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Intelligent Tutoring System for Personalized Learning Using Artificial Intelligence and Machine Learning

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ARTICLE DETAILS

Research Paper

Keywords:
Artificial Intelligence, Machine Learning, ITS, Education, Personalized Learning.

ABSTRACT

This research proposes the development of an Intelligent Tutorial System (ITS) that leverages artificial intelligence (AI) and machine learning (ML) to provide personalized learning experiences for students. Very huge utilization of AI & ML in the educational organization, in this research discussed about the intelligent tutorial for personalized learning using AI & ML. In this research or survey discussed about enhancing the learning capacity of the students & problems solving of the students. This research based on teaching methods & problems solving of the students. In the modern time utilization of AI & ML tools in the education by using students and in this study discussed the utilization of AL & ML in the national & international level. This research also describes the advantages, disadvantages, applications of AI & ML, and challenges of AI & ML.

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Introduction

In modern time huge utilization of artificial intelligence & machine learning in some areas like as an education, transportation, manufacturing, finance industry, stock market and many others industries. In present the student wants to enhance the learning capacity by use personalized learning techniques so he tries to learn everything by using the AI & ML. Many types of categories of the students in which some

students not feel the fear to ask to teacher for any question but in present some student which is face the problem to ask his teacher. These types of students try to search answer of his question by using AI. Machine learning is a subfield of AI that involves the use of algorithms and statistical models to enable machines to perform a specific task without being explicitly programmed for that task. ML is based on the idea that machines can learn from or predictions with minimal human intervention. Types of machine learning are supervised learning, unsupervised learning, reinforcement learning, semi-supervised learning, and deep learning etc. Machine learning algorithms defined as linear regression, decision trees, random forests, support vector machines, and neural networks. Applications of machines learning defined as image and speech recognition, natural language processing (NLP), predictive maintenance, recommendation systems, and autonomous vehicles. Benefits of machine learning defined as improved accuracy, increased efficiency, scalability, and flexibility. Challenges of machine learning defined as data quality, bias, and fairness, explain-ability, and security. AI stands for artificial intelligence it is very useful for students to learn & enhance the learning capacity. AI is very helpful for simulation like as human & problem-solving. The term can also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving. The utilization of some industries defined as healthcare, finance, transportation, education, and customer services.

In the modern time every organization/industry/Institution wants to do smart work and grow self & many school, many engineering private/Government college wants to grow his growth. Every person/student wants to enhance to grow his skill and smartness. Intelligent tutorial system (ITS) has play very important role to make a smart person/machine/student. Machine learning is the part of artificial intelligence, the role of machine learning to create an algorithm and statistical models that enable machines to learn from data without being explicitly programmed. To create a smart machine, require artificial intelligence & machine learning these both terms make a smart machine using the AI & ML (algorithm, statistical model). Play the role of machine learning in the manufacturing industry, using machine learning to save the time and save the money & save the labour cost. Artificial intelligence, to create the simulation and create an approximately results and programme understand to machine using machine learning. To increase the production of product and increased the sale artificial intelligence & machine learning is very important for growth of industry. Data science is multidisciplinary field that extracts insights and knowledge from structure and unstructured data using various techniques, such as machine learning, statistical modelling, and data visualization.

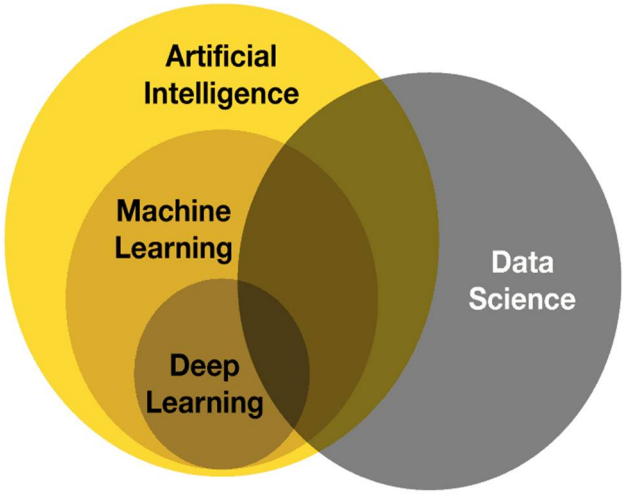

Fig.1. Artificial intelligence, machine learning & data science

Key components of data science defined as data are foundation of data science. Data can come from various sources, such as databases, APIs, files, and sensors. Analytics is the part of data science defined as analytics involves using statistical and mathematical techniques to extract insights from data. Machine learning is also playing important role in the data science & machine learning involves training algorithms on data to make predictions or classify outcomes. Visualization is the part of data science defined as data visualization involves presenting data in a graphical format to facilitate understanding and insight. Domain expertise is the key component of the data science; it involves having knowledge of the industry or domain in which the data is being analyzed. Some key point of data science process defined as the problem or question to be addressed called as problem definition. Collect relevant data from various sources called as data collection. Clean and pre-process the data to remove errors and inconsistencies called as data cleaning. Analyze the data using statistical and machine learning techniques this phenomenon is called data analysis. Generate insights and recommendation based on the analysis called as insight generation. Communication is the part of data science process defined as it is the insight and recommendations to stakeholders. Tools and technologies of data science defined as programming languages, data analysis, and machine learning framework, data visualization tools, and big data technologies. Applications of data science defined as business intelligence, healthcare, finance, marketing, environmental science. Some skills of data science defined as programming skills, data analysis skills, data visualization skills, and communication skills. Certificate of data science defined as certified data scientist (CDS), certified analytics professional (CAP), Google data analytics certification, Microsoft certified, and IBM data science certification.

Literature review

Intelligence tutorial system (ITS) is computer-based system that provides personalized instruction and feedback to learners. ITS aim to mimic the behaviour of human tutors, adapting to individual learners' needs, abilities, and learning styles. History and evolution defined as the concept of ITS emerged in 1970s, with the development of the first ITS, called SCHOLAR. Since then, ITS have evolved significantly, incorporating advances in AI, machine learning, and cognitive science. Key components defined as domain model, student model, pedagogical model, interface model. Types of Intelligent Tutorial System defined as cognitive tutors, constraint-based tutors, and example-based tutors. Benefits of Intelligent Tutorial System defined as personalised learning, improved learning outcomes, and increased efficiency. Challenges and limitations of ITS defined as authoring complexity, scalability, and limited contextual understanding & Future directions of Intelligent Tutorial System defined as multimodal interaction, affective computing, and collaborative learning. The conclusion of Intelligent Tutorial System is intelligent tutorial systems have the potential to revolutionize education, providing personalized instruction and feedback to learners. While challenges and limitations remain, ongoing research and development are addressing these issues, paving the way for widespread adoption and impact. Personalized learning means try to enhance the learning capacity by self and develop to self & grow. Artificial intelligence & machine learning is helping the tool due to these all tools to help enhance the skills. For example, any students want to learn any one skill but he cannot afford the high-profile teacher or tutor because is not an easy game it's very tough to learn the skill. AI & ML is very smart tools which are learning to capacity of your skills. AI and ML in personalized learning defined as adaptive learning system, learning analytics, intelligent tutorial systems, natural language processing. Benefits of AI and ML in personalized learning defined as improved learning outcomes, increased efficiency, and enhanced learner engagement, better support for diverse learners. Challenges and limitations of personalized learning using AI & ML defined as data quality and availability, bias and fairness, transparency and explain-ability, scalability and sustainability. Future directions of personalized AI & ML defined as human-AI, explainable, emphasis on equity and inclusion, integration with emerging technologies. A comprehensive literature review of artificial intelligence and machine learning defined as AI & ML are rapidly growing field that have transformed numerous industries and aspects of our lives. AI refers to the development of computer systems that can perform tasks that typically require human intelligence, such as visual perception, speech recognition, and decision-making. ML is a subset of AI that involves the development of algorithms and statistical models that

enable machines to learn from data, without being explicitly programmed. The history and evolution, the concept of AI created from 1950s when computer scientists like Alan Turing and Marvin Minsky began exploring the idea of creating machines that could think and learn like humans. The field has since evolved significantly, with the development of various AI techniques, such as rule-based systems, decision trees, and neural networks. ML has also undergone significant advancements, with the development of deep learning algorithms and the availability of large datasets.

Methodology

In research used of surveying methodology, collection of data from different website and other data reports after study. Objective of this research describe the personalized learning of students & industries.

Result and discussion

Artificial intelligence and machine learning is very powerful tools of students to solve different types of problems mention below figure. Assignment & tutorial solve by using artificial intelligence and machine learning. Some tools are mention in this research like as ChatGPT, Jasper, and WordLift. Some tools of AI art and design defined as DALL-E, Midjourney, and Prisma. Artificial intelligence Chatbots and virtual assistants defined as Dialogflow, ManyChat, and IBM Watson Assistant. Artificial intelligence data analysis and science defined as TensorFlow, PyTorch, and Tableau. Artificial intelligence education and learning defined as Coursera, Udacity, and DreamBox. There are just a few examples of artificial intelligence tools. There are many more tools and platforms available. And the landscape is constantly evolving.

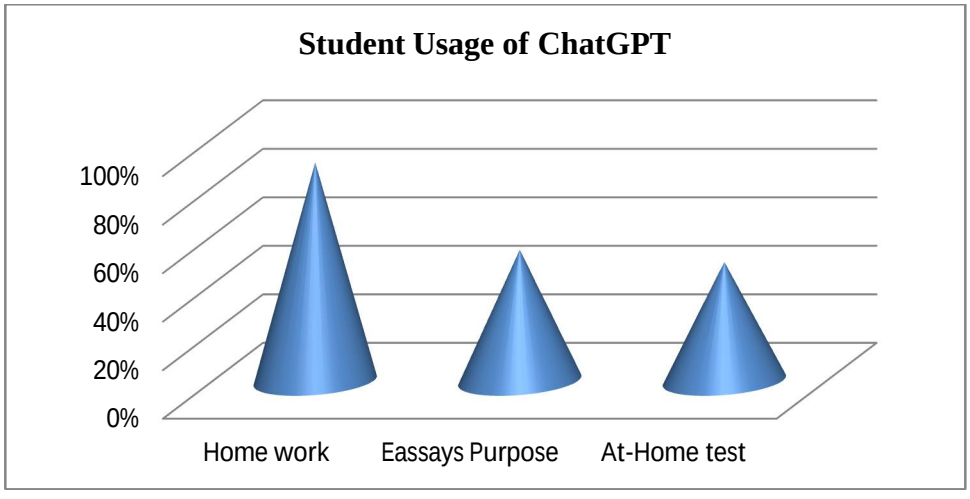

Fig.1. Usage of ChatGPT

The students use of ChatGPT in different work, home work, essays purpose, and At-home test. The student can also use the his assignment and tutorial work. Here are some of the most common use cases for artificial intelligence. Virtual assistts of artificial intelligence defined as smart speakers, chatbots. Image and video recognition of artificial intelligence defined as facial recognition, object dectection, image classification. Predictive maintenance and quality control defined as predictive maintenance, quality control. Natural language processing of artificial intelligence defined as language translation, sentiment analysis, text summarization. Healtcare and medicine of artificial and machine learning defined as medical diagnosis, personalized medicine, clinical trials. Finance and accounting of artificial inteligence defined as risk management, fraud detection, portfolio management. Eduaction and learning of artificial intelligence defined as personalized learning, intelligent tutorial systems, learning analytics.

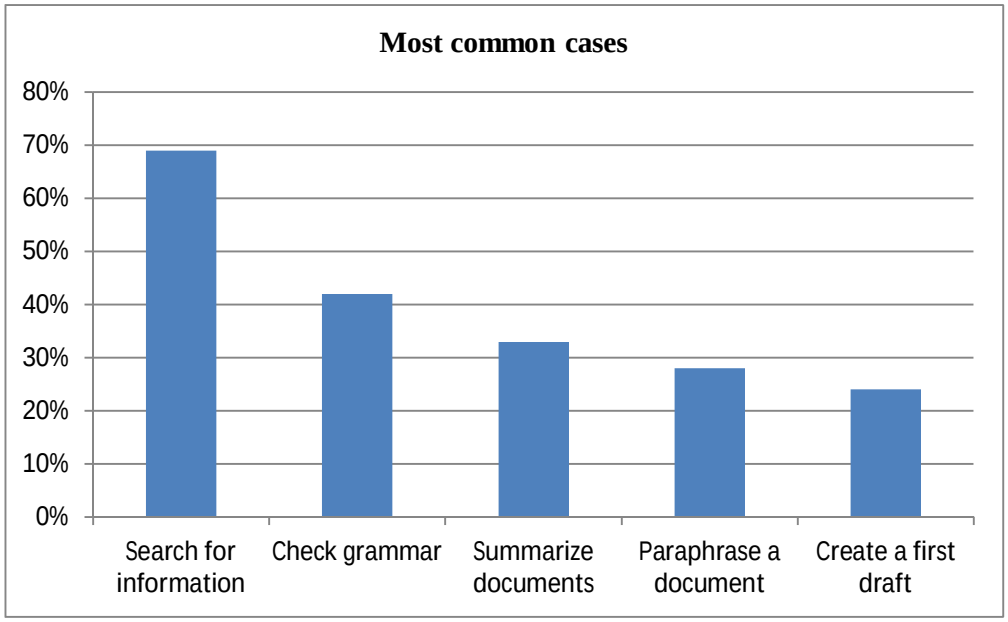

Fig.2. Most common cases using by AI

Various applications of artificial intelligenece defined as manufacturing, transportation, finance, healthcare, education, and reatil. Application of artificial intelligence in the healtcare industry defined as medical diagnosis, personalized medicine, and predictive analytics. Application of artificial intelligence in the finance indutry defined as risk management, fraud dectection, and portfolio management. Application of artificial intelligence in the education industry defined as personalized learning, intelligent tutorial systems, and automated grading. Application of artificial intelligence in the customer service defined as Chatbots, sentiment analysis, personalized recommendations.

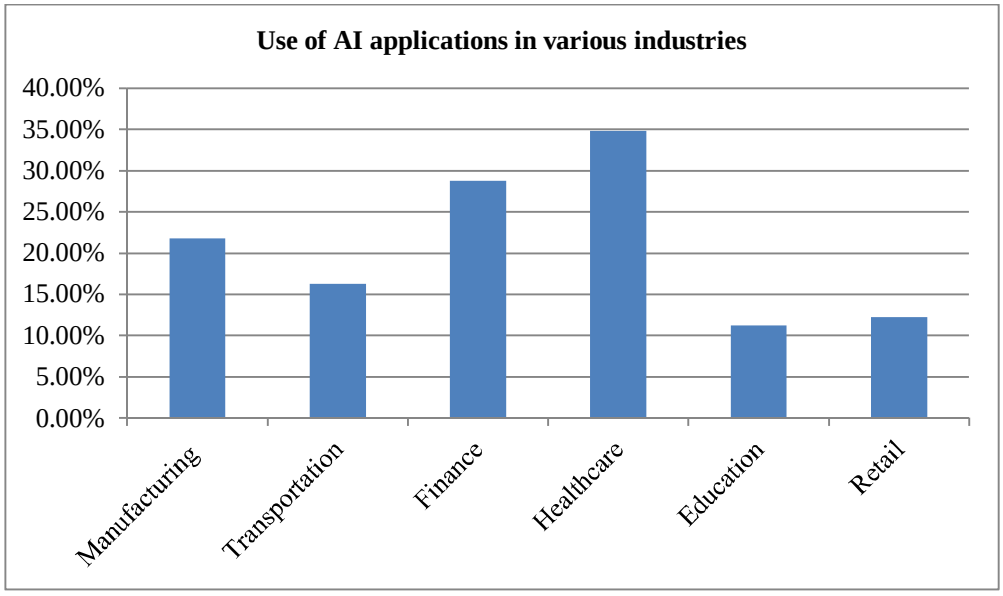

Fig.3. AI applications

Application of artificial intelligence in the transportation industry defined as autonomous vehicle, predictive maintenance, and route optimization. Application of artificial intelligence in the manufacturing industry defined as predictive maintenance, quality control, and suppy chain optimization. Application of artificial intelligence in the marketing industry defined as personalized advertising, sentiment analysis, and content generation. Application of artificial intelligence in the human resources defined as recruitment, employee engagement, tarining and development.

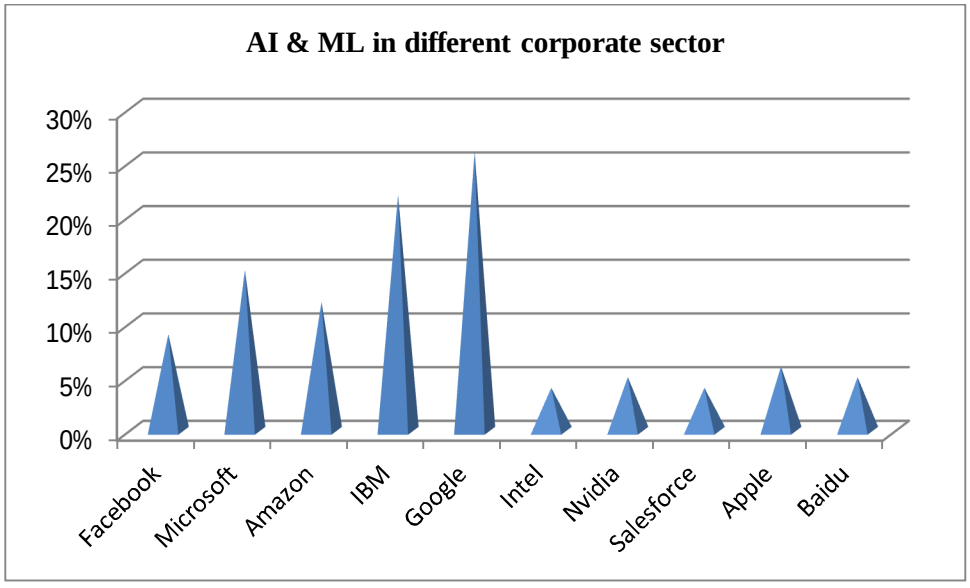

Fig.4. Use of AI & ML in different corporate sector

Some examples of the use of artificial intelligence (AI) and machine learning in different corporate sectors defined as facebook, microsoft, amazon, IBM, Google, Intel, Nvidia, Apple, Baidu. Some other corporate sector defined as finance management, healthcare and pharmaceuticals, ratail and E-commerce, manufacturing and logistics, human resources and recruitment, marketing and advertising, energy and utilities. Finance and banking corporate sector defined as risk management, fraud detection, and portfolio management. Healthcare and pharmaceuticals sector defined as medical diagnosis, personalized medicine, and clinical trials. Manuafcturing and logistics sector defined as predictive maintenance, quality control, and route optimization. Human resources and requiremenet sector defined as talent acquisition, employee enagagement, and training and development. Marketing and advertising defined as customer profiling, content personalization, and Ad targeting. Energy and utilities defined as predictive maintenance, energy forecasting, and smart grid management. Some benefits of artificial intelligence (AI) and machine learning (ML) in the corporate section defined as improve efficiency, enhanced customer experience, increased revenue, competitive advatange, risk management, talent acquistion and retention. Improved efficiency of artificial intelligence and machine learning defined as automation, process optimization, and faster decision-making. Enhanced customer experience benefit of artificial intelligence and machine learning defined as personalization, chatbots and virtual assistants, and sentiment analysis. Benefits of increased revenue defined as predictive analytics, targeted marketing, and optimized pricing. Benefit of competitive advantages of artificial intelligence defined as innovation, data driven decision making, and improved operation efficiency. The benefits of risk management of artificial intelligence defined as predictive maintenance, fraud detection, and compliance and regulatory risk. The benefits of talent acquistion and retention of artificial intelligence and machine learning defined as talent identification, employee enagament, and personalized learning and development.

Some popular tools used in the classroom defined as educational technology tools, productivity and organization tools, assessment and feedback tools, accessibility and inclusion tools, and STEM and cooling tools. Educational technology tools defined as learning managemnet systems (LMS), online whiteboards (smart board), virtual classroom platforms, student response systems, and digital annotation tools. Productivity and organization tools defined as task managemnet tools, note taking apps, digital calenders, file sharing and collaboration tools, and mind mapping and brainstorming tools.

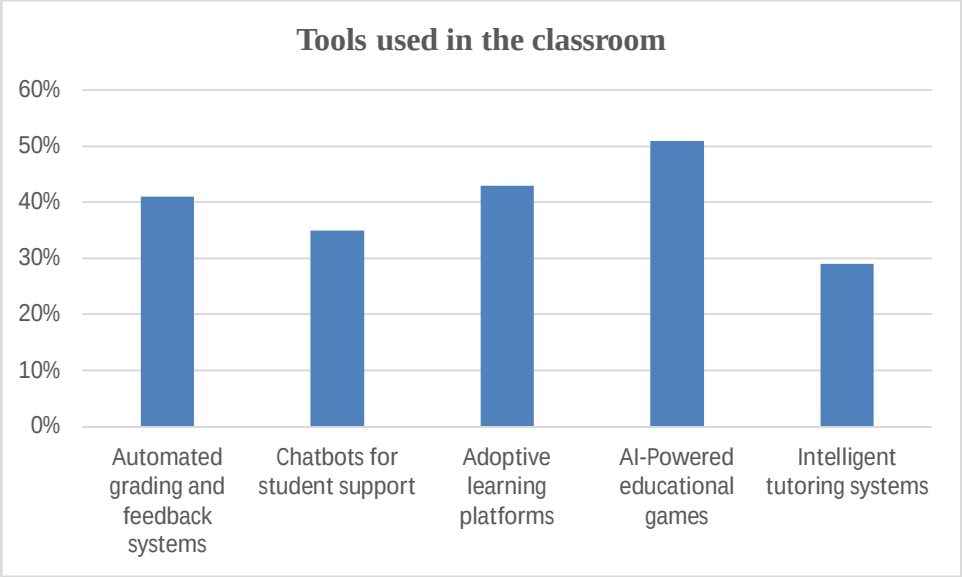

Fig.5. Popular tools used in the classroom

Assessment and feedback tools defined as online quizzing and testing tools, peer review and feedback tools, rubric and grading tools, students self assessment and reflection tools, and automated grading tools. Accessibility and inclusion tools defined as text to speech software, speech to text software, screen readers, closed captioning and subtitiling tools, and accessible document conversion tools. STEM and coding tools defined as coding platforms, robotics and programming kits, math and science software, 3D modeling and printing tools, and data analysis and visualization tools.

Conslusion

Finding of this research defined as intelligent tutorial system for personalised learning is very role of students and industrial employees using artificial intelligence and machine learning. Outcome of this research defined as utilization of tools of AI & ML, to easy of problem solving. In present time very huge work on the data science, artificial intelligence, machine learning and deep learning these all combination is called as data science. Some findings of this research defined as ChatGPT is very important tool of artificial intelligence and machine learning. Student usage of ChatGPT defined as home work, essays purpose, and at home test, very huge utilization of ChatGPT in the home work. In this research finding most common cases of artificial intelligence and machine learning defined as search for information, check grammar, summarize documents, paraphrase a document, and create a first draft. Search for information is very huge utilization in the artificial intelligence and machine learning. In this research finding defined as use of AI applications in various industries defined as manufacturing,

transportation, finance, healthcare, education, and retail and very huge utilization the healthcare. AI & ML in different sector like as The Face book, Microsoft, Amazon, IBM, Google, Intel, Nvidia, Salesforce, Apple, and Baidu, in these all very huge utilization AI & ML in Google corporate sector. AI powered educational games very huge tools used in the classroom.

References

1. Hossain, A., Al Mamun, M. A., Hossain, K., Rahman, H. B. H., Al-Jawahry, H. M., & Melon, M. M. H. (2024). AI-Driven Optimization and Management of Decentralized Renewable Energy Grids. Nanotechnology Perceptions, 76-97.
2. Knights, D., & Murray, F. (1994). Managers divided: Organisation politics and information technology management. John Wiley & Sons, Inc.
3. Bhattacherjee, A., Gupta, Y. P., & Somers, T. M. (2000). The effects of MIS steering committees on information technology management sophistication. Journal of Management Information Systems, 17(2), 207-230.
4. McBee, M. P., Awan, O. A., Colucci, A. T., Ghobadi, C. W., Kadom, N., Kansagra, A. P., ... & Auffermann, W. F. (2018). Deep learning in radiology. Academic radiology, 25(11), 1472-1480.
5. Ahmed, Z., Amizadeh, S., Bilenko, M., Carr, R., Chin, W. S., Dekel, Y., ... & Zhu, Y. (2019, July). Machine learning at Microsoft with ML. NET. In Proceedings of the 25th ACM SIGKDD international conference on knowledge discovery & data mining (pp. 2448-2458).
6. Lee, C. A., Tzeng, J. W., Huang, N. F., & Su, Y. S. (2021). Prediction of student performance in massive open online courses
7. using deep learning system based on learning behaviors. *Educational Technology and Society, 24*(3), 130–146.
8. Lin, C. J., & Mubarok, H. (2021). Learning analytics for investigating the mind map-guided AI chatbot approach in an EFL
9. flipped speaking classroom. *Educational Technology and Society*, *24*(4), 16–35.
10. Lu, O. H. T., Huang, A. Y. Q., & Yang, S. J. H. (2018). Benchmarking and tuning regression algorithms on predicting students'
11. academic performance. In *26th International conference on computers in education*, Philippines.

12. Ogunkunle, O., & Qu, Y. (2020). A data mining based optimization of selecting learning material in an intelligent tutoring
13. system for advancing STEM education. In *2020 International conference on computational science and computational*
14. *intelligence (CSCI)*, Las Vegas, USA.
15. Meng Wang, Yu Liang, Wenjun Wu, "A Novel Intelligent System for Learning Programming" – 2020-year published paper under Beijing University of Technology.