北京邮电大学 本科毕业设计（论文）初期进度报告

Project Early-term Progress Report

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1. Introduction

In contemporary education, the development of student skills is crucial, particularly in areas such as critical thinking, problem-solving, and collaboration. Standard approaches such as the use of tests and assignment results are limited in their ability to measure the changes in students over these diverse skill areas. All these methods do not give a holistic picture of students' progress in the competencies. Due to the continued development of artificial intelligence (AI) in the recent past, the education sector is steadily adopting AI solutions for purposes of improving the assessment of student skills.

The *AI-Enhanced Student Skills Development Tracker* is designed to offer students' performance analysis and recommendations for further improvement based on the data about students' learning behavior, results of the assignments, and activity in the class. This system is to provide timely feedback on students' learning of critical thinking, problem solving and collaboration, so that both students and teachers will be able to improve these skills incrementally.

2. The development of AI technology

Since the advent of the Turing Test in the fifties, the primary concern of AI scientists has been to create machines that could learn language. In the 1970s, the concept of expert systems was recognized as one of the most important trends in the AI field. These systems addressed real-life issues by transforming knowledge from a specific domain into a set of instructions for computers. In the 1990s ML and NLP brought AI to various fields such as healthcare and finance [1].

In the twenty first century, the developments in the machine learning and deep learning further improved the capabilities of AI and resulted in new application areas like smart learning and intelligent learning tools. AI has evolved from simple data processing to decision making over the recent past due to development in computational power and algorithms [2]; AI is best in language understanding, image identification, and self-reasoning.

In recent years, new large language models (LLMs), including GPT-3, have achieved significant progress because of the growth of pre-trained models and the availability of data. These models not only demonstrate better performance but also have special skills, including contextual awareness and incremental reasoning that cannot be achieved by smaller models, thus allowing AI to take on more challenging tasks and enter new areas of application [3].

3. The use of AI in evaluating skills of students

In recent years, the application of AI in education has gradually deepened, especially in personalized learning and student assessment. Big data analysis can be used to monitor students' learning behavior and skill performance in real time, and assist teachers to understand students' learning characteristics and deficiencies in a timely manner so as to offer individualized learning solutions. AI methods including machine learning, deep learning and natural language processing (NLP) have been applied in student assessment and feedback, learning analytics, etc.

Student behavior can be monitored through AI where it can gather data such as grades of the assignments, students' interactions in classroom, online learning activities, etc., and the data collected can be processed in real-time by the learning analytics system. This data enables the AI model to gain a clear understanding of the performance of the student in different skills domains. For instance, AI systems can detect which aspects of critical thinking a learner is good at and which aspects he/she is not good at, and suggest appropriate materials and exercises to develop the aspect in question. Learning paths can not only engage students in learning, but also enhance specific learning skills at one's own pace [4].

One of the most widely used areas of applying AI technology in education is the adaptive learning and feedback provision. Students are offered individual learning pathways and feedback using learning analytics and machine learning that analyse student behavioral data, academic performance, and learning process in real time. The intelligent recommendation system can recommend learning resources to the students based on their preferences, aptitude, and learning achievement. For instance, intelligent recommender systems can suggest to students the best learning content they could possibly engage in based on their past performance and preferences. Moreover, AI can also adapt the learning content and frequency when the students face learning challenges to ensure that students can learn best way possible.

Sajja et al. (2023) [5] pointed out that VTA is one of the most discussed issues in the context of the use of AI in education in recent years. With the help of NLP technology, virtual teaching assistants are capable of giving students instant feedback and help through natural language.

Crompton and Song et al. (2021) [6] provided a general introduction to the use of AI in higher education and noted that AI technology can enhance the personalization process of education and enhance the learning performance of students. By the use of the virtual teaching assistant, the students are able to have a real time conversation with the AI and get an immediate response which can be engaging and interactive in the sense that the student is learning.

In the educational field, the progress in AI technology in the field of Natural Language Processing (NLP) has made it possible to automate many tasks including writing of academic papers and text analysis. Neumann et al. (2023) [7] aim at identifying the advantages and disadvantages of using ChatGPT in higher learning institutions focusing on software engineering and academic writing. The study proves that ChatGPT can enhance students' writing skills and plays a supportive role in generating text and academic writing.

Automatic scoring system is one of the applications of AI in the education system. AI can also provide feedback on the student's work, tests, and performance in class without much difficulty. Perkins et al. (2023) [8] mentioned the application of AI tools (including ChatGPT) in formal assessment, while noting that while AI can enhance efficiency in scoring, academic integrity is not yet a solved problem. Hence, ways on how to maintain and implement academic integrity and discourage cheating and academic misconduct when using AI tools has remained a big challenge in the application of AI.

In this context, the use of AI technology in education can not only enhance the efficiency of learning effects, but also enhance the educational justice. Big data and machine learning can help students with different learning experiences to have their own learning programs, and each student will have proper learning materials for their level. For instance, in some areas and schools where there are inadequate teachers, AI can fill the vacuum by giving students feedback and assistance through virtual teachers and thus enhance the performance of the learners.

According to Essel et al. (2022) [9], the use of AI chatbots as virtual teaching assistants can enhance educational access and student achievement when teaching in low resource settings. Teacher shortage can be solved by using AI in the classroom and equal opportunities for every student can be given using technology.

4. Ethical issues of Artificial Intelligence in Education

While AI has proven to be effective in education, its use has also raised numerous issues of ethical consideration especially in personalized learning environments and in automated testing. Olaf et al. (2019) [10] analyzed the problematic of ethical concerns in the use of AI and how to address the ethical concerns raised by the use of artificial intelligence in education and mitigate algorithmic bias in education. It is also important for AI systems in education not to focus too much on data, which would not pay attention to the need of each learner, and make sure that every learner will be given the right support and fair evaluation.

Another ethical concern that arises when using AI is the question of academic integrity. Due to the availability of AI tools like ChatGPT, the issue of how students can be prevented from cheating, and the ways to develop prevention strategies to make education fair has become a research question. Kasneci et al. (2023) [11] stress that AI based education solutions should include anti cheating methods to make the education process fair.

5. Conclusion

AI provides new possibilities for the education field, which allows monitoring and evaluating the student's progress in the process of acquiring important competencies in real time. Though some issues are still open, for example, data protection, choosing of the right algorithms, and models' effectiveness, as the AI technology progresses, it will be able to help learners achieve more significant progress in developing multidimensional skills.

References

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Completed task

The Llama 8B model is planned to be selected as the primary pre-trained model. Currently, a Linux virtual environment is running on the Windows system for development and testing purposes. The next step is to migrate to a cloud server based on the Linux system to handle large-scale computational tasks efficiently. The Llama model has been deployed, and all required libraries, including Hugging Face Transformers and PyTorch, have been installed. Version management is handled using Conda.

For the skill identification section, Further work is needed to further define the core skills and their assessment metrics beyond what is available, as well as to establish a corresponding classification framework to ensure that subsequent data processing and model fine-tuning align effectively with educational objectives.

是否符合进度? On schedule as per GANTT chart?
YES

下一步 Next steps:
Integrate AI algorithms to analyse student performance data and track skill development over time.