

Role Of Artificial Intelligence In Educational Sector

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Abstract: *In the past years, computers had been engaged in the sector of education but they mostly yielded unproductive and disappointing results. This paper discusses the present researches and works in the field of Artificial Intelligence which is creating a constructive and supportive influence on the educational applications. Like, there are ICAI (Intelligent computer-assisted instruction) and ITS (Intelligent tutoring system) these days to help students learn many subjects. With these, there are also certain learning environments that are structured in such a way that it makes student-initiated learning easier and faster. The paper discusses ITS with an example of ZOSMAT. Apart from these, there are many other applications of AI in educational sector. There are also some advantages and disadvantages which all along with the future scope of the same is discussed in the paper. AI has played a crucial role in the development of many systems and some additional research is required to overcome the present constraints.*

Keywords: *Artificial Intelligence (AI), Intelligent tutoring system (ITS), ZOSMAT.*

I. INTRODUCTION

Artificial Intelligence is the capacity of a computer program to think and grasp on its own. This idea came up in the year 1955. Before 1955, it has appeared in Greek myths. The term 'Artificial Intelligence' was first coined by John McCarthy. The research in this field started in 1956 at a conference in Dartmouth College but after getting funds and working, researchers started underestimating it because of some immense problems they were facing. Later in the 1980's AI was revived and in 1990's and 2000's it was started to be used widely in many fields. It aims at resembling human perception and solve problems logically.

In the area of education, AI can be used to measure the growth, habituate and assist individual learners. For instance, the technologies used can track the growth of learners by creating a pseudo-model of what knowledge the child has which depends on the successes and failures in solving problems. It can habituate children by changing the pattern of questions and also altering the interactions of the computer with the student on particular steps of the problem. AI basically aim at the advantages of one-to-one tutoring. Studies

say that the benefit of human teaching and AI teaching comes from analyzing the mistakes of the student. Executing the feedback on the computer needs the representation of how problems are solved in steps.

Today AI is just not limited to resembling human teachers. It also uses some physiological monitoring methods to understand the part of emotions and expressions in learning and creating new models of student intervention. It uses narrative and communicative learning environments and some study-related games which are designed in such a way that it gives customized training opportunities and motivation and better involvement. AI also plays an important role in learning analytics and personalized training. It also develops unique learning methods in MOOC's as well as the adaptive systems for online training, although this idea is yet to be realized completely.

These techniques can therefore give us some future insights for human learning and help create interest around, in the world. By way of illustration, in this paper we mainly focus on the ways in which AI is applied in the field of education.

II. METHODOLOGY

Since 1980's Artificial Intelligence is been used in the field of education. In this world full of technology, it has become a necessity to improve our education sector. The CAI (Computer Assisted Instruction) has been used to facilitate learning with the help of aided instruction but suffers some major limitations like inability to converse with the students in the natural language and not been able to anticipate, and decide what to be taught. Then a modified version of CAI called Intelligent Computer Aided instruction came into existence and expertise's in tutoring particular subjects. Education aims at providing knowledge and training minds whereas AI sights at evolving a precise image of how the human mind performs. Below discussed are some of the ways used to enhance the educational sector with the help of AI.

Since CAI were not able to give individualized focus on each student new research in the area of Intelligent Tutoring systems (ITS) were prompted. ITS is basically a computer system that gives immediate instructions and feedback to learner. This does not only improve the performance of the student but also reduces the learning time. The ITS showed exceptional results like an ITS of economics "Smithtown" enables student to learn the same course studied by traditional economics student in half time but with equal performance.

ITS can be divided into different interdependent components based on a number of architectures.

- ✓ Three model architecture consists of domain, student knowledge and skills and tutoring expertise an example of such architecture is Derry et al architecture
- ✓ Four model architecture Apart from retaining the four components it added a fourth module as user interface example according to Woolfs[2] research the major components are pedagogical module, student module, domain knowledge, communication module. Joseph[2] Later introduced another module as expert module. In our discussion we shall consider all the five modules.

Pedagogical Module: This controls the teaching process like when and how to introduce a new topics. It depends on student module for individual student hence it caters to the personalized need of a particular student.

Student Module: Main objective of this module is to collect data that is specific to each and every student. It then feeds the data to the pedagogical module. It collects data like the performance history of a student, topics already taught etc.

Domain Knowledge Module: This contains pool of knowledge that the tutor is going to deliver. Major issue concerning the domain is to include representing knowledge apart from facts and procedures like mental models.

Communication Module: This module deals with the interaction with the user in most effective way. It includes the ways of interaction like dialogue or layout of the output page. An interactive way of teaching makes ITS more successful.

Expert Module: As discussed earlier this is an additional module. It is very much like the domain module which contains the information being taught. Using this module the tutor can compare the solution of a student with an expert and find out the points where he faces difficulties or ways in which they can improve to a better solution.

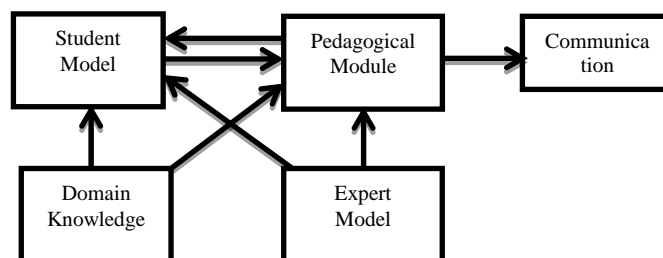


Figure 1: Interaction between different components in an intelligent tutoring system[3]

Another important application of AI is Data mining. It is a field of computer science which is a process of discovering sequences in big data sets including methods of machine learning, database and statistics. Educational data mining is a research field which uses the above resources and applies it to educational institutions and Intelligent Tutoring system (ITS). It can be used for analysis of data, giving feedbacks to instructors predict students academic performance, groups students, develops conceptual maps, analyses social networks and helps in planning and scheduling.

The idea of virtual facilitator replace human teachers with virtual human like characters (robot) who can perform all activities as a human and can interact in an ordinary way reciprocating all the verbal and non-verbal communications. While these days no one wants real teachers to be replaced but this idea is a promising area of development. The University of south California (USC) Institute for creative technologies has already started creating smart virtual learning environment base on AI, 3-D gaming and animation which develops virtual human like characters. Apart from human like virtual teachers hypermedia can be a medium that inculcates audio, video, hyperlinks and graphics. This is just another form of web personalization and is used in e-learning and distance learning programs.

Each student has a different pace of learning and grasping. AI provides individualized learning programs which allow each child to learn at his own speed. There are many MOOC's (Massive open online courses) which allows unlimited involvement and are free to access via the net.

AI can also be applied to grade the examination sheets of students. Teachers can grade the multiple choice questions and fill in the blanks. Essays and subjective types of questions might take some time to rise. This reduces the pressure of teachers and allows them to concentrate on daily interactions and activities held in class. AI can also help to detect if a child can show any kind of improvement. The online course providers 'Coursera' uses this technology when many students submit the wrong answer, the system alerts the admin (teacher) and sends some hints to the children regarding the correct answer. The children need not wait for their teacher to tell them if they submitted answers are correct or not.

Case study of "ZOSMAT": A web based Intelligent tutoring system

ZOSMAT model of ITS was developed for tutoring mathematics. The main aim of this tutor is to provide individual learning environment. It contains six components:

- ✓ ZOSMAT Manager: It is the control center for the the tutor and performs the most important tasks like creating an adaptive test for each individual based on the learning

history of the respective student. It is also assigned the task for invoking the expert model for creation of planned courses based on domain knowledge for each student.

- ✓ Student Model It contains the record for each student and gives personalized instructions depending upon the performance of the learner. It adapts to the need of particular student and depending upon the performance of student it gives the advice. This feature is also called "Advisor".
- ✓ Content Structure and Question bank: Structure of the course defines the way the content is to be presented to the learner which may include HTML pages, animations, audio, video etc. Question bank is a the collection of questions that helps to generate the test and evaluate the performance of the student on a topic. Hence it becomes important to organize the questions properly. If there are more than one concepts linked with the question it must be recorded for future reference.
- ✓ Expert Model combines the Artificial intelligence technology with domain knowledge given by a human tutor. It is a core component of ZOSMAT. It gives advices based on advisors that focus on results of the learner. The planner on the other hand manages the resources in the most efficient manner. The system is based upon rules that determines planner to select the flow and organization of materials that needs to be presented to the students and advisor gives the test instructions.
- ✓ User Interface is implemented through ASP.NET with Visual C# and SQL 2005 as database platform. A web based UI is provided for the students which display the result of other ZOSMAT components.

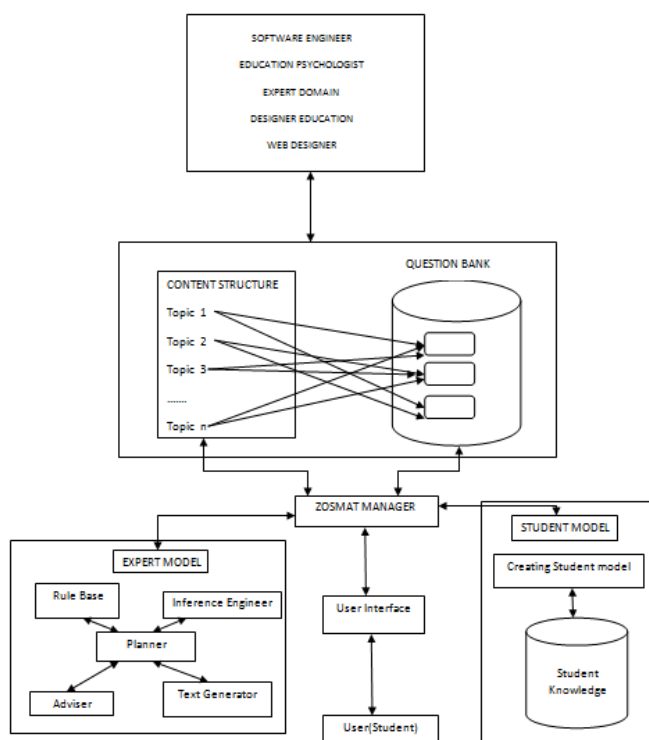


Figure 2: The architecture of ZOSMAT[1]

III. ADVANTAGES

Teachers will have comparatively more time since AI will take care of grading and keep records of children so instructors can give more time to student's learning process. AI will force parents to participate in student's learning and take up additional roles as guardians, tutors and caretakers since their children will access new tools and learn new academic platforms. Allowance of AI for mass customization and decentralization of education makes child's schedule relatively less hectic and can be tallied with their sleeping schedule, which will make sure that each child gets enough rest and would improve their stress and health conditions. AI can customize machine learning by providing learning systems with powerful facial recognition and can include emotional data. When AI comes into picture, the cost of education is likely to decrease with higher standards and changing lifestyles, the cost of education has risen terribly in the past few years. It becomes a pressure for the parents as well as the students.

IV. DISADVANTAGES

Customized learning can lead to inequalities among children with everyone learning at their own pace, some will progress faster than others of the same age. In today's educational system, a teacher takes everyone together and progresses. Initially, the new system will be complicated and tedious because our society has always witnessed a different system so it may take time for parents to adapt to this new system and play the roles that AI demands. Children always try to learn from other children and try to replicate them. This type of a system will hamper mutual learning and healthy competition. They won't be able to connect with each other properly and this will affect their socialization. For putting AI into the system, new specialized learning centers will be required which will involve an initial high cost as well as some experienced labour. AI cannot completely become a teacher for a student. A teacher has some model behaviors like emotional expressions and flexibility, so it would be tough for the students initially to fit into this system.

V. CONCLUSION

AI has been used in the education since 1980s. It can enhance the learning procedure of the student and provide a standard learning environment. There are a number of applications of Artificial intelligence in the field of education most importantly the Intelligent Tutoring System. The different components of the ITS model are pedagogical module, student module, domain knowledge module, communication module and expert module one such example of ITS is ZOSMAT. Major advantage of AI includes individualized attention to each student and a more fair analysis of performance of the student. Major concerns are inequality in learning process amongst the same class as each student will learn a different topic at the same time and the initial high cost of investment. The recent research in the field

of AI further improves natural language understanding, Reasoning and gives a better personalized teaching experience.

VI. FUTURE SCOPE

We live in a world which is running on technology, the recent being artificial intelligence. The world has made an advancement in almost every field due to artificial intelligence, be it Facebook suggesting us friends or cars which are being parked on their own. The field where Artificial Intelligence is being immensely applied is education. Right now we are not able to see human robots as teachers but tools are being developed which enable to see that in the near polish the educational opportunities and future. Right from adapting to needs of students, lessening the load of teachers, analyzing scope of improvement in performance of the student as well as the curriculum to helping student find the best suited program or profession for them in the future,. Also the idea of intelligent systems is being supported. AI will not surely replace the human teaching system but will serve as an precious extension of human expert, helping teachers to meet the needs of many students simultaneously. Therefore, AI techniques will provide deeper sights into human learning and development and will also help educational technologies caught up with the world.

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