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## AI AND DEVELOPING HUMAN INTELLIGENCE, FUTURE LEARNING AND EDUCATIONAL INNOVATION

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### Introduction

AI is a branch of computer science that emphasises the development of intelligent machines that think and work like humans. Examples of AI applications are speech recognition, natural language processing, image recognition etc. The term ML represents the application of AI to enable systems' ability to learn and improve based on experience, without the explicit need for programming, using various problem-solving algorithms. For example, in machine learning, computers learn based on the data they process, not program instructions.

As AI machine relationships and human interactions become more complex, researchers wonder about the roles of humans as intelligent learners in a socio-dynamic learning environment. The core discussion covered in this collection of ideas, questions, and activities for learners to explore requires a new global view of intelligence and education. The authors examine many theories presented in science books and literature regarding social behaviour, acceptance of the world, nature of people and they use them as starting points. For example, they refer to Lewis Carrol, Ada Byron and Russell Ackoff while building a network around poetic science, social grooming, communication and the like.

The authors quote Luckin while referring to the consequence of AI: A lot of what was previously defined as the "human domain" is being replaced by AI. Consequently, the proof that society needs to modify its conception of intelligence and school curricula grows ever more persuasive. People must act on this evidence and utilise their human ingenuity to conceive and develop an education system that will help them retain their intellect as the world's most competent intelligence<sup>4</sup>.

The authors introduce the phenomena of "general-purpose artificial intelligence (GPAI)" to the reader's perspective, underlining the concept "The future informed by work done today", meaning that AI will offer many solutions to the world based on the fact that AI does not have to make same mistakes as human intelligence has done over time. The book offers a wide range of exercises to better understand what educational systems and views of intelligence need to change, investigate artificial intelligence, learn automation, care for all learners, and the future of learning.

### The importance of the book

The book discusses how the future is affected by AI. First of all, authors define intelligence, both human and artificial. According to the Oxford dictionary, artificial intelligence is "the theory and development of computer systems capable of performing tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making and language translation"<sup>5</sup>. The field of Artificial Intelligence is the creation of software or machines to replicate the cognitive abilities of human intelligence and to perform typical tasks carried out by people. The term

<sup>4</sup> Luckin, R. (2018). *Machine Learning and Human Intelligence: The Future of Education for the 21st Century*. London: UCL IOE Press.

<sup>5</sup> Oxford Languages Artificial Intelligence definition. Retrieved from: [https://languages.oup.com/google-dictionary-en/\(30.7.2021.\)](https://languages.oup.com/google-dictionary-en/(30.7.2021.))

“artificial intelligence” is used, according to Russell and Norvig, “when a computer imitates the cognitive functions associated with other human minds, such as learning and problem solving”<sup>6</sup>. The development of numerous economies, the educational fields and the overall quality of life for people is influenced by AI<sup>7</sup>.

Roland and Huang classify different economies based on their relationship to AI using three concepts: mechanical (physical), thinking, and feeling. They discuss how the Feeling Economy will transform education, arguing that it must evolve from its current form in the Physical Economy and Thinking Economy to a new, improved form that emphasises continuing education, group work, and a strong emphasis on communication skills. In some ways, the new concept diminishes the importance of STEM (science, technology, engineering, and mathematics) skills and empowers the “feeling skills”<sup>8</sup>.

Computers are capable of performing functions that used to require human intelligence. Conversely, while the term “emotional intelligence” does capture a lot of the qualities of human workers, automated emotional intelligence is more complex, and this is where humans currently outperform machines. Artificial intelligence is changing the way our world works, with cognitive capacities previously found only in humans using new-to-the-market innovative technologies. However, that will be only the first step in a longer process.

While presenting their book, the authors explain that this is a “guide of the concept of the intelligence.” This is a simplified guide to the history of intelligence and the various definitions that have been em-

ployed over time. This book is about what will future generations consider as being intelligent. The authors underline that developing learning that incorporates human and artificial intelligence gives society the best possible chance to survive as humanity confronts the emerging developments, unprecedented changes, perils, and threats brought on by AI. The fact that “times are a-changing” and that people need to learn how to learn and how to teach and how to adjust human intelligence to gather more gifts for artificial intelligence and to cope with the challenges is the main contribution of this book.

The authors were inspired by the Initiatives undertaken by the Countess of Lovelace, Augusta Ada King, who coined the term “poetical science”. These can be taken as stepping stones for new endeavours. As she studied from a perspective of poetical science, the journey prompted her to pose questions about the “analytical engine”. She considered how individuals and society viewed technology as a collaborative tool, presciently stating that machines can only do what people teach them to do. Also, the book provides essential perspectives for readers in coping with the future and teaches readers about the importance of adjusting how to be a human “in a world of intelligent machines”. The book is adapting to changes, and it has its sociological perspective as well, not only pedagogical and andragogical. It also raises the ethical and legal level of the human-machine interaction, especially in synthesising machine and human thinking.

Similarly to this book, Rolland and Huang, in “The Feeling Economy: How Artificial Intelligence Is Creating the Era of

<sup>6</sup> Russell, S., & Norvig, P. (2003). *Artificial Intelligence: A Modern Approach*. London: Pearson.

<sup>7</sup> Hassanien, A., Darwish, A., & El-Aska, H. (2020). *Machine Learning and Data Mining in Aerospace Technology*. Springer Nature Switzerland AG.

<sup>8</sup> Roland R, Huang M. (2021). *The Feeling Economy: How Artificial Intelligence Is Creating the Era of Empathy*. Cham: Palgrave Macmillan.

Empathy”, state that while pondering over the future, workers will be more critical for feeling tasks than thinking tasks by 2036. A feeling job may be more critical in technical occupations than it was in the past<sup>9</sup>.

### Authors

John Senior is a visiting researcher at the Hungarian Academy’s Institute for Cognitive Neuroscience and Psychology. He is studying the relationship between HI and the psychodynamic mental health issues that AI machines may face. John Senior is a lifelong learner and educator and a creativity consultant, lecturer, and author. He has worked as a co-learner/mentor with and for young, insatiable learners for over four decades. His current research focuses on the relationship between human intelligence and the potential psychodynamic mental health problems associated with AI machines. Additionally, he is interested in the authenticity of being and practical strategies for assisting parents, caregivers, schools, and learners in navigating a time of turbulence. Senior is the author/co-author of 17 books. Additionally, he has published enrichment programs and publications advocating for home education. His current research focuses on the relationship between human intelligence and the potential psychodynamic mental health problems associated with AI machines.

Éva Gyarmathy is a senior researcher at the Hungarian Academy’s Institute of Cognitive Neuroscience and Psychology. She studies the challenges of the twenty-first century and the talents associated with specific learning difficulties, attention deficit hyperactivity disorder, and autism. Current-

ly, she is researching profoundly talented people as well. Her work on the subject has helped both theoretical and practical fields significantly. Eva Gyarmathy is frequently invited to lecture at the ELTE University, the University of Szeged, and the Budapest University of Technology and Economics. Her lectures focus on multilevel options for various skills treatment. She advocates free and open education, and thus her lectures are made publicly available to a larger audience. Additionally, her work is accessible to the public for free<sup>10</sup>.

### Structure of the book

The book “AI and Developing Human Intelligence, Future Learning and Educational Innovation” comprises 264 pages and is organised into eight chapters. After the preface and introduction, the book continues with a brief overview of the concept of intelligence within chapters 1 and 2. Chapter 1 entitled “Defining the New Learning Landscape” brings the difference within phenomena of data, information, knowledge, understanding and wisdom based on Ackoff’s analysis<sup>11</sup> regarding how humans learn and understand. The authors go all the way from past and 0.0. versions to Industry, Media and Education 4.0. The book refers to social revolutions and axial crises to describe the new learning landscape, discussing the Carpe Diem paradigm, autonomy, harmony, cooperation, critical thinking and most importantly, accepting the uncertainty as the elements of “a survival kit for the 21<sup>st</sup> century”. Finally, the authors introduce the third culture phenomena coined by Charles Snow<sup>12</sup> as the third culture of the info-communication while they are referring

<sup>9</sup> Roland R, Huang M. (2021). *The Feeling Economy: How Artificial Intelligence Is Creating the Era of Empathy*. Cham: Palgrave Macmillan.

<sup>10</sup> Institute of Cognitive Neuroscience and Psychology <http://www.ttk.hu/en/phonebook/eva-gyarmathy> (30.7.2021.)

<sup>11</sup> Ackoff, R. L. 1989. From data to wisdom. *Journal of Applied Systems Analysis*, 16: 3–9.

<sup>12</sup> Snow, C. P. (1959.) *The Two Cultures and the Scientific Revolution*. Cambridge: Cambridge University Press. Snow, C. P. (1963.) *The Two Cultures: A Second Look*. Cambridge: Cambridge University Press.

to David C. Pollock and his colleagues as “third-culture kids” and their specificities<sup>13</sup>.

Chapter 2 called “A Brief History of Intelligence – artificial and otherwise” starts with defining intelligence in general and presenting various contributions and models available throughout history (Edward Thorndike, Louis Thurstone, Raymond B. Cattell, Howard Gardner, Aron Keith Barbey and the like). This chapter presents three sublevels of AI: ANI, GAI and ASI. ANI is particularised for one or several areas such as chemical formulas. AGI has cognitive abilities equal to human intelligence, and Artificial superintelligence (ASI) appears in books, movies, and video games dominated by AI-themed science fiction. It has advanced abilities to the extent that it is many times more capable than human intelligence. This chapter compares AI concepts with the elements and concepts of human intelligence, exploring similarities to analytical and creative (human) intelligence. The chapter also opens discussion of human intelligence being culture-dependent.

Chapter 3 entitled “Fluid Intelligence, Other Satellites and Consciousness” points that, unlike crystallised intelligence, fluid intelligence allows an agent (human or machine) to make new connections rather than apply previously learned knowledge. It explains the role of pattern recognition with humans as well as in artificial intelligence. To build this chapter, the authors have expressed the views of various authors such as Raymond Cattell, Salzman & Fusi, Michelle Dawson, David Geary and Ken Wilber. Starting from them, the authors developed various theses about pattern recognition, emotions, instincts and impulses, and motivated thinking.

Chapter 4 with the title “The Changing Nature of Employment and Future Learn-

ing” addresses the thesis that people need to look forward and utilise what has come before in a rapidly changing world of work. AI has and will affect how people live, think, and view intelligence and how they raise it. Also, the authors find that societies must examine their understanding of employment, education, and the impact of AI-driven change on old and new forms of employment, community structures, and education in a post-work society. The chapter recalls occupations that no longer exist and predicts the disappearance of others. Also, based on AI, many new occupations will emerge in the military, agriculture, preventing professional crime, law enforcement etc. Finally, the authors list applied skills for the 21st-century AI-HI living and working with critical thinking, creativity, and collaboration at the top. The main motto of the chapter is that education will never disappear. It will just be reinvented for the 21st century. With eLearning and connectivity, learning will be available 24 hours a day, anywhere.

Chapter 5 called “Included, Excluded, Extraordinary and Efficacious Learners: The Transitional Curriculum” speaks about transitional and open curriculums. The 21st-century learners imply excluded learners, extraordinary learners, efficacious and invisible learners, and machine learners as the authors identify them to the contrary; instead of reducing learners to having a fixed mindset, the authors look to enhance learners’ growth capabilities. The chapter analyses the pedagogical work of Célestin Freinet, Maria Montessori and Reggio Emilia and discusses these observed models. By designing a learning summary, the authors plant “the seeds of a new curriculum”.

Chapter 6 by the name “Accepting Change: A Brief History of the Future” presents the psychology of seeing and inventing

<sup>13</sup> Pollock, David C., Van Reken, Ruth E. (1999). *Third Culture Kids: The Experience of Growing Up among Worlds*. Yarmouth: International Press, Inc. ISBN: 97-1473657663.

the future. The authors point that the future is not like the past in that it is unchanging. The future is perceived relative to where people stand in the present. The awareness of that fact helps people to accept that changes are possible. Creativity plays an important role, as well as motivation and curiosity.

In Chapter 7, “The Mental Health of Machines”, the authors begin with the statement “... humans care”. A human philosophy of caring will give rise to a machine philosophy, which parallels it. The advanced Turing Test requires a synthetic intelligence to exhibit complex human characteristics as part of its identity in order to pass it. As a human development, AI will reflect our core human identity, anxieties, and drive to care. A better understanding of mental health in the 21st century and how it will become a function of both human and artificial intelligence development remains a challenge. The authors complete the story with mental illness by presenting the Synthetic mental illness issue.

The Chapter 8, “What Needs to be Done: The Creative Being and Being Creative Afterword Glossary”, makes an introduction to concluding remarks. The authors hope to inspire a creative debate within the educational, scientific, and artistic communities to explore what will take the society beyond AI in the early 21st century to something new. They mention curiosity of species about the complexities of continuing to grow despite fears, ambitions, and obstacles. AI is just another door. Beyond intelligence, humanity paddles against the current, seeking new opportunities to learn. What comes next, they wonder.

### **Concluding remarks**

The book focuses on examining the relationship and necessary collaboration between human and artificial intelligence

from several different angles, resulting in an educational model that encompasses learners, learning, and future-proof curricula. Thus, the book is a framework for thinking about how AI will change not only the sphere of education, but the society as well, and it is a “humble” guide, as authors call it, from the past, over the present to the future.

Artificial intelligence is changing the way our world works, with cognitive capacities previously found only in humans using new-to-the-market innovative technologies. However, that will be the first step in a longer process.

The book re-examines our general knowledge. What people think is part of their code and what they do automatically, like “being a human”, does not apply – the book makes readers learn what they think they already know. History has shown that over time man had to adapt in order to survive. That rule still applies in the present and it will continue to apply in the future. People have to learn how to become a better version of themselves. The book “AI and Developing Human Intelligence Future Learning and Educational Innovation” can help the world succeed in that.

Researchers in artificial intelligence and the development of human intelligence will be informed about artificial intelligence and empowered by the understanding of intelligence and where the civilisation is headed as people go down the next part of their journey to learn what it means to be human now and what will it mean in the future. The book is about social adjustment to what the future brings to society, inevitably.

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