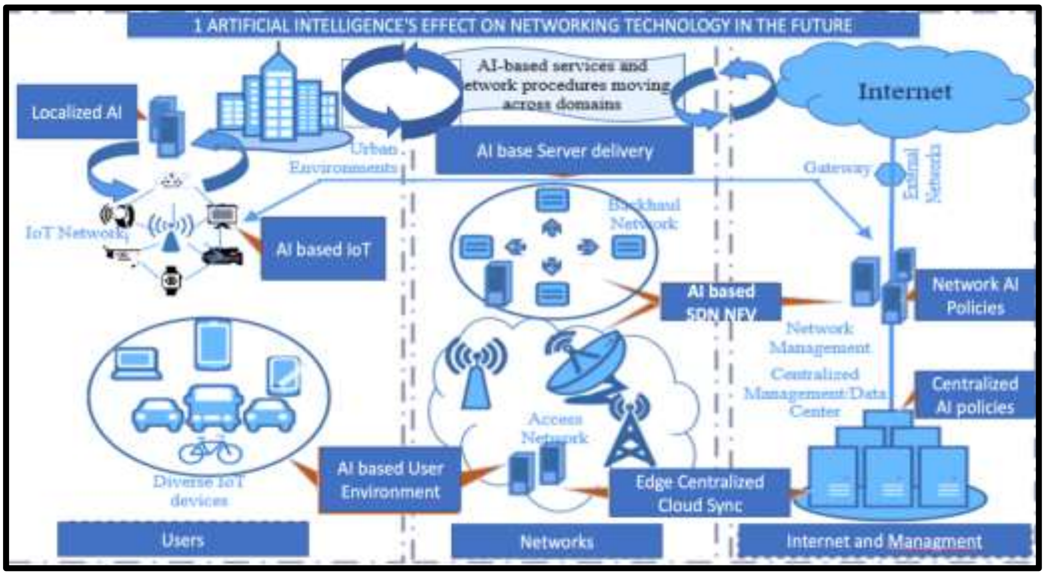
- **The combinatorial explosion:** early AI programs relied on exhaustive search, which meant testing every conceivable answer until the desired one was found. Consider Latin squares as an example of when this method falls short. Latin squares are arrays of n by n cells that contain the same subset of n symbols exactly once in each row. In comparison to the dozen Latin squares of order three (representing the dozen potential permutations for squares with three rows and three columns), the 812.851.200 Latin squares of order six and the 5,25x1027 Latin squares of order nine are practically incomprehensible. Many of the activities that AI is meant to undertake or solve encounter "combinatorial explosion." A computer cannot, mathematically, test every possible sequence until the proper one is found. To deal with the combinatorial explosion, algorithms that take use of structure in the target domain are required, but AI systems have yet to develop them.

- **Data issues:** To execute even the most basic of tasks, AI requires a massive amount of data about the world and its nature (which is sometimes compared to a child's limited grasp of the universe). It was impossible to assemble all the data required by such a system into a single database in the 1960s and 1970s.

The AI winter ended in 1980, thanks in major part to the development of so-called expert systems, and a new period of prosperity for AI research began. These programs could solve issues and making judgments based on a predefined set of logical principles, but they were limited to a small field of competence. Japan, too, launched its Fifth-Generation Computer System Project in 1981, committing $850 million to it at the time. The goal was to build a machine that could translate languages, hold natural-sounding conversations, and reason just like humans. After being inspired by Japan's tremendous postwar economic performance, other countries started to invest significantly in AI and similar efforts. However, a new AI Winter began near the end of the decade. Smaller expert systems proved ineffectual, but larger systems were excessively expensive to design, operate, and maintain. Furthermore, neither the Fifth-Generation Computer System Project nor its Western counterparts met their aims.

OBJECTIVES

1. To analyze the role of NLP in Artificial Intelligence.
2. To investigate the development of text analytics in Artificial Intelligence.



State of the Art

Artificial intelligence (AI) has exceeded human intelligence in numerous areas after more than 60 years of research. Software has surpassed human levels of play in games such as chess, checkers, and scrabble (Samuel, 1950; Newborn, 2011; Sheppard, 2002). The impact of this occurrence, however, has been significantly inflated. It was once thought that an artificial intelligence capable of defeating human chess players possessed a "general" degree of intelligence. Regrettably, this was not the case. Contrary to how difficult they may appear to humans, complicated problems are frequently "solved" by AI using relatively simple approaches, such as advanced calculus or chess. Understanding language, recognizing objects, and reacting to environmental cues are all examples of "simple" activities that pose a considerable challenge to artificial intelligence. A effective artificial intelligence is projected to have human-level intelligence or be very close to it once these barriers are overcome.

Many businesses are now utilizing AI, and academics are committing more resources than ever before to the subject's advancement. AI's everyday applications include:

- In the medical profession, artificial intelligence is used to help with breast cancer detection, treatment plan recommendations, EKG interpretation, and other tasks.
- Speech recognition and optical character recognition have both progressed to the point where they are extensively used and extremely accurate in their respective sectors.
- Automated border crossings are being used in Europe and Australia, while the US military has been using bomb-disposal robots, surveillance drones, and attack drones for years. AI-assisted intelligent scheduling has been a big success. A complex pricing and scheduling mechanism is used for airline reservations. Another method that organizations use AI is through automatic telephone reservation systems and help

lines that use speech recognition software. Another thriving and well-established domain for AI is the international finance sector. AI is occasionally used in stock-trading systems used by major investment firms, allowing them to pursue sophisticated trading strategies and adapt swiftly to market fluctuations.

True, the line between software and AI is, at best, hazy. Some of the AI implementations presented here may appear to be extraordinarily sophisticated programs. Some artificial intelligence scientists are concerned that we will lose sight of how far we've come if we cease thinking of a system as "intelligent" once it has mastered a specific task and this has become the norm. "Every time we figure out a piece of it, it stops being magical; we say, 'Oh, that's just a computation!'" Rodney Brooks is quoted as saying. (Khan, 2002)

All the systems discussed above have incredibly limited "knowledge" and are nowhere near human intelligence. Some of these approaches, such as search engines, classifiers, and representational frameworks, may be applied to the general extension of AI.

Sustainability

For quite some time, humanity has been working toward the establishment of an intelligent, robot-based workforce. Humans' creation of a "automated and intelligent workforce" became known as "AI." This refers to McCarthy's 1956 Dartmouth Conference proposal for "the engineering and science of making intelligent machines," which means exactly what it sounds like. The third edition of the Oxford English Dictionary defines "artificial intelligence" (AI) as "computer systems capable of performing tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages".

NTNU

Artificial intelligence (a subfield of computer science) is concerned with providing robots with the ability to learn and make decisions. Artificial intelligence research focuses on knowledge representation, perception, learning, reasoning, and planning. These are based on analogous processes in the human brain.

People nowadays regularly use the buzzword "artificial intelligence" (AI) to refer to robots or other cutting-edge technologies. There is no universally accepted definition of intelligence because the term might imply different things to different people. Artificial intelligence (AI) techniques have seen a renaissance in the twenty-first century, as computing power, data storage, and theoretical understanding have all increased. They are now widely used across the tech industry to tackle difficult problems in fields such as computer science, software engineering, and operations research. "Artificial intelligence constitutes a paradigm shift in computer science, enabling substantially shorter development cycles, extremely powerful solutions, and immediate transfer of technologies from one domain to another."

Pinar Ozturk offers an effective paradigm for identifying AI by focusing on two dimensions:

1. **Science:**

- The study of intelligence, which includes the development of hypotheses to define and predict the features of intelligent beings.

- Find information ideas that can explain many sorts of intelligence.
- The human brain functions as a model.

2. **Engineering:**

- Applying knowledge representation and utilization theories to real-world problems
- Sentient Beings in Synthesis
- Any means required to generate intelligent conduct.

AI systems are software (and possibly also hardware) systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge or processing the information derived from this data, and deciding the best action(s) to take in order to achieve the goal. AI systems can apply symbolic rules, learn a numerical model, and alter their behavior based on the influence of their actions on their surroundings. Artificial intelligence (AI) encompasses robotics, machine learning (including deep learning and reinforcement learning), machine reasoning (covering planning, scheduling, knowledge representation and reasoning, search, and optimization), and so on. AI algorithms may incorporate a range of epistemic and practical reasoning (such as recognizing patterns and forms, applying rules, and creating predictions or plans) and learning methodologies. In their examination of the problem, IBM provides several useful definitions of "AI". In the field of computer science, the phrase "artificial intelligence" (AI) refers to any machine's or program's ability to replicate human intelligence. When most people talk about AI, they're referring to a computer or machine that can learn from examples and experience, recognize objects, understand, and respond to language, make decisions and solve problems, and combine these abilities to perform tasks that a human might do, such as greeting a hotel guest or operating a vehicle.

Machine Learning

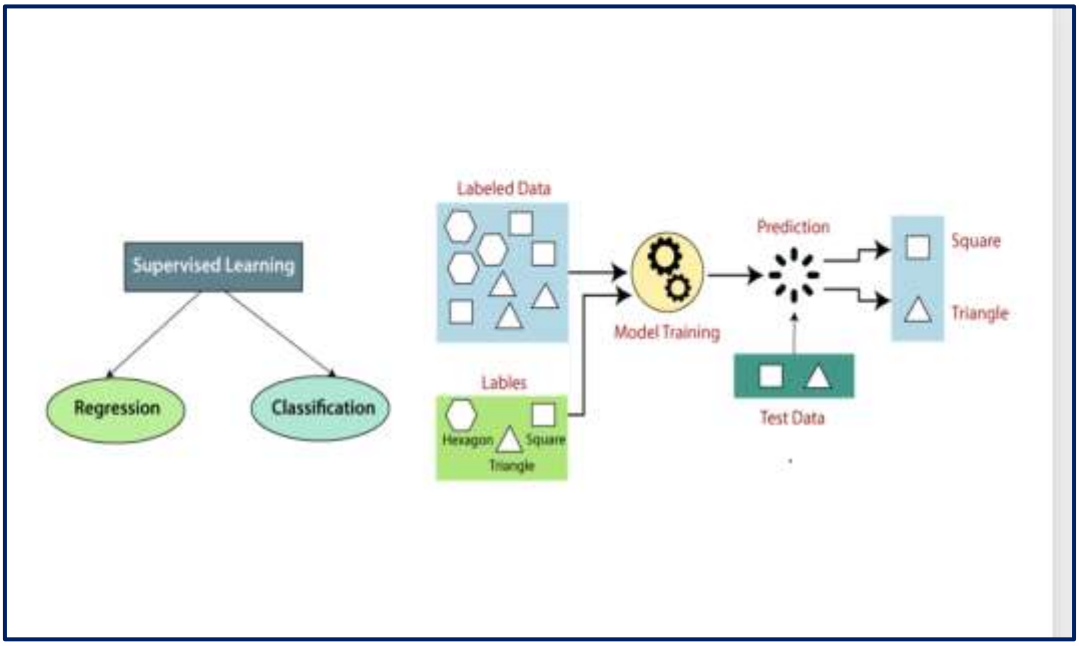
According to Arthur Samuel's 1959 definition of machine learning, "machine learning gives computers the ability to learn without being explicitly programmed". Machine Learning is defined as "methods and techniques that enable computers to improve their performance through their own experience," according to Bach and Nguyen. Machine learning, an artificial intelligence subfield, "learns" on its own. As it processes more data, it basically rewrites its own software to better perform its intended role.

Learning can be defined as the process by which a system improves its performance, a person implements good changes, or both. Machine learning (ML) is a set of processes that educate machines to improve over time. Data mining (using prior data to make better decisions), self-customizing programs (recommendation systems), and software applications that humans cannot develop by hand (such as autonomous driving or speech recognition) are three areas where machine learning may be familiar. "Machine learning allows a machine to interpret a set of data and learn from those interpretations" when it comes to producing new outcomes.

Mocanu

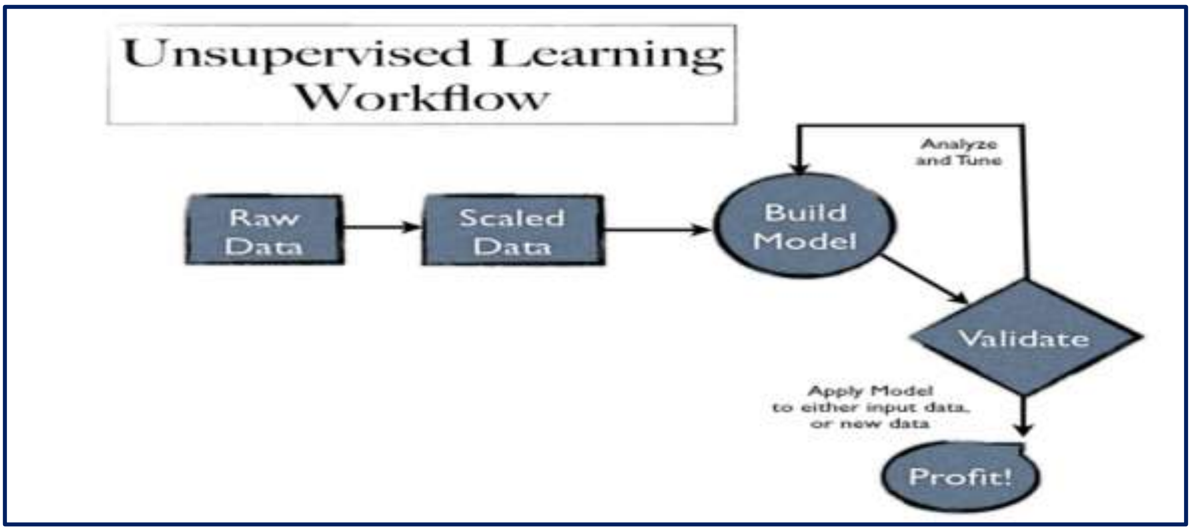
Machine learning is the study of how to teach computers to execute specific tasks without being explicitly programmed to do so. There are three main techniques to machine learning, or "paradigms":

1. **Supervised learning:** It aims to build a general function (or model) using data input-output pairings. To be more specific, the function learns how to approximate each output based on its corresponding input. This type of learning requires labeled data, with the premise that expert-generated labels exist for each data point (the input). The two most prevalent sorts of problems in the supervised learning paradigm are classification (where the output has discrete values) and regression.

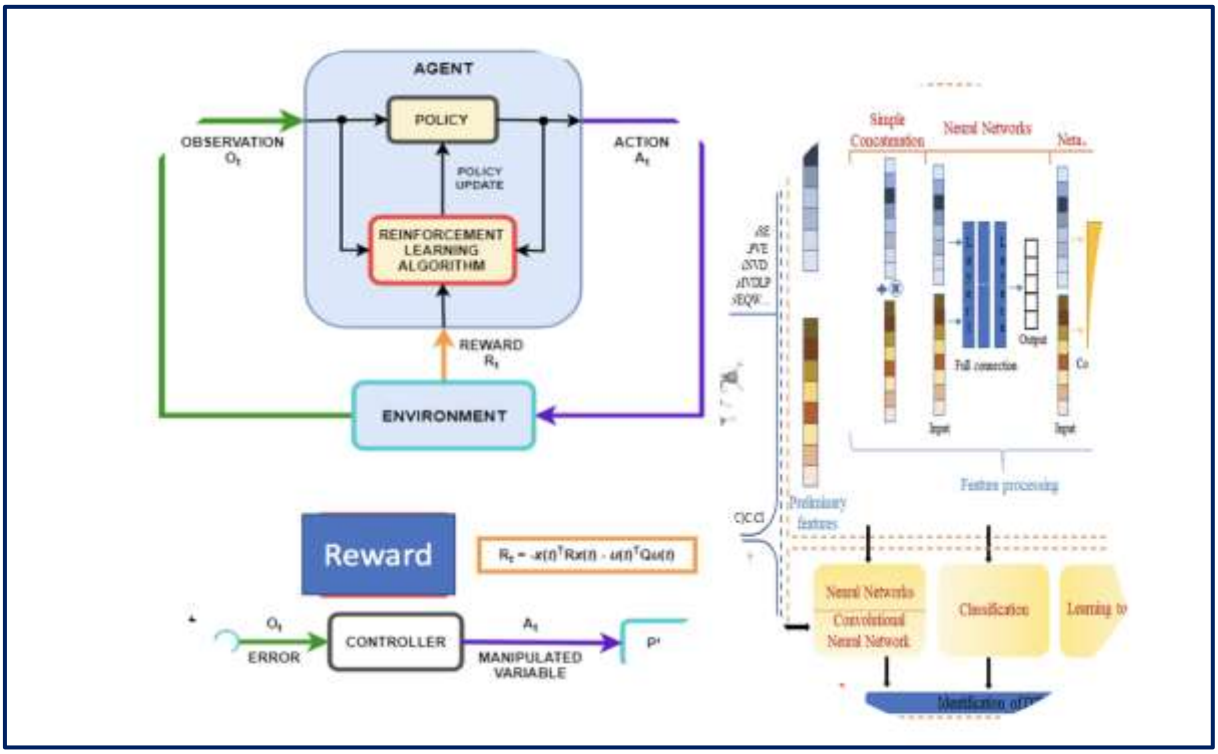


2. **Unsupervised learning:** The goal of unsupervised learning is to build functions (or models) that can extract important information from incoming data without external supervision. Unsupervised learning problems include grouping, density estimation, and dimensionality reduction, and commonly used unsupervised algorithms are:

    1. Self-Organizing maps
    2. k-means clustering
    3. Hierarchical clustering
    4. Hidden Markov Models
    5. Gaussian mixture models



3. **Reinforcement learning:** It is a subset of learning that is significantly influenced by psychological concepts. An agent engages in dynamic interactions with its surroundings to learn what the optimal course of action is in a particular state (situation) without being explicitly taught the truth. The agent receives either positive or negative feedback (also known as reward) as it explores its surroundings based on the decisions it makes.



Different learning paradigms can carry out different models. ANNs are a sort of mathematical model inspired by biological neural networks that can be used in conjunction with the three primary types of machine learning. The recent spectacular performance of ANNs, such as the most recent generation of ANNs known as Deep Artificial Neural Networks (short for deep learning), proves their versatility and strength.

CONCLUSION

Regarding NLP technique applications to improve documentation process focusing on artifact conversion, something that we have not found and that could be interesting is a complete tool that can process an artifact as input to obtain a user story as output. Moreover, at the same time, to be able to provide the developer with a code template serving as a base for developing the code fragment related to that user story. The closest examples to this approach were works that convert user stories into use case scenarios and use cases into goal models.

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