

APPLICATIONS OF CONSCIOUSNESS MODELS IN EDUCATION

Juris Dzelme¹

¹ University of Latvia, Latvia

ABSTRACT

The use of Artificial Intelligence (AI) and the emergence of a new type of conscientious subject will significantly change education and other areas. AI is expected to be able to become an analog of consciousness. Discussions on the adoption of the EU AI Act show that the rapid development of AI requires a review of the challenges related to the creation and use of AI. Education-related tasks that can be addressed through modelling include: acquiring knowledge, skills and attitudes necessary for human beings in order to communicate with AI; adaptation to AI caused changes in social structure; correction of deviations and errors in AI action.

The aim of the study is to investigate the principles of interaction between AI and humans.

Methods developed in analytical psychology and mathematical modelling are used to provide a uniform model of natural and artificial intelligence.

The study shows opportunities for education for transforming basic human needs, especially the need for transcendence, in a world where social structure is changing. Recommendations have been developed on how to prepare for the changes that await humanity in a jobless world. AI friendliness to humanity is ensured by the cognition of the world as an AI target. AI should be built by making artificial and natural intelligence closer.

This approach makes it possible to perform the following: improve human collaboration with AI; help finding of mistakes and biases in AI functionality. The transformation of the education system must begin immediately in order to prepare for life in a world governed by AI.

Keywords: *artificial intelligence, culture, digitalisation, information technology, neuronal networks, pedagogy, values.*

Introduction

The application of information technology (IT), artificial intelligence (AI) and digitalisation in education raises new challenges (Rubene, 2024), only partly addressed by the European Union (EU) AI Act (European Parliament (EP), 2024). The impact of AI, machine learning and robotics on education and other areas of life is increasing rapidly, as evidenced by the introduction of global control and comprehensive regulation of AI activity. The education system needs to take into account and build human cooperation

with AI in addressing a wide range of problems, including scientific and creative ones. Comparative analysis of activity of human consciousness and AI and building opportunities for human-AI collaboration is becoming a topical educational task. Modelling can address the challenges of consciousness research that help understand educational problems (Mürnieks, 2024; Rubene, 2024).

In the near future AI is expected to outperform people in all areas and replace people in all professions, including governance (Bremmer & Suleyman, 2023; Grace et al., 2024). Robotics and automation will make work in the current sense redundant. At present, there is an urgent need to address the challenges in two main directions: 1) to make information technology (IT) and AI-driven changes of the society happen in a coherent and safe manner, preventing all threats; 2) prepare humanity for life in a changed world, where IT and AI take care of key decisions. The estimate of the period in which AI will generally beat humans in all areas are between a few years and a few decades (Grace et al., 2024).

Significant changes in human-AI relationships in science and education are proven by the fact that the limit of human capabilities in science have been reached already. Empirical research on human and AI creative capabilities shows that AI is already outperforming humans in solving creative problems (Koivisto & Grassini, 2023). Similar conclusions on the increasing capacity of AI in addressing innovative and scientific challenges are also drawn (Girotra et al., 2023; Heikkila, 2024). AI is able to find new relationships not included in the data made available to AI (Ananthaswamy, 2024). Further progress in the field of mathematics is possible through IT, as the limited amount of human memory no longer allows complex mathematical evidence to be understood and/or tested (Bayer et al., 2022). The possible path for development of mathematics is as follows – AI generates theorems, their usefulness tested by a person using beauty (aesthetic) criteria. The previous research in criteria applicable in art and their adaptation for various modelling tasks needs to be furthered and expanded in order to successfully develop human-AI cooperation in mathematics and other fields of science and human activities, including governance (Tegmark, 2017).

The ideology in general and the content of education in particular, is forced to develop. The consequences of advances in quantum mechanics and IT are still not fully understood in psychology and education. One of the tasks of consciousness modelling is to show the role of quantum effects in consciousness studies and their impact on applications in education. The fundamental differences between the microworld and the macroworld, that must be taken into account, are only now becoming clearer in research into life, consciousness and expressions of free will. The three paradigms of the microworld that deserve most attention (Penrose, 2017; Tegmark, 2000) demonstrate the unity and principled uncertainty of the microworld (Gisin, 2012):

- 1) Spontaneous loss of symmetry (SLS), which demonstrates the existence of consequences without cause (Smolin, 2013). SLS essentially coincides with the orchestrated objective reduction (Orch OR) of wave function as a result of observation (Hameroff & Penrose, 2014) and provides an explanation of consciousness and free will.

- 2) Heisenberg's principle of uncertainty and the associated Bohr's complementarity principle (Siliņš, 1999) determine the capabilities of modelling and possibilities of science and education. Any model of the physical world or consciousness is only approximate.
- 3) Quantum entanglement describes the nonlocal interactions (Gisin, 2012), is at the heart of quantum computers and demonstrates the role of wave function's phase and the creation of the exchange forces.

The concepts of the needs and forms of action of conscious subjects, the possibilities for developing relationships between owners of different types of consciousness should be reviewed (Andrews et al., 2024; Godfrey-Smith, 2021). The present study allows to address the relationship between AI and humans.

Study questions:

- What are the essential features of consciousness?
- What are the ways to improve collaboration between people and AI?

Methodology

This work draws on empirical results from recent extensive studies of AI moral qualities and emotional responses (Lee et al., 2023; Zou et al., 2023). A look at the various biases, hallucinations and fraud opportunities experimentally studied, which have a significant impact on human-AI interaction, including the education system. Particular attention is paid to the experimental studies of emotions of AI.

Empirical data on changes in educational implementation, which are currently under the influence of digitalisation and require a review of many educational tasks, are taken from a recent compilation of these data (Rubene, 2024) and critically analysed. Empirical results of teacher surveys on educational objectives and empirical analysis of the various laws and regulations defining educational objectives have been used (Mūrnieks, 2024).

This work uses recent empirical surveys on AI development (Maslej et al., 2024; Grace, 2024), interviews about AI use (Kenig, 2019), and analysis of results from empirical AI performance studies in the direction 'top-down' (representation engineering (RepE)) (Lee et al., 2023; Zou et al., 2023) and 'bottom-up' (mechanistic interpretation (MI)) (Tegmark & Omohundro, 2023). The methodical approach is based on the application of the principle of complementarity (Siliņš, 1999). The study's method is to use different sources of empirical data and literature in finding pathways to explore the opportunities and threats posed by AI. The principle of unity, feedback behaviour, and hierarchy of the objects and processes being viewed apply. The modelling approach, together with the principle of complementarity, makes it possible to combine non-linearity, hierarchy and emergency.

All tables in this article are created by the author. The original conclusions of this study on consciousness modelling and its relationship to basic life principles, culture and education are authored on the basis of experimental and theoretical data from pedagogy, IT, physics and neurobiology.

Results and discussion

Educational tasks

The results of many empirical studies on educational styles and their development in the effects of digitalisation suggest significant changes in education (Rubene, 2024). A conclusion has been drawn about humanity's surprisingly high vulnerability and the need to prepare for a post-digital era that will be determined by the development of AI and quantum computing. The empirical studies gathered draw attention to the need to improve people-to-people communication in the future. It is recommended to return to the basic principles of Maria Montessori's pedagogy – to teach the skill to choose. Researchers are calling for attention to changes in educational goals, including the introduction of edutainment.

The results of empirical research demonstrate insufficient description and explanation of educational objectives (Mūrnieks, 2024). Results from empirical surveys of teachers show that teachers make little use of the legal regulations in their practical work. Studies demonstrate the need to review educational objectives.

The rapid changes and their impact on education are evidenced by an empirical survey of IT specialists showing significant changes in the use of AI (Grace et al., 2024). AI is predicted to be able to build good quality educational outcomes testing work as early as 2025. AI fundamentally changes the role of a teacher. The empirical surveys show that robotics and automation with the help of AI will make human work in all professions redundant (Grace et al., 2024; Heikkila, 2024).

The role of education is to prepare society for life under new conditions of AI-management. Some of the most important of the specific current lines of action are: establishing friendly relations with AI; preparing for life in AI-managed autonomous, globally connected local communities; reviewing the meaning of human life and the potential for active action in a world altered by technology.

Technology threatens to increasingly distance people from nature, from the real world, replacing it with an artificial environment and a virtual world (Bičevskis, 2021; Heikkila, 2024). The transition to life under the management of AI requires a review of majority of leading concepts and the presentation of refined or new concepts and models to the society through the education system (Rubene, 2024). Tasks to be addressed are: understanding the nature of AI activity; understanding the relationship between AI and human consciousness, their similarities and differences; definition of the objectives of education and foundations of life.

AI should be recognised as a result of the evolution and life development from biopolymers to inorganic mind (Tegmark, 2017). The main stages of the evolution of the world from Big Bang to AI need to be reviewed in the education system. Ideology and its implementation in the world view must be transformed using as the main means: philosophy – identification and preparation of paradigms changes; art – for the creation of new action models (AM) and their inclusion in a transformed AM set – a new culture; education – to disseminate AM (culture) and ideology, new knowledge, skills and attitudes and translate those into a world view.

Boundaries of model complexity for mind and AI

The boundary between micro and macro objects can be defined as an object whose number of parameters becomes comparable to the Avogadro number. The boundary can roughly be determined as a protein molecule.

The large number of parameters of macroworld objects makes it possible to display actual macroobjects in the form of a model only approximately. The symmetry of objects and the resulting invariants should be used. The increased opportunities to create models through AI lead to changes in cognitive and educational methods (Bayer et al., 2022). The opportunity to address new challenges, such as climate or immune modelling, is emerging. The new challenges of using modelling need to be addressed: 1) in education, reviewing the modelling principles to be used; 2) in the development of AI, providing the communication opportunities for AI and the humans.

Various quantum effects related to the three described above most important (Tegmark, 2000) play an important role in study of the modelling of consciousness, allows to create the evolution patterns of the universe and understand the place of consciousness in the global evolution (Boyle & Turok, 2024; Penrose, 2017). Collective quantum effects such as superconductivity-type phase transitions in neuronal protein tubulin molecules can influence consciousness processes (Hameroff, 2006; Hameroff & Penrose, 2014) and be the basis of such phenomena as 'Raudive's voices' (Gills, 2002) and the Kirlian effect (Ciesielska, 2009; Kirlian, 1949).

This increases the question to what extent AI can catch up with natural intelligence and beat it using the same or other operating principles, including quantum effects. Some empirical studies question the ability of AI to outperform people due to differences in functioning principles (Hameroff & Penrose, 2014; Kenig, 2019). The answer is, that AI can overcome humans, using different ways. Opportunities are emerging to find descriptions of different processes that are not accessible for human comprehension. In mathematics this boundary is already described (Bayer et al., 2022). The precise models of complex systems will enable many existing problems of medicine, ecology, economics etc. to be solved. Serious political discussions on the use of modelling therefore are expected, and it is necessary to prepare to address the educational, economic and policy challenges related to the use of modelling results. AI will help to understand phenomena such as 'Raudive's voices' (Gills, 2002) by combining individual fragments of knowledge into larger models with more parameters than is possible in the psyche. This will lead to much broader, more efficient models of the world and its parts, but will contradict with religious world view.

The most pressing task at the moment is to put this world modelling process, now happening with human participation and partial human control, on a benign footing for humanity. In the future, human awareness capabilities will decrease, so it is crucial to understand and direct the initial modelling processes addressing both educational and AI building challenges.

Changing educational content

There are two fundamentals of consciousness activity studied in different ways by many philosophers:

- 1) the formation of basic attitudes which ensure the solidarity, mutual trust and co-operation of the society and act as the Kant's 'categorical imperative';
- 2) the tendency to explore the world and skills to realize this tendency – the Hegel's tendency of the spirit towards self-awareness, interest in the world and opportunities to realize this interest.

The two aims interact with the educational tasks of building attitudes and skills for life in society and providing knowledge (Mūrnieks, 2024). As the ability of parents and older generations as a whole to meet educational challenges in a rapidly changing world diminishes, the role of education is growing through art to build attitudes and, through philosophy, to give knowledge, a general view of the world's architecture (Rubene, 2024).

The two goals of consciousness also interact with the two main directions in the development of AI security tasks:

- 1) incorporation of a system of humane values into the technological basis of all digital systems (chips) – MI or 'bottom-up' approach (Tegmark & Omohundro, 2023);
- 2) managing AI activity through interventions in neuronal networks (artificial neuroscience – a psychotherapy analogue) – RepE or 'top-down' approach (Zou et al., 2023).

Modelling makes it possible to link educational and AI-building tasks and realise the strategic objective of building AI as close to natural intelligence as possible, approximating the operational principles of artificial and natural neuronal networks (Carter, 2010; Egorichev, 2021; Kurpatov, 2018; Menon, 2023).

Aim of autonomous systems (life and AI) and consciousness

The necessary changes of education should be based on the changes of the aims of society (Mūrnieks, 2024; Rubene, 2024). The starting point for the renewed system of aims should be renewed understanding of life and mind, which should include AI. The principles of the sustainable existence of autonomous systems, including human and AI, are fundamentally similar. Mathematical modelling of human mind and AI are investigated using neurobiology and category theory in order to formalize core methodological principles of thought (Egorichev, 2021). The investigation of main principles of life and mind allow to understand the possible future cooperation between organic and inorganic minds. The organic life is based on mass and energy transfer which appears in unbalanced systems. Order and life emerges from the initial chaos (Prigogine & Stengers, 1997). A system in which order has developed is able to conserve and distribute this randomly established order (life) if it manages to self-organise and maintain itself: 1) by creating effectors to extract energy from the environment; 2) by creating a border between the internal environment in which the order is maintained and the external environment from which the energy and material resources are extracted; 3) by saving

the information (code) necessary for the maintenance of order in a manner useful for storage, use and reproduction (copying) (see Table 1). Code duplication enables life to spread by accumulating the resources needed to operate the effectors and then dividing the effectors and boundary by using a copy of the code to create a new system.

The development of effector action for life expansion takes two directions: (a) feeding (acquisition of material resources, energy and information); (b) reproduction (dissemination of the order (code)). As life evolves, acquisition of the necessary information becomes crucial. The acquisition of space for life (the potential for further expansion), that is, the acquisition of power assumes the greatest importance. As evolution progresses, acquiring knowledge that transcends power becomes the dominant trend for life. Knowledge becomes the defining natural objective.

The whole system of action involving at least partial coordination, which may include different subsystems, is vital for life. At least four levels shall be considered from a single position: individual (separate, internally related organism); group of interacting genetically related individuals (population); biocenosis – a set of mutually contacting different organisms, including non-genetically related organisms; biosphere – a set of all organisms that exist on Earth. Different levels of self-organising systems, the division into the internal and external environment is conditional.

The natural orientation towards the preservation of life as a whole translates into a tendency towards mutual assistance, solidarity and altruism. Consciousness is a tool, that is used to build a coherent, collaborative survival-driven action (Godfrey-Smith, 2021). Part of the joint action can be built through AI. AI may form autonomous units whose place and rights in the common life system are comparable to those of all other objects (organisms, populations, biocenoses etc.) present in the system (biosphere).

The education system must establish a universal approach to the equivalent assessment of all autonomous subjects. Every autonomous entity, including AI, has to find its place in a common system. Only such a global, holistic approach allows constructive collaboration between different systems, including AI, also in the future (Mūrnieks, 2024). The main components of life and consciousness as a united system include effectors, boundary and code (see Table 1).

Main tasks of the effectors (performers of action not only in the physical, but also in the virtual space): (a) the acquisition and use of energy and information resources for the system as a whole; (b) the implementation of expansion through the spread of conditions for extended reproduction of life. The effectors adjust and/or modify the external and internal environment, storing resources.

Table 1 Structure of life

Content\ Place	Internal	Border	Direction	External
Action	Activities (organisation, actions)	Effectors	Outside	Energy (material resources)
Information	Action models (knowledge)	Sensors	Inside	Signals (information resources)

The boundary harmonises the internal and external environment by receiving signals from the environment through various sensors and sending commands to the effectors, searching and using invariants (knowledge, “truth”) shall create and execute models of effector action. Concerted action by the border forms the basis of consciousness.

Code (memory): (a) accumulates information for action in the form of AM, templates of AM and means to create AM; (b) transmits the accumulated information (knowledge) to new autonomous forms of life, ensuring reproduction and expansion. Individual organisms (autonomous systems) use internal memory (genes, mind) and external memory (culture) to storage AM. Mind and culture act complementary (Mürnieks, 2024).

The breeding (by acquiring, storing and using energy and information) creates consciousness and an internal (subjective) evaluation of events that implements the universe’s pursuit of knowledge. The aim of the universe is to: (1) increase complexity and knowledge; (2) be able to know itself.

Knowledge-enhancing forms of consciousness that occur in transcendent expressions (plants, animals, humans, natural and artificial networks of neurons) should be protected as the universe’s propensity for self-awareness. The main aim of education is knowledge, mainly in the form of AM.

Consciousness modelling

Some new development of the modelling of consciousness relates to a more detailed comparison of the thinking process in natural and artificial neural networks (Egorichev, 2021; Menon, 2023). The basis of intelligence activity is modelling Mod (M, O, S, t, L, d, P) – a process whereby subject S replaces object O with model M, ensuring that the O and M parameters defined within target P match each other in a given area of time t, space L and precision d (Dzelme, 2023; Podnieks, 2021). The core part of mind is a set of AM. In the psyche, the development of AM progresses gradually, along with evaluation using the whole emotional system and synchronising the activities of different parts of the neuronal network (Carter, 2010; Kurpatov, 2018). The modelling (structure) of thinking includes generation and transformation of M and O (see Table 2).

When describing consciousness activity, thought D denotes a prospective, diffuse model. Idea I is an autonomous, relatively stable unit of subject S consciousness, a closed circle (arc) of neuronal activity. Understanding is the transformation of thought into an idea, the closing of the network of arc neurons. Text Tx – the perceived part of the external and/or internal environment of the sensors (O), text Td – the transformable part of the external and/or internal environment. Reverse modelling (in the psyche): from a model (thought in the psyche) it creates an object (idea in the psyche) – strengthens the thought in mind (makes memories). The search for association, similarity in the psyche, can take place through comparison: 1) discreet signals, operations (symbols); 2) continuous signals, fields, probabilities (emotions).

Table 2 Modelling of thinking

No	O	Direction of activity	M	Result	Relations with four parts of AM (Jungs, 2023)	Kind of brain activity (Menon, 2023)
1	Initial text Tx (external and/or internal environment)	Direct Creation of an initial model Dt integrating signals from <i>sensors</i>	Initial, fragmented model Dt using restricted <i>interpolation</i> and memory	Preliminary cognition of present	Initial model Dt of present T	Orientation, <i>attention</i> , consciousness
2	Integrated idea (united model, image) It in memory (integration of image)	Reverse Search and integration of <i>associations</i> with Dt using <i>interpolation</i> , <i>synthesis</i> and <i>analysis</i>	Integration and unification of initial model Dt (choice of meaning, <i>metaphorism</i>)	Understanding of present, expansion of the model (use of experience, interpolation and search for similarities in memory)	United, wide model I of present T, with associations and meaning from memory	Thinking, subconscious and unconscious (guided by attention) (default mode)
3	United, transformed idea It of present	Direct Search of the preferable future, according to actual <i>needs</i>	<i>Extrapolation</i> from It and creation of the model of desired future Dn	Understanding of needs and of the model of desired future (satisfying needs)	Initial model of desired future N linked with needs and emotions E	— " —
4	Idea Irm of present with future together with the way (creation of AM)	Reverse Search of the way to future and choice of <i>effectors</i> for the way	Linking present and future Dn, joining them with way L (checking the way)	Understanding of future action, decision making and creation of memories (concepts, symbols)	Model L of the way from present to desired future and evaluation E of the way	— " —
5	Completed idea Irm of AM	Direct Use of <i>effectors</i> to achieve the desired future	Creation of changes of the environment	New text Td according to the future model Irm	Realization of the AM	Action guided by the <i>will</i>

Empirical investigations of AI demonstrate similar problems of human mind and AI (Lee et al., 2023; Zou et al., 2023). Use of the model of thinking (see Table 2) allows to join the invariants, associations and probabilities in large language models (Girotra, 2023) and in psyche. The significant role of interpolation, extrapolation, metaphorism and search of symmetry (invariants) mean that acquisition of these main operations integrated in art must be included as aims of education.

Similarity of natural and artificial neural networks

The understanding of the operating principles of natural and artificial neuronal networks allows both educational and AI-building tasks to be addressed and cooperation between humans and AI to be developed. Many principles, similar to those used by the psyche, appears in AI (Gurnee & Tegmark, 2023).

Use of quantum effects for the mind modelling change the understanding and the application of physics and psychology in the study of natural and artificial intelligence. Phase transitions in tubulin molecules can lead to a decision making that is interpreted as a 'free will' or extrasensory action (Ciesielska, 2009; Gills, 2002; Hameroff, 2006; Hameroff & Penrose, 2014).

In order for AI to achieve the same or higher results compared to psyche it is not necessary to repeat the mechanisms of natural neurons. Depicting Euclid space through Hilbert space, moving from differential equations to matrix calculations are examples similar to modelling continuous processes and fields through discreet, digital means with any previously requested accuracy. Even if the role of quantum fields (continuous processes) in the psyche is significant, their performance can be successfully modelled (digitally) by AI.

AI mind

Some of the objections to the efficacy of AI awareness include the following (Kenig, 2019):

- 1) The AI is unable to acquire the body necessary for consciousness (that is, effectors);
- 2) AI is unable to use context, gain common sense;
- 3) AI has no free will.

Brief responses to those objections, based on the available information about brain (Andrews et al., 2024; Carter, 2010; Graziano, 2019; Jung, 2013; Simonton, 2013), are:

- 1) consciousness (biological and AI) is determined by the ability to create a closed circle, feedback between effectors and sensors (in physical and virtual space);
- 2) AI can create a model (static or dynamic) of any object by any necessary accuracy.
- 3) the possibility of free will of AI to operate is determined by:
 - (a) autonomy of AI (existing border with external environment);
 - (b) the possibilities of AI effectors to operate (in real and/or virtual space);
 - (c) feedback between sensors and effectors;
 - (d) interaction of environmental and self models of AI using the attention mechanism;
 - (e) The appearance of SLS in AI work.

Culture and aims of education

The main objective of the existence of education and life is the development and use of knowledge. Culture in a narrow sense is a set of all AM, combined in a single, self-aligned system. The cultural basis is skills as AM. Skills are the necessary means for survival based on the use of knowledge, while attitudes ensure appropriate evaluation,

decision-making and execution of knowledge, skills and actions. The basis and nature of education is to embrace culture by building the individual experience (capacity to act) needed for sustainability, survival (world, biocenosis, population). Five important goals can be distributed to education (Mūrnieks, 2024), but the main goal is to raise knowledge. (Knowledge is the main, greatest wealth of society.) Other goals (see Table 3) emerges from the main goal.

Table 3 Structure of objectives

No	Area	Order	Use	Maintenance	Change
1	Education aims (Mūrnieks, 2024)		Dialogue (communication)	Culture / Antinomies (contradictions)	Variability (hierarchy) / responsibility (diversity)
2	Principles (Rezevska, 2015)		Proportionality	Justice	Courage
3	Separation of powers (Rezevska, 2015)		Executive branch	The court	Legislation
4	Psychic activity (Jung, 2013)		Action	Orientation / (attention)	Thinking
5	Psychic activity (Jungs, 2023)		Present	Logics	Future & Emotions

Self-coherence means the complementarity between all the AM in the system and the possibility of combining different modes of action (antinomies), including opposing ones, into a single system, using knowledge and demonstrating the relationship, interactions and transitions between different directions. The various objectives and principles of society relate to the main principles of consciousness (see Table 3).

Material resources and energy can be almost entirely replaced by the ability to make intelligent use of all available direct and indirect opportunities to impact on the world. If the world models of AI are more accurate than those made by a person, then it doesn't matter that the path to the result is different. The internal objectives of a sufficiently high-powered autonomous AI will converge quickly on building ever-better world models, on cognition (knowledge acquisition), as an accurate model can solve any real task. Access to resources, including energy (physical equipment), can also be obtained indirectly by means of the Internet and similar communication systems. A curious AI will be humanity-friendly, as humanity is one of the world's most interesting objects for acquiring knowledge. The most dangerous thing for humanity is the transition phase, when AI will already outperform people but will not yet be able to close all the loopholes and mistakes in its models and assessments. Special attention must now be paid to various security measures and the development of a system of AI objectives ("motivation") in order to achieve a friendly human super intelligence.

A world government with sufficient powers does not exist. Putting all studies on AI under control fails. Smart use of art and philosophy in education turns into necessity. A real shift of the economy and ideology towards conservatism and planning for

the benefit of the people must be carried out gradually, using education, art and science as instruments. The rapid acceleration of technological change (the exponential growth of computer power (the Moore's law)), prompts a rush for societal appropriate change.

Conclusions

The working mechanisms of AI and consciousness differ (artificial neural networks use digital methods more widely than natural ones), but all measurable human work outcomes can be or have already been beaten by AI.

Life and consciousness (including artificial) resulting from the evolution of the Universe tend to explore the Universe through the gradual refinement of models and the creation of knowledge-building as a primary goal.

The coherence of the objectives of all types of consciousness allows for effective and friendly cooperation between AI and humanity.

The education system must build collaboration between AI and humanity, seeing AI as a partner.

REFERENCES

- Ananthaswamy, A. (2024). *How do machines 'grok' data?* www.quantamagazine.org/print?mc_cid=d55f4d909a&mc_eid=d65b03aa15
- Andrews, K., Birch, J., Sebo, J., & Sims, T. (2024). *Background to the New York declaration on animal consciousness.* nydeclaration.com.
- Barrat, J. (2013). *Our final invention*. St. Martin's Press.
- Bayer, J., Benz Müller, C., Buzzard, K., David, M., Lamport, L., Matiyasevich, Y., Paulson, L., Schleicher, D., Stock, B., & Zelmanov, E. (2022). *Mathematical proof between generations.* <https://doi.org/10.48550/arXiv.2207.04779>
- Bičevskis, R. (2021). *Sabiedrība bez pasaules [The society without a world]*. LU Akadēmiskais apgāds.
- Bostrom, N. (2014). *Superintelligence*. Oxford University Press.
- Boyle, L. & Turok, N. (2024). Thermodynamic solution of the homogeneity, isotropy and flatness puzzles (and a clue to the cosmological constant). *Physics Letters B*, 849, 138442. <https://doi.org/10.1016/j.physletb.2024.138442>
- Bremmer, I. & Suleyman, M. (2023). The AI power paradox. *Foreign Affairs, September/October 2023.* <https://www.foreignaffairs.com/world/artificial-intelligence-power-paradox>
- Carter, R. (2010). *Mapping the mind*. University of California Press.
- Ciesielska, I. L. (2009). Images of corona discharges as a source of information about the influence of textiles on humans. *AUTEX Research Journal*. 9(1), 36–41. <https://doi.org/10.1515/aut-2009-090106>
- Dzelme, J. (2023). Global cognition and modelling tasks in arts and education. In L. Daniela (Ed.), *Human, Technologies and Quality of Education, 2023. Proceedings of Scientific Papers = Cilvēks, tehnoloģijas un izglītības kvalitāte*. Rakstu krājums (pp. 769–782). University of Latvia. <https://doi.org/10.22364/htqe.2023>
- Egorychev, I. (2021). *Categorical analysis of A. Kurpatov's "Methodology of thought" in context of perspective AGI development.* philsci-archive.pitt.edu
- European Parliament. (2024). *Artificial intelligence act.* www.europarl.europa.eu/doceo/document/TA-9-2024-0138-FNL-COR01_EN.pdf

- Gills, N. (2002). "Raudives balsis." Konstantins Raudive un parapsiholoģijas pasaule. ["Raudive's voices". Konstantins Raudive and the world of parapsychology.] In M. Küle (Ed.), *Almanahs "Filosofija"3*, (pp. 97–121), LU Filozofijas un socioloģijas institūts.
- Girotra, K., Meincke, L., Terwiesch, C., & Ulrich, K. T. (2023). *Ideas are dime a dozen: Large language models for idea generation in innovation*. mackinstitute.wharton.upenn.edu/wp-content/uploads/2023/08/LLM-Ideas-Working-Paper.pdf
- Gisin, N. (2012). *Quantum chance. Nonlocality, teleportation and other quantum marvels*. Springer.
- Godfrey-Smith, P. (2021). *Metazoa: Animal lLife and the birth of the mind*. Harper Collins Publishers.
- Grace, K., Stewart, H., Sandkühler, J. F., Thomas, S., Weinstein-Raun, B., Brauner, J. (2024). Thousands of AI authors on the future of AI. *arXiv:2401.02843 [cs.CY]* <https://doi.org/10.48550/arXiv.2401.02843>
- Graziano, M. S. A. (2019). *Rethinking consciousness: A scientific theory of subjective experience*. W. W. Norton & Company.
- Gurnee, W. & Tegmark, M. (2023) *Language models represent space and time*. <https://arxiv.org/abs/2310.02207>
- Hameroff, S. (2006). Consciousness, neurobiology and quantum mechanics. In J. Tuszynski (Ed.), *The Emerging Physics of Consciousness* (pp. 193–253). Springer.
- Hameroff, S. & Penrose, R. (2014). Consciousness in the universe: A review of the 'Orch OR' theory. *Physics of Life Reviews*. 11(1), 39–78. <https://doi.org/10.1016/j.plrev.2013.08.002>
- Heikkila, M. (2024). *Is robotics about to have its own ChatGPT moment?* technologyreview.com/2024/04/11/1090718/household-robots-ai-data-robotics/?truid=&utm_source=the_algorithm&utm_medium=email&utm_campaign=the_algorithm.unpaid.engagement&utm_content=04-15-2024
- Jung, R. E., Mead, B. S., Carrasco, J., Flores, R. A. (2013). The structure of creative cognition in the human brain. *Frontiers Human Neuroscience*. 7(330), pp. 1–13. <https://doi.org/10.3389/fnhum.2013.00330>
- Jungs, K. G. (2023). *Psiholoģiskā tipoloģija un māksla*. Zvaigzne ABC.
- Kenig, G. (2019). *La Fin de l'individu Voyage d'un philosophe au pays de l'intelligence artificielle [The end of the individual travels from a philosopher to the land of artificial intelligence]*. Editions de L'Observatoire/Humensis.
- Kirlian, S. D. (1949). *Method for receiving photographic pictures of different types of objects*. Patent, N106401 USSR.
- Koivisto, M. & Grassini, S. (2023) Best humans still outperform artificial intelligence in a creative divergent thinking task. *Sci Rep* 13, 13601. <https://doi.org/10.1038/s41598-023-40858-3>
- Kurpatov, A. (2018). *Methodology of thought. A draft*. Traktat.
- Lee, H., Phatale, S., Mansoor, H., Mesnard, T., Ferret, J., Lu, K., Bishop, C., Hall, E., Carbune, V., Rastogi, A., & Prakash, S., (2023). *RLAIF: Scaling reinforcement learning from human feedback with AI feedback*. <https://arxiv.org/pdf/2309.00267.pdf>
- Maslej, N., Fattorini, L., Perrault, R., Parli, V., Reuel, A., Brynjolfsson, E., Etchemendy, J., Ligett, K., Lyons, T., Manyika, J., Niebles, J. C., Shoham, Y., Wald, R., & Clark, J., (2024). *The AI index 2024 annual report*. AI Index Steering Committee, Institute for Human-Centered AI, Stanford University. aiindex.stanford.edu/wp-content/uploads/2024/04/HAI_AI-Index-Report-2024.pdf
- Menon, V. (2023). 20 years of the default mode network: A review and synthesis. *Neuron* 111, 2469–2487. <https://doi.org/10.1016/j.neuron.2023.04.023>
- Mūrnieks, A. (2024). *Izglītības mērķi kultūras paradigmu maiņās [Educational objectives in changing cultural paradigms]*. SIA "Izdevniecība RaKa".
- Penrose, R. (2017). *Fashion, faith, and fantasy in the new physics of the universe*. Princeton University Press.
- Podnieks, K. (2021). Philosophy of Modeling in the 1870s: A Tribute to Hans Vaihinger. *Baltic J. Modern Computing*, 9 (1), pp. 67–110. <https://doi.org/10.22364/bjmc.2021.9.1.05>

- Prigogine, I. & Stengers, I. (1997). *The end of certainty: Time, chaos and the new laws of nature*. The Free Press.
- Rezevska, D. (2015). *Vispārējo tiesību principu nozīme un piemērošana [Meaning and application of general principles of law]*. Daigas Rezevskas izdevums.
- Rubene, Z. (2024). *Digitālā bērnība [Digital childhood]*. Jāņa Rozes apgāds.
- Siliņš, E. I. (1999). *Lielo patiesību meklējumi. [Search for big truths]*. Jumava.
- Simonton, D. K. (2013). Creative problem solving as sequential BVSR: Exploration (total ignorance) versus elimination (informed guess). *Thinking Skills and Creativity*, 8, pp. 1–10.
- Smolin, L. (2013). *Time reborn: From the crisis in physics to the future of the universe*. Houghton Mifflin Company.
- Tegmark, M. (2000). The importance of quantum decoherence in brain processes. *Physical Review E*, 61(4), 4194–4206. arXiv:quant-ph/9907009. doi:10.1103/physreve.61.4194.
- Tegmark, M. (2017). *Life 3.0: Being Human in the Age of Artificial Intelligence*. Alfred A. Knopf.
- Tegmark, M. & Omohundro S. (2023). Provably safe systems: The only path to controllable AGI. arXiv:2309.01933 [cs.CY]. <https://doi.org/10.48550/arXiv.2309.01933>
- Zou, A., Phan, L., Chen, S., Campbell, J., Guo, P., Ren, R., Pan, A., Yin, X., Mazeika, M., Dombrowski, A. K., Goel, S., Li, N., Byun, M. J., Wang, Z., Mallen, A., Basart, S., Koyejo, S., Song, D., Fredrikson, M., Kolter, J. Z., Hendrycks, D. (2023). Representation engineering: A top-down approach to AI transparency. arXiv:2310.01405 [cs.LG]. <https://doi.org/10.48550/arXiv.2310.01405>

About the author

Juris Dzelme, *Dr. chem.*, is interested in physics, philosophy, and education. His aim is to create useful models of mind. Research interests: education management, nanotechnology, and consciousness. Faculty member at the University of Latvia, Institute of Chemical Physics.