The future of AI in medicine and education - 10th anniversary of E- methodology community

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Abstract

This special edition of the E-methodology journal and conference, marking its 10th anniversary, explores the dynamic intersection of technology, science, and society. During a decade we have seen a revolution in the meaning of "e" from being just a digital version of human activity to a totally new world of LLMs (Large Language Models) and other deep learning possibilities. The articles in this volume delve mainly into the transformative potential of artificial intelligence (AI) across diverse fields such as forensic science, education, healthcare, One Health, and public discourse, while examining the broader implications of technology on human life.

Keywords: Artificial intelligence, technology, education, medicine

Introducion (10 years of experience)

Established a decade ago in 2014, the journal "E-methodology" is an annual publication and conference focusing on the challenges and opportunities presented by Internet-based research in social sciences and humanities. Inspired by

the E-methodology research team and building upon the findings, the journal aims to explore the unique methodological considerations associated with utilising the Internet as a research environment and tool. The journal is historically divided into three sections: theoretical discussions about the Internet, research conducted using the Internet, and presentations of Internet-based projects. The primary objective of the journal is to foster the development of effective solutions for Internet research. The papers presented in this 10th edition of the E-Methodology journal explore a wide range of topics at the intersection of technology, science, and society. They delve into the applications of artificial intelligence (AI) in forensic science, education, and healthcare, while also examining the impact of technology on various aspects of human life.

AI IN MEDICINE, EDUCATION AND NORMAL LIFE

The main driver for the development of new technologies, including artificial intelligence, is to maximise profits and minimise costs. In the last few years our journal increased focus mainly on widely understood areas of medicine and education:

- Education and the challenges of digitalization by studying the impact of the digital revolution on school education; the theoretical possibilities of using information and communication technologies (ICT) applications; topics related to ICT in the context of disabilities and special education (Varela et al., 2016) for people with special needs (e.g., refugees due to recent geopolitical crises in the regions) and the use of immersive technologies in education had multiple attempts.
- Health and technology with focus on telemedicine, sensors, e-therapy trends, the rise of e- therapy, especially during the pandemic, explored to determine if it represents a temporary trend or a lasting change in mental health care and the benefits of integrating information technology (IT) into care, demonstrating improvements in patient care. As a special category, our journal published numerous papers and presentations dedicated to multiple patients applications, highlighting their use and perception of these digital tools. There are also many papers on the infodemic impact on patient behaviour i.e. memes in public health or analysis of Twitter or Google Trends, online research on student prostitution.
- Online research methods, primarily focusing on the use of online surveys, were demonstrated along with the methodology and findings of this approach (Latkovikj & Popovska, 2019); privacy and phishing on social networks, virtual reality in research and advantages and disadvantages of online research with the pros and cons of conducting online research were assessed, providing insights into the effectiveness and limitations of the methodology.

The integration of artificial intelligence (AI) in medicine and education is poised to revolutionize both fields, offering unprecedented opportunities for

advancements and improvements and the great majority of text in the current volume raise this question:

- AI in medical diagnosis: Lichosik et al. highlight the potential of AI algorithms to analyse vast amounts of medical data, aiding in early and accurate diagnoses. Klisowska, et al. discuss the use of apps for seniors.
- AI in medical education: Di Sia discusses the use of virtual reality (VR) and augmented reality (AR) simulations in medical education, providing students and doctors with realistic training experiences.
- AI in personalised learning: Isave and Lichosik et al. mention the potential of AI to personalise learning experiences and adapt to individual student needs, while Szabo and Soperna concentrate on group learning (mainly remotely).
- AI in educational technology: Buda discusses the role of LLMs (large language models) in teaching thermodynamics. Szabo discusses the effectiveness of group learning. Isave shows how AI supports teaching.
- AI in public and One Health: Sołtysiak et al. find application on NLP (natural language processing) in analysis of discussion in the Internet on important issues.
- Ethical considerations of AI: Lichosik et al., Di Sia and Dudek, et al., raise concerns about the ethical implications of AI in medicine and education, including issues related to data privacy, algorithmic bias, and the impact on human interaction.

In medicine, AI is expected to play an increasingly crucial role in diagnostics, treatment planning, and patient care (Tran et al., 2019). AI algorithms can analyse vast amounts of medical data, including images, lab results, and patient records, to identify patterns and anomalies that may not be apparent to human clinicians. This can lead to earlier and more accurate diagnoses, personalised treatment plans, and improved patient outcomes. AI-powered tools can also assist in surgical procedures, drug discovery, and disease prediction, ultimately transforming the way healthcare is delivered. Yet another area related to the development of new technologies in medicine is the use of immersive technologies, such as VR and AR, that is also gaining traction in medical education and training. VR simulations can provide students and doctors with realistic and immersive training experiences, allowing them to practice procedures and develop skills in a safe and controlled environment. AR can enhance surgical procedures by overlaying real-time information and guidance onto the surgeon's field of view, improving precision and reducing risks.

In education, AI has the potential to personalise learning experiences, adapt to individual student needs, and provide targeted support (Knopp et al., 2023). AI-powered tutoring systems can identify students' strengths and weaknesses, tailor instruction accordingly, and provide immediate feedback. This can help students learn at their own pace, master concepts more effectively, and achieve better academic outcomes. AI can also automate administrative tasks, freeing up teachers' time to focus on instruction and student interaction.

However, the integration of AI in medicine and education also raises ethical considerations and challenges. In medicine, concerns about data privacy, algorithmic bias, and the potential for AI to replace human clinicians need to be addressed. In education, issues such as the digital divide, the impact of AI on student-teacher relationships, and the need for educators to adapt to new technologies must be considered.

Despite these challenges, the future of AI in medicine and education is bright. With careful planning, ethical considerations, and collaboration between stakeholders, AI has the potential to transform these fields, improving outcomes for patients and students alike. The continued development and integration of AI technologies will undoubtedly shape the future of medicine and education, leading to more personalised, effective, and accessible healthcare and learning experiences.

Summary of the current volume

- Lichosik et al. discuss the impact of widely used large language model algorithms on information retrieval and the associated potential risks. The authors highlight the benefits of AI in knowledge acquisition, such as faster and more accurate results, but also raise concerns about potential manipulation, privacy issues, and the need for critical evaluation of AI-generated information.
- Dudek et al. explore the integration of AI in forensic science, focusing on its applications in crime scene analysis, pattern recognition, and decision support systems. The authors emphasise the potential of AI to improve the efficiency and accuracy of forensic investigations, but also acknowledge the challenges and ethical considerations associated with its use.
- Di Sia provides an overview of immersive technologies, particularly VR and AR, and their applications in various fields, including industry, entertainment, medicine, education, and training. The author discusses the potential benefits of these technologies, such as enhanced learning experiences and improved productivity, but also raises concerns about potential negative impacts on health, privacy, and social interaction.
- Lipieta and Kiedik investigate the impact of endometriosis on the quality of sexual life of women of reproductive age in Poland. The authors find that endometriosis negatively affects sexual functioning, but treatment can improve the quality of sexual life. The study highlights the importance of addressing the physical and psychological aspects of endometriosis to improve patients' overall well-being.
- Klisowska et al. discuss the need for and challenges of technological innovation for older adults in Poland. The authors emphasise the importance of considering the diverse needs and abilities of seniors when designing and implementing new technologies, as well as the need for education and support to ensure that older adults are not excluded from the benefits of technological advancements.

- Buda discusses the concept of "global warming" with the scientific definition of temperature in statistical physics by discussion with ChatGPT 3+ (LLM). The author concludes that the model is hallucinating and gives answers not aligning with the physics-based knowledge.
- Szabo is developing teaching-learning sequences of STEM subjects through transnational cooperation among teachers and teacher trainers. These sequences, designed with intercultural and multilingual considerations, are then implemented and analysed in classrooms, contributing to the production of a MOOC for teacher professional development.
- Isave surveyed student-teachers in India on their use of AI in education, finding that they primarily utilise tools like ChatGPT for lesson planning, practicals, and presentations. The study concludes that student-teachers support the use of AI in education with appropriate regulations and guidelines rather than a complete ban.
- Rozensztrauch et al. examine the knowledge of medical staff regarding the impact of noise on newborns in neonatal intensive care units and its application in practice. The study reveals a need for increased staff training on noise reduction strategies and highlights the potential long-term effects of noise exposure on newborns' development.
- Soperna investigates the impact of the COVID-19 pandemic on academic stress in high school students in Vietnam due to the transition from offline to online lessons. The study finds a negative correlation between academic stress levels and exam results, highlighting the need for targeted interventions to support students' mental health and academic performance during challenging times.
- The study of Sołtysiak et al. revealed a high interest in natural products and personal experiences with antibiotic discourse on the Internet, while discussions on antibiotic resistance were limited to paediatric aspects only and primarily found in traditional media.

Conclusions

The articles in this volume continue a decade-long effort by the journal to enhance our understanding of the complex interplay of "e" concepts among technology, science, and society. In 122 papers and around 250 conference presentations, posters and wokshops, a multidisciplinary team of researchers and students has built a solid body of knowledge on the evolution of "e" in medicine and education. They highlight the potential of technology to improve various aspects of human life, while also emphasizing the need to address the ethical, social, and psychological implications of technological advancements. The increasing reliance on AI in medicine and education raises concerns about the potential dehumanisation of these fields, as algorithms may replace human interaction and empathy. Although AI can enhance efficiency and accuracy, its limitations in understanding complex human emotions and experiences may lead to less

personalised care and education. Nevertheless, there is no substitute for a direct relationship with another human being in both medical and educational contexts. We are confident that we can continue to advance this field over the next decade!

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