Session Chair: István Balajti

16:20 – 16:40	Éva Ádámkó **Data-Driven Insight: Transforming Education Through Modern Analytics**
16:40 – 17:00	Gusztáv Áron Sziki **Project Tasks Supported by Mathematical Software for Teaching the Subject of Electromagnetizm in Mechatronics Engineering Education**
17:00 – 17:20	Masuk Abdullah **Data Science and Artificial Intelligence in Engineering Education: Challenges, Opportunities, and Future Directions**
17:20 – 17:40	Mahmoud Hassan Thullah **Integrated Education with Artificial Intelligence for Future Skills with Insights from International Students.**
17:40 – 18:00	Inti Toalombo **Learning AI and Machine Learning Assisted by AI-Driven Tools and E-Learning Platforms**

16:20 – 16:40	**Éva Ádámkó** – Senior Lecturer, University of Debrecen, Faculty of Engineering, Department of Basic Technical Studies

Data-Driven Insight: Transforming Education Through Modern Analytics

In the past, data had a limited impact on education, as it was primarily gathered through static assessments that offered little actionable insight. In recent years, however, advancements in data processing tools, the exponential growth of computational power, and the rise of artificial intelligence have dramatically transformed our understanding of data-driven education. Today, student performance, behavior, and progress can be tracked in real time, enabling more effective and personalized learning experiences.This presentation explores the evolving field of data-driven education, focusing on cutting-edge methods and practical applications of Learning Analytics. Key areas include Adaptive Learning Systems, which tailor content to individual needs; Multimodal Analytics, integrating diverse data types like video and emotion tracking; IoT-Enabled Smart Classrooms, which enhance learning environments; and tools utilizing Natural Language Processing, such as automated feedback systems. Innovative approaches like Gamification and Micro-Learning Analytics will also be examined, alongside advancements in Deep Learning Models and Real-Time Analytics, all of which are shaping the future of education.

16:40 – 17:00	**Gusztáv Áron Sziki** – College Professor, University of Debrecen, Faculty of Engineering, Department of Basic Technical Studies

Project Tasks Supported by Mathematical Software for Teaching the Subject of Electromagnetizm in Mechatronics Engineering Education

The subject Electromagnetizm is included in the first year Mechatronics Engineering BsC program at the Faculty of Engineering of the University of Debrecen. The aim of the subject is to give theoretical knowledge in the field of electromagnetics, which is essential for students to understand the later professional and professional foundation subjects.

In addition to imparting theoretical knowledge, it is important that students apply the laws, relationships and calculation procedures, included in the subject, to solve, as a first step basic, then more difficult problems, finally complex project tasks that approximate real-world applications. The project task can be for example the calculation and visualization of complex electric and magnetic fields, or the simulation of electromagnetic systems.

To solve the above mentioned project tasks the use of a highly developed mathematical software, like MATLAB, is inevitable. The above software facilitates these activities, offering a robust platform for modelling and computation, thus bridging the gap between abstract theory and engineering applications.

The application of mathematical software significantly improves students' understanding and engagement, fostering deeper comprehension and equipping students with practical skills essential for their future careers. The presentation will detail the structure of the above project tasks, the role of MATLAB in their execution, and the positive outcomes observed in student performance and feedback.

17:00 – 17:20	**Masuk Abdullah** - Department Engineer, University of Debrecen, Faculty of Engineering, Department of Vehicle Engineering and Mechatronics

Integrating Sustainable and Ethical AI with Data Science in Engineering Education

The study explores the integration of sustainable and ethical AI (artificial intelligence) with data science in engineering education. The rapid advancements in technology require the amendment of traditional engineering curricula to produce future engineers with both technical proficiency and ethical liability. The discussion highlights the importance of balancing theoretical knowledge with practical applications, incorporating ethical considerations, and fostering interdisciplinary collaboration with industry and engineering institutions. Based on personal experiences as a mechatronics engineer, a case study on cyber-physical systems (CPSs) applications shares real-world insights on how AI is changing engineering education, improving problem-solving, and boosting innovation. Findings from the case study explore successful sustainable AI implementations and the key takeaways for advanced AI tool uses for better engineering solutions. Key findings of this study emphasize the importance of continuous curricula evolution for advanced real-life learning and the development of critical thinking skills for graduate engineers and instructors. Continuous advancement of AI technology with data science is crucial for preparing future engineers to undertake complex global challenges responsibly and creatively.

| 17:20 – 17:40 | **Mahmoud Hassan Thullah** – Student, University of Debrecen |

Integrated Education with Artificial Intelligence for Future Skills with Insights from International Students

Artificial intelligence has inspired a lot of discussions about the impact and the role of it has in the development of student background and knowledge and in innovation optimization. As such, the continuous release of ML models in academia before 2014 as presented by teh results of AI index 2024 report and the standard Institute for Human-Centered Artificial Intelligence (HAI) (https://aiindex.stanford.edu/report/), makes it vital to address the opportunities and how the student are using the recent AI digital tools in their studies. Moreover, this is also aligned the European Union Project "Next GenerationEU Make it Real" (https://next-generation-eu.europa.eu/index) where it highlighted the AI usage for advancing education and training in skills which can help in resolving challenges of the future related to climate change, improve healthcare and education. The aim of the study is to provide an insight of the usage of AI digital tools among international students Hungary given their perspective on:

How AI tools and in what areas it is improving their learning processes How do they think that the usage of these tools can improve in the development of skills for industry un their field.

| 17:40 – 18:00 | **Inti Toalombo** – Master's Student, University of Debrecen, Faculty of Engineering |

Education 4.0 Assisted by AI-driven Tools

Thanks to the wide availability of online learning resources, traditional learning methods are changing. Nowadays, people tend to learn from online academic platforms, video platforms, forums, and, recently, AI-Driven learning assistants. In Engineering Education, AI have also significantly impacted teaching en learning of future engineers since these tools have the potential to boost the learning experience.

This presentation explores how AI tools, digital technologies, and e-learning platforms, and the Challenge-Base Method (CMB) enhance the learning experience allowing to engineering students to gain a deeper understanding of engineering subjects. Personal findings into utilizing these resources are shared. We talk about the traditional learning path such as classroom lectures, textbooks, and static content, and compare with modern approaches that leverage AI-driven assistants and interactive platforms. The study explores, how modern Chatbots, such as GitHub Copilot and ChatGPT mimic a personalized tutor along with CBM, presenting a good opportunity to facilitate a profound learning of complex engineering subjects in the field of Cyber-Physical Systems (CPS). Additionally, we highlight how E-learning Platforms in Education 4.0 (E4.0) are valuable for learning AI-related topics from recognized experts for enhancing professional profiles for employability.

We will present the concept of realization of CMB in E4.0 by presenting a project with real-world application based on my experiences. Afterwards, a personal finding will be shared, detailing E4.0's efficiency and consequences in learning engineering subjects. How AI-driven tools helped the enhancement of the engineering community will be highlighted. Finally, the pros, cons and challenges of using these tools in engineering education will be discussed.