

# Review of Artificial Intelligence Applications and Modelling AI Framework in Education System

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## ABSTRACT

The potential of using artificial intelligence in education to enhance learning, assist teachers and fuel more effective individualized learning is exciting, but also a bit challenging. To even have an intelligent conversation about AI in education, one must first push past imaginary science-fiction scenarios of computers and robots teaching our children, replacing teachers and reducing the human element from what is a fundamentally human activity.

AI can automate grading so that the tutor can have more time to teach. AI chatbot can communicate with students as a teaching assistant. This research paper focuses on modelling of AI ingredients in framework of education.

AI in future can work as a personal virtual tutor for students, which will be easily accessible at any time and any place.

**Keywords :** Artificial Intelligence (AI), Machine Learning, Neural Network, Cognitive Computing, Knowledge, Learning, Cognitive Computing, Natural Language Processing(NLP)

## I. INTRODUCTION

Artificial intelligence (AI) is the branch of computer science that is concerned with designing and developing systems that act and think like human beings.

Artificial intelligence is focused with making computers behave more human-like and in a fraction of the time it takes a person to do it.

Artificial Intelligence is a technology that allows machines and computer applications to mimic human

intelligence, learning from experience via iterative processing and algorithmic training.

AI isn't just a single computer program or application, but an entire discipline, or a science.

Artificial intelligence (AI) is defined as the ability of an artificial mechanism to provide solution of complicated problems using its own intelligence. Computer science and physiology are combined in Artificial Intelligence. Now, intelligence is the computational component of one's ability to understand and resolve the issues to achieve goals. Intelligence is attributed by one's capacity to think, envision, memorize, and

comprehend, see patterns, make decisions, adapt to change, and learn from experience. Overall, it is known as Artificial Intelligence. Artificial intelligence is concerned about pushing the boundaries of practical computer science in the direction of systems that are adaptable, flexible, and capable of forming their own analyses and solution techniques by applying general knowledge to specific situations.

Machine or software intelligence is referred to as artificial intelligence. Perceive + Analyse + React = Intelligence. Artificial intelligence is a subject of computer science that is rapidly gaining popularity since it has improved human existence in a variety of ways. Artificial intelligence has substantially enhanced the performance of manufacturing and service systems during the previous two decades. Expert systems are a fast-emerging technology that originated from artificial intelligence research. Intelligent machines will replace or augment human capabilities in many sectors in the future.

### **Working :**

AI systems work by combining large sets of data with intelligent, fast, iterative processing algorithms to learn automatically from patterns and features in the data that they analyse.

Each time an AI system runs a round of data processing, it tests and measures its own performance and develops additional expertise.

Because AI never needs a break, it can run through hundreds, thousands, or even millions of tasks extremely quickly, learning a great deal in very little time, and becoming extremely capable at whatever it's being trained to accomplish.

The goal of AI science is to build a computer system that is capable of modelling human behaviour so that it can use human-like thinking processes to solve complex problems.

For accomplishing this objective, AI systems utilize a whole series of techniques and processes, as well as a vast array of different technologies.

AI can automate routine and time-consuming tasks, allowing us to focus on more important activities. In addition, AI algorithms can analyse vast amounts of data to personalize products, services and experiences. Moreover, AI is driving innovation in various industries, such as finance, retail and education.

## **II. Artificial Intelligence Ingredients:**

### **A. Machine Learning | Learning from experience**

Machine learning, or ML, is an AI application that allows computers to automatically learn and grow from their experiences without having to be explicitly programmed. The data you give machine learning tools help AI create data sets to learn how to make decisions and predictions without being programmed to perform specific tasks.

The goal of machine learning is to create algorithms that can analyse data and generate predictions. A specific application of AI that lets computer systems, programs, or applications learn automatically and develop better results based on experience, all without being programmed to do so. Machine Learning allows AI to find patterns in data, uncover insights, and improve the results of whatever task the system has been set out to achieve.

Machine learning is being utilized in the healthcare, pharma, and life sciences sectors to improve illness detection, medical picture interpretation, and medication acceleration, in addition to predicting.

However, while machine learning allows AI systems to learn from data, they still need programming and algorithms to process that data and generate meaningful insights. Image classification is an excellent example.

### **B. Deep Learning | Self-educating machines**

It is one of the applications of AI where machines are not explicitly programmed to perform certain tasks; rather, they learn and improve from experience

automatically. Deep Learning is a subset of machine learning based on artificial neural networks for predictive analysis. There are various machine learning algorithms, such as Unsupervised Learning, Supervised Learning, and Reinforcement Learning. In Unsupervised Learning, the algorithm does not use classified information to act on it without any guidance. In Supervised Learning, it deduces a function from the training data, which consists of a set of an input object and the desired output. Reinforcement learning is used by machines to take suitable actions to increase the reward to find the best possibility which should be taken into account.

A specific type of machine learning that allows AI to learn and improve by processing data. Deep Learning uses artificial neural networks which mimic biological neural networks in the human brain to process information, find connections between the data, and come up with inferences, or results based on positive and negative reinforcement.

Deep learning is a type of neural network with multiple hidden layers, so it can learn more complex relationships in the data. Data scientists can then optimize those layers using different formats (text, audio, video, and images) to improve accuracy—but they also need much more training to work.

Nodes adapt based on the information coming into the neural network. This gives neural networks the ability to find relationships and patterns in data. Nodes are arranged in several layers. The input layer receives the data. The hidden layer processes the data. The output layer produces the results.

Neural Networks - Neural networks are a type of machine learning algorithm that provides the tools to process the information you create based on AI models. They're made up of nodes (or artificial neurons) connected to each other. A process that analyses data sets over and over again to find associations and

interpret meaning from undefined data. Neural Networks operate like networks of neurons in the human brain, allowing AI systems to take in large data sets, uncover patterns amongst the data, and answer questions about it.

Cognitive Computing - Another important component of AI systems designed to imitate the interactions between humans and machines, allowing computer models to mimic the way that a human brain works when performing a complex task, like analysing text, speech, or images.

Artificial neural networks that learn by analysing data are used in deep learning, which is a subset of machine learning. Artificial neural networks are designed to look like organic neural networks in the brain. Several layers of artificial neural networks collaborate to produce a single output from a large number of inputs, such as detecting a facial picture from a mosaic of tiles. The machines learn by receiving positive and negative reinforcement for the tasks they perform, which necessitates ongoing processing and reinforcement in order for them to advance.

Natural Language Processing - A critical piece of the AI process since it allows computers to recognize, analyse, interpret, and truly understand human language, either written or spoken. Natural Language Processing is critical for any AI-driven system that interacts with humans in some way, either via text or spoken inputs.

Computer Vision - One of the prolific uses of AI technologies is the ability to review and interpret the content of an image via pattern recognition and deep learning. Computer Vision lets AI systems identify components of visual data, like the captchas you'll find all over the web which learn by asking humans to help them identify cars, crosswalks, bicycles, mountains, etc. It is the interactions between computers and human language where the computers are programmed to process natural languages. Machine Learning is a reliable technology for Natural Language Processing to

obtain meaning from human languages. In NLP, the audio of a human talk is captured by the machine. Then the audio to text conversation occurs, and then the text is processed where the data is converted into audio. Then the machine uses the audio to respond to humans. Applications of Natural Language Processing can be found in IVR (Interactive Voice Response) applications used in call centres, language translation applications like Google Translate and word processors such as Microsoft Word to check the accuracy of grammar in text. However, the nature of human languages makes the Natural Language Processing difficult because of the rules which are involved in the passing of information using natural language, and they are not easy for the computers to understand. So, NLP uses algorithms to recognize and abstract the rules of the natural languages where the unstructured data from the human languages can be converted to a format that is understood by the computer.

### C. Cognitive Computing | Making inferences from context.

Cognitive computing is another essential component of AI. Its purpose is to imitate and improve interaction between humans and machines. Cognitive computing seeks to recreate the human thought process in a computer model, in this case, by understanding human language and the meaning of images. Together, cognitive computing and artificial intelligence strive to endow machines with human-like behaviours and information processing abilities. Another form of deep learning is speech recognition, which enables the voice assistant in phones to understand questions.

### D. Computer Vision | Understanding images

Computer vision is a method of interpreting image material, such as graphs, tables, and photographs within PDF documents, as well as other text and video, using deep learning and pattern recognition. Computer vision is a branch of artificial intelligence that allows computers to recognize, analyse, and interpret visual input.

It's actually being applied in retail, healthcare, manufacturing, life sciences, finance and many more.

Data set, natural language processing are prerequisite and algorithms are backbone of AI.

AI working step by step:

1. Data collection. Gather the relevant data for your use and pass it to a training program to inform the AI.
2. Data preprocessing. Look through your data set to remove bad data, fix formatting, and ensure information stays updated.
3. Model selection. Pick the AI model that best suits your needs.
4. Model training. Give your training data to the AI model for training.
5. Model testing. Use a test data set to ensure your model produces accurate results.
6. Model optimization. Make changes to your model to improve the results and performance.
7. Deployment. Integrate your new AI model with your current systems.
8. Continuous learning. Keep updating your AI model on new information to keep it relevant and producing great results.

However, this is just a sample process. Not all AI systems are the same, so you may need to change this process to account for your unique needs.

## III. Literature Review

Major challenges for artificial intelligence in Education incorporates virtual coaches for each student in which inescapable help that coordinates user displaying, social reenactment and information portrayal, helps students with self-heading, self-evaluation, collaboration and then some, unite the tremendous measures of information about individual learning, social settings, learning settings and individual interests, increment the inter connectedness and openness of classrooms worldwide and taking learning outside of the study hall and into the student life outside of school. Woolf, et al.(1)

Machine-learning and data mining methods are used to explore unique types of educational data and to better understand students and the settings in which they learn Koedinger et al. (2)

Machine-learning (ML) techniques are promising tools when systems repeatedly observe how students react and then generalize rules about the domain or student Conati and Kardan (3), Kobsa (4).

Animated and AI-based agents that act as facilitators have been integrated into many learning environments Craig et al.(5)

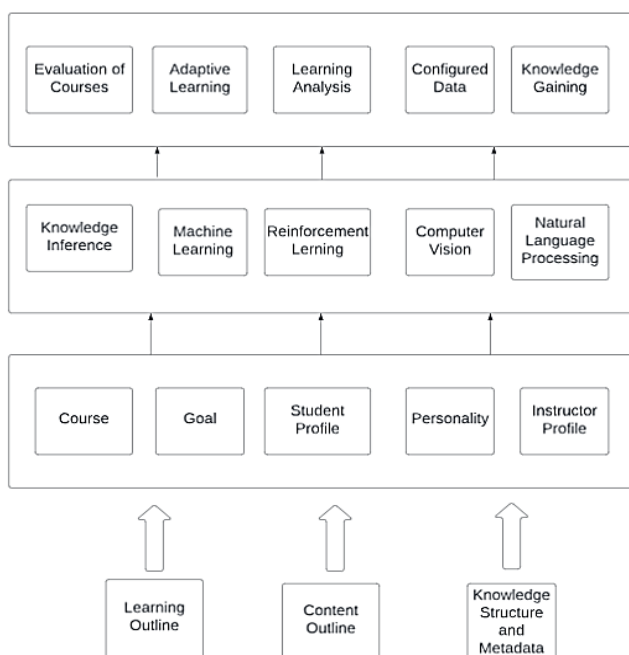
Observation of prior students' behaviour provides training examples that form models to predict future actions .Webb et al.(6)

Some scholars have publicly proposed to replace teachers or certain roles of teachers with AI robots. Edwards & Cheok(7)

#### IV. Modelling of AI application in Education

It is evident from the above literature review that AI use may prove versatile in education.

The following block diagram is suggested as a part of research for viability of AI usage in education.



Learning Map, Content map and structure metadata are big basic data input for AI engine.

Course, Target, student profile, personality, Instructor data are the desired and required data orientation attributes for structured metadata. These are prerequisites of AI engine in this particular case.

Knowledge Inference, Machine learning, Reinforcement Learning, computer vision, Natural Language Processing are used as per applicability and set algorithms. These are backbone of this research engine.

Course assessment, Adaptive Learning, Learning Analysis, customized Teaching and Knowledge acquirement are the results or outcomes of this AI engine.

Larger, More Accessible Data Sets, Intelligent Data Processing, Graphical Processing Units, Application Programming Interfaces.

Meaningful and immediate feedback to students, reducing time spent by teachers on tedious tasks to free up time for more meaningful ones, Differentiated and individualized learning, Automation of administrative tasks, Tutoring and support outside the classroom, Universal access for all students are the benefits of the proposed model. The model may be used to teach students basic and advanced skills by assessing their present skill level and creating a guided instructional experience that helps them become proficient. It can help special needs that students access a more equitable education. Can used by teachers and education administrators to analyse and interpret data enabling them to make better-informed decisions. It facilitates administrators to schedule courses and individuals to manage tasks.

Many a times, machine learning, neural networks, and graphs are used in automation. Such automation can prevent fraud issues by using CAPTCHA technology. Robotic process automation is programmed to perform high volume repetitive tasks which can adapt to the change in different circumstances.

The research results supports what Lynch writes in 'The EdAdvocate', "AI does not detract from classroom instruction but enhances it in many ways."

a) Personalization: AI systems easily adapt to each student's individual learning needs and can target instruction based on their strengths and weaknesses."

b) Tutoring: AI systems can "gauge a student's learning style and pre-existing knowledge to deliver customized support and instruction."

c) Grading: AI can help grade exams using an answer key; but it can also "compile data about how students performed and even grade more abstract assessments such as essays."

d) Feedback on course quality: For example, if many students are answering a question incorrectly, "AI can zero in on the specific information or concepts that students are missing, so educators can deliver targeted improvements in materials and methods."

## V. CONCLUSION

AI has benefited computer science because it is the artificial psychology that made the machines to focus on the philosophical attributes. AI performs tasks faster than human beings and the major goal of artificial intelligence is to create the technology in an intelligent manner. It is proved that artificial intelligence is the computer knowledge that has human traits, however, these computers and robots help the environment to grow, and they respond rationally to help human beings. AI can ultimately help educators make continued progress in addressing the broad range of physical, cognitive, academic, social and emotional factors that can affect student learning and ensure that all students have equal opportunity in education. The research aims considerable optimism around the idea that, as artificial intelligence becomes a more integral part of the classroom, teachers will be better equipped to offer an individualized learning experience for every student.

## Way Forward

The research may be applied to the various education purposes like plagiarism detection, learning management systems, academic research, student enrolment and admission process, assessment during exam, schedule planning, student behaviour management. AI can help teachers evaluate their students more accurately, more effectively.

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