


Philosophy and Computing Conference at IS4SI 2021 [†]

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Abstract: The philosophy of AI currently comprises the core of Philosophy and Computing. Fascinating ideas include: B. Goertzel states that humans use paraconsistent logic, which robots should follow; S. Thaler's discovery engines (DABUS), which are at the early stage AGI; the Uplift team trying to build advanced AI around the kernel of ethics, while solving the problem of life-long-learning neural nets. J. Copeland gave an IS4SI plenary, while Oron Shagrir and Jun Tani gave APC plenary lectures. J. Bach assembled an amazing panel on machine consciousness. Novel session on the fourth space was led by D. Hardegger. Invited speakers including M. Burgin, S. Castro, R. Goodwin, R. Manzotti, M. Talanov. Graduate presentations e.g., J. Dakowski, C. Abels. BICA/APC panel on ethics and future AGI with R. Yampolkiy, M. Waser and D. Kelley.

Keywords: philosophy of AI; AGI; discovery engines; digital transformation; the fourth space; machine consciousness; fairness in data

1. Introduction

The session was devoted to philosophical issues in computing, including three tracks:

- A. **Philosophy of AI:** Philosophical issues in AI; Artificial General Intelligence; Discovery AI; Ethical issues in and around AI; Social acceptance of AI on its way to AGI.
- B. **Machine consciousness:** Conscious-like functionalities; AI and first-person consciousness, Machine Personhood and Machine Intelligence.
- C. **Ethics, Equity and Society in digital world:** Computer ethics; fairness in algorithms; social equity or social exclusion through digitization. Privacy and transparency.

Session A hosted keynotes by Ben Goertzel, Stephen Thaler and Kate Gaudry, Jun Tani, and Oron Shagrir. Last but not least, we recommended Jack Copeland's IS4SI keynote, which shall be presented in the related editorial. Analytical philosophers may have been most at home during session B, on machine consciousness, or at the Turing and Church session. Session C included important presentations by Mark Waser, Susan Castro, a panel with Roman Yampolskiy and David Kelley (joint with BICA), the fourth space session, and numerous other interesting contributions.

In this overview, we mention all presentations at the Philosophy and Computing conference. Those papers presented in the current publication shall be noted here just briefly since the reader has easy access to the main ideas of such papers.

Several papers have not been independently submitted to this volume—in many cases, they were based on some earlier or upcoming publications, and the authors rightly decided not to auto-plagiarize. In some of these cases, we decided to go back to the short, early abstracts to give our readers the very gist of their work; this also pertains to papers not quite finished by their authors for health or other special reasons.

The conference took place on 12, 14–18 September. It was organized by philosophers assembled, over the years, around the Newsletter on Philosophy and Computers of the



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American Philosophical Association and the APA Committee on Philosophy and Computers (both now discontinued) and related organizations; especially The Association on Philosophy and Computing (APC), affiliate of the APA <https://philosophyandcomputing.wordpress.com/> (accessed on 12 September 2021). Additionally, the conference was enhanced by the philosophy interest group within BICA Society (which also organized its own conference at this IS4SI); PHAEDE (Philosophy of Engineering and Artifact in the Digital Era, within the Romanian Society for Philosophy, Engineering and Techno-ethics); Philosophy and Science (a journal of the Polish Academy of Science) [1], The Fourth Space Scholars' Group, and other organizations focused on philosophy of the digital world.

2. Philosophy of AI

This track started with the paper "Philosophy 2.0: Applying Collective Intelligence Systems and Iterative Degrees of Scientific Validation," by Kyrtin Arteides followed by one of the longest, more thorough accepted presentations "From Signals to Knowledge and from Knowledge to Action: Peircean Semiotics and the Grounding of Cognition" by a Brasil team headed by Ricardo Gudwin, where the authors drew lessons from C.S. Peirce for current AI.

In his keynote "Patternism 2021: Toward a General Philosophy & Science of Intelligent Information Processing", Ben Goertzel revisited his 2006 book on patternist philosophy [2]. The new point that attracted many people's attention was Goertzel's thesis, shared by him in late 2021, that human beings follow paraconsistent logic—particularly, in ethics. Goertzel argues, that the human condition, including evolutionary competitive pressures, would require people's brains to be more efficient by an order of magnitude to be able to follow all kinds of practical problems and conflicts of value. Thus, para-consistencies in one's life create the best (meta-rational) set of behavioral patterns for beings like us to lead relatively successful lives. Goertzel argues that humanoid robots able to truly interact with human beings (advanced artificial human companions) also ought to follow paraconsistent logic, in order to smoothly interact with real people in real situations.

In his APC keynote, Stephen Thaler presented DABUS his most advanced creativity engine. The focus of the presentation by Kate Gaudry, was legal attempt to provide DABUS the right to hold patents. Incidentally. While supportive of Gaundry's work towards recognition of DABUS as an inventor, in a broader picture Thaler seemed a bit annoyed by excessive publicity that his legal attempts received since the Summer of 2021, which overshadow details of DABUS' functioning. Several of my computer science students who attended the lecture shared with me that DABUS seems closer to Artificial General Intelligence than any other cognitive engine they are familiar with.

Oron Shagrir in his keynote for APC shared fragments of the project related to computational indeterminacy, while Jun Tani explored intricacies of robotic minds (his paper has been enclosed here).

At the special plenary lecture on Symbiotic Computing Mark Burgin and Rao Mikkilineni presented: "Symbiotic Computing: A methodological analysis" (included in this issue, just like most of the papers that follow).

At the APC Session Information and Computing we had invited talks by Riccardo Manzotti's "Information is (only) probability"; Max Talanov and team on "Neuroprosthetics and neurosimulations technologies"; Magnus Johnsson's "Perceptions, imagery, memory and consciousness in man and machine".

In regular sessions on Analytic Philosophy of AI, Piotr Giza spoke on the consequence of big data for scientific methodology in his paper "The End of Theory: Will Data Deluge and Machine Learning Make the Scientific Method Obsolete?" (Piotr Rabiza's presentation at this conference: <https://www.youtube.com/watch?v=rJU8Vhcpyhg>, accessed on 20 October 2021); Robin Hill came up with "The Argument Against Fact Check"; Jakub Dakowski, laureate of the graduate prize at the graduate conference *Cognition 21* at the University of Poznań, presented his elegant and formally highly competent paper: "Isomorphism between Sudoku and proof systems and its application in Sudoku solving."

The papers on the ontological status of virtual objects included: Mariusz Mazurek's "The problem of existence of virtual objects" and Roxanne Smith's "Conceptual engineering and the harms of AI bias". A very special, *ontological to esoteric*, session took place at very early morning on Sept 18, with Simon Duan's lecture "Platonic Computer—The universal machine from which everything is produced", followed by an exceptional paper by Pawel Polak and Roman Krzanowski on "Ontology and AI Paradigms".

A highly analytical session, prepared by APC's Gary Mar, was devoted to: "Gödel, Church, and Turing in Retrospect". Oron Shagrir opened the session with his paper "Who is the human computer", followed by Nathan Salmón with "The Decision Problem for Effective Procedures" and Gary Mar on "Gödel on the Creativity of Mathematics" (we have short abstracts of the first two quoted below).

3. Machine Consciousness

The track was primarily a session on machine consciousness, organized by Joscha Bach. It opened with the paper "The strength of weak artificial consciousness" by Anil Seth presented, impressively, shortly after he disembarked an airplane, giving his quite excellent lecture at somewhat unsafe looking evening London streets. It was followed by Joscha Bach with "Virtualism as a perspective on consciousness". That was followed by "Epistemic indeterminacy and the applied ethics of synthetic phenomenology" by Thomas Metzinger; "Making a machine that really feels" by J. Kevin O'Regan; "Non-reductive physicalism" by Peter Boltuc [3] (Real slow-going Peter Boltuc's presentation at this conference: <https://www.youtube.com/watch?v=KnXZTU4XuLE>, accessed on 5 October 2021) and Ron Chrisley's "Machine Consciousness, Meta-Knowledge, and Physical Omniscience". We present short abstracts of most of those papers in Section 6.

4. Ethics, Equity and Society in Digital World

The Session, begun with the symposium on *The 4-th Space* by The Fourth Space Research Group. Daniel Hardegger, opened the session with the paper "Towards a Merging of Spaces: A 'holistic concept' for the emerging '4th Space'". It was followed by Nick Clifton's "Co-Working Spaces, Innovation and the 4th Space", Christoph M. Abels on "Everybody lies? Misinformation and its implications for the '4th Space'", Gordana Dodig Crnkovic with a team "4th Space as Information Ecology with Requirements of Inclusion and Ethics", Peter Boltuc on "The Fourth Space as Reality", followed by Maria-Luisa Gómez Jiménez on "Legal concerns concerning digital fourth space" as well as Rafał Maciąg on "The space of humanistic management."

This was followed by a block on Ethics and Persons: with lectures by Stefan Lorenz Sorgner "The moral status of embodied AI's". Several persons in the audience found Mark Waser's presentation on "Philosophy in the Age of Blockchain" particularly important for the present time—up to date, technically very competent and ethically sensitive. The session ended with the paper "Finding the 'I' with AI—modeling self and its place in the natural order" by Jeffrey White [4].

In a session devoted to engaged AI ethics we had: "Ethical governance of AI in the global south: A Human rights approach to responsible use of AI" by Aníbal Monasterio Astobiza, Txetxu Ausín, Belén Liedo, Mario Toboso, Manuel Aparicio, Daniel López. This was followed by "Freedom of speech—European tradition and new challenges" by Aleksander Bobko and by "The Will to Submit: Surveillance Technologies and Autonomy" by Dustin Gray.

Under the auspices of PHAEDE, we had a session under a provocative title "Waiting for the first AI enrolled in a philosophy/social sciences/humanities program" led by Viorel Guliciuc. This included Lorenzo Magnani: "The Uniqueness of the Unlocked Character of Human Creative Abductive Inferences."; Colin T. A. Schmidt: "Natural or artificial: Life with a cursor?"; L. Dan Milici: "Is AI capable of generating an ethic to save the planet and contemporary society?"; Denisa Lepădatu: "Computing the human and humanizing computers"; Selmer Bringsjord: "Can the Right Math Foil Superhuman, Unethical AGIs?

Yes”; Kuruvilla Joseph Pandikattu SJ: “AGI and Morality: Sense and Nonsense of Morality without Will and Body”; Bogdan Popoveniuc: “Ethical AI is a Moral Simulacra” [5]; Viorel Guliciuc: “Could we speak about a moral identity of AI?”

In the closing session, Mark Waser gave his second paper, this one on “AGI, Consciousness & Morality”; Vincent C. Müller & Alexandre Erler gave a talk on “The ethics of AI as IA”. After this more general opening, the following presentations focused on applied ethics: Sean Welsh spoke on “An Ethical and Technical Examination of ICRC’s Call for Regulation of Autonomous Weapons”; Léo Trocmé—Nadal on “Ecological big data: between hybridization of old scientific traditions and novel transformations of research practices in ecology”, while Susan Castro, in her analytically and socially advanced lecture spoke in depth on “Paradigms for Smart Farming: Chemical, Ecological, Algorithmic”.

5. *Ad Acta Contributions*

Several participants were unable to present accepted or invited papers due to various situations, health related or otherwise. Due to specificity of the current times of the pandemics, I decided to introduce some of those in this section. They include: Tom Abeles “Navigating Futures”; Philosophy of Education; Andrew Targowski ‘The Panoramic Leadership as a New Paradigm of Teaching in the Age of Common Digitalization’. The above authors were in the program, though unable to present in September, they became well and submitted interesting papers for the current issue.

In the first version of the programme, we had Mason Dambrot talk on “Philosophy of AI as general theory within AI”, which is a great topic. Yet, for overwhelming reasons, it became impossible to move this project any further. Based on our excellent conversation, I was allowed by Mason to follow up with this paradigm elsewhere. Sviatoslav Braynov submitted us a short abstract on “Human Trust as Subconscious Computation” but has not been in position to follow up for the time being. The abstract reads:

“We present a model of human trust as a distributed computation based on the interaction of several decision-making systems, situated in the conscious and subconscious brain, each of which has different computational properties. We will explore each of these systems, the calculations they perform on the trust signals, their corresponding neural substrates, the factors that can distort or affect these computations, and possible points of failure.”

6. Discussion over Select Short Abstracts

In the absence of some of the main lectures, we post, and sometimes briefly discuss, the short abstracts of some of the crucial papers, which we were allowed to make public, even at a pre-conference publication, which did not happen.

6.1. *Machine Consciousness*

Anil Seth. The strength of weak artificial consciousness.

Abstract: There are at least two ways to think about the project of artificial (or machine) consciousness. On the strong view, the aim is to build an actually conscious machine. On the weak view, the aim is to build detailed models of properties of consciousness, while remaining at best agnostic about the conscious status of these models. I will make the case that the weak approach is the most realistic, and the most beneficial (and least dangerous) path to follow. I will suggest that the development of artificial intelligence does not lead inevitably to artificial consciousness, that attempts to build actually conscious machines are hamstrung by a lack of theoretical consensus about the sufficient conditions for consciousness, and that retaining strong artificial consciousness as a goal is ethically highly problematic. In contrast, the weak approach to artificial consciousness promises to enhance the scientific understanding of consciousness by providing explanatorily powerful bridges between physical/neural mechanisms and properties of consciousness—both functional and phenomenological. I will illustrate this with examples from a methodology which can be called ‘computational neurophenomenology’. Conversely, weak artificial

consciousness also holds promise for artificial intelligence, through equipping the latter with some of the functional benefits associated with consciousness. Finally, I will address some of the risks posed by technologies that merely give the appearance of being conscious, and suggest some reasons why consciousness might be more tightly tied to being alive than being intelligent [6].

Joscha Bach, Virtualism as a perspective on consciousness. (Fascinating presentation of Joscha Bach's paper: <https://www.youtube.com/watch?v=b6oekXIQ-LM>, accessed on 19 October 2021).

Abstract: How is it possible that a physical system experiences a feeling of what it's like? I suggest that this question is ill-posed: physical existence does not have an experiential aspect, and all experience is simulated, within a frame of reference that is entirely virtual. Understanding consciousness requires a conceptual analysis that explains the genesis of a cohesive dynamic model of the universe by perceptual processes (processing agent) in the service of control tasks (control agent), and the scanning and reflection of the perceptual model by an integrated analytical, attentional process (attention agent). I will discuss some of the necessary conditions for a system creating and acting on models of its own agency, volition, first person perspective, and conscious phenomenology. The sense of agency, self and phenomenology are not realized in physics, but virtual. Virtuality implies that the causal structure of a domain is not shaped by physics, but by the functional constraints of a representational task. Such representations are either simulations (models that are reproducing observable dynamics of a domain using a different causal structure) or simulacra (reproductions of observables without underlying causal structure). Simulations allow interaction with the model, to explore possible branches and counterfactual states, while simulacra don't offer interaction. Virtualism is not a new perspective, it is a conceptual clarification at the point of convergence of various contemporary, functionalist approaches to understanding the functionality, implementation and phenomenology of consciousness, including Barnard Baars' and Stanislas Dehaene's Global Workspace Theory, Michael Graziano's Attention Schema theory, Keith Frankish's Illusionism, Thomas Metzinger's Self model theory and Yoshua Bengio's Consciousness Prior. This convergence is marked by the role of consciousness as a control model of attention, at the interface between perception and reasoning, in the service of integrating different mental representations into a coherent model of reality, including the observing system's own agency.

Thomas Metzinger. Epistemic indeterminacy and the applied ethics of synthetic phenomenology (Presentation of Thomas, Metzinger's paper: <https://www.youtube.com/watch?v=uHY4aU4Emq4>, accessed on 5 October 2021).

Abstract: By far the most common misunderstanding in the ethics of machine consciousness is that people think that one first assigns a certain probability to the emergence of conscious systems, and then makes a proposal as to how to best optimize the risk/benefit ratio from an ethical perspective. The typical knee-jerk reaction then is: "We do not even have to think about this, because it is all wildly speculative, mere Science Fiction!" This is false, and the popular resentment it expresses blocks progress. There is no given probability in this domain, and the ethical challenge rather consists in discussing the ethics of risk-taking under conditions of epistemic indeterminacy. „Epistemic indeterminacy“ means it is not the case that either we know that artificial consciousness will inevitably emerge at some point or we know that artificial consciousness will never be instantiated on machines or other postbiotic systems [7] (p. 47). It is this neither-nor-ness that has to be dealt with in a rational, intellectually honest, and ethically sensitive way.

J. Kevin O'Regan Making a machine that really feels.

Abstract: There is an aspect of consciousness that is often considered to be mysterious and perhaps not amenable to science, and therefore not implementable in machines: so-called "Phenomenal Consciousness". Phenomenal Consciousness involves the experience of "qualia" like the raw feel of the redness of red, the smell of onion, or the prick of a pin. Facts like the fact that experiences differ among themselves in certain ways, and that globally they have "something it's like", seem not to be explicable by current science.

Instead, current theories of consciousness just bluntly assert that somehow the special phenomenology of experiences “emerges” from certain forms of complex information processing. But most current theories have nothing to say about the mechanisms that allow Phenomenal Consciousness to emerge in this way. The “sensorimotor theory”, on the other hand, is an approach that is directly aimed at explaining Phenomenal Consciousness. It suggests that there is a way of thinking about what a sensory experience consists in that disperses the apparent mystery of qualia. The approach contends that experience should be considered a thing we do, not a thing that is generated by brains. Taking this view immediately allows the similarities and differences between different experiences to be explained in terms of similarities and differences in the sensorimotor laws that govern the interactions with the world that different experiences consist in. The additional fact that experiences globally have “something it’s like” is explained by the fact, first, that one has conscious access to the experience, and second, that the experience has the property of “sensory presence”. Sensory presence is a measure of the extent to which an experience imposes itself on our cognitive processes by virtue of having what I call “bodiliness”, “insubordinateness” and “grabbiness”.

If we accept the sensorimotor approach to Phenomenal Consciousness, there is no obstacle to machines having “feels” exactly in the same way humans do. As soon as machines are sufficiently intelligent to be able to develop selves and be aware of their actions and thoughts, then, when they interact with the world, they will automatically also “feel”.

Peter (Piotr) Boltuc, Non-Reductive Physicalism.

Abstract: Radical functionalism on consciousness holds that all conscious and intelligent functions are strictly physical, while non-reductive physicalism holds that conscious experience cannot be reduced to strictly mechanical/functional third-person experiences. We define non reductive physicalism not in terms of advanced functionalities, but of what psychology calls **creature-consciousness**, at the level of its bio-chemical specificity, not content. These positions might be seen as irreconcilable. I try to show that they are not, by arguing that first-person consciousness is physical like chemistry or biology are physical, creating non-reducible, emergent physical processes. Thus, I demonstrate that non-reductive physicalism represents a complementary fit with radical functionalism on consciousness. Link to this presentation has been included in Section 3.

Ron Chrisley, Machine Consciousness, Meta-Knowledge, and Physical Omniscience.

Abstract: Several thinkers have argued that a capacity for certain kinds of meta-knowledge is central to being conscious, and that meta-knowledge will, in turn, be central to the design of at least some forms of machine consciousness. After a quick review of such work, I will present a novel objection to Frank Jackson’s Knowledge Argument (KA) against physicalism, one in which such meta-knowledge plays a central role. First I will show that the KA’s supposition of a person, Mary, who is physically omniscient, and yet who has not experienced seeing red, is logically inconsistent, due to the existence of epistemic blindspots for Mary. I will then show that even if one makes the KA consistent by supposing a more limited physical omniscience for Mary, this revised argument is invalid. This demonstration will be achieved via the construction of a physical fact (a recursive conditional epistemic blindspot) that Mary cannot know before she experiences seeing red for the first time, but which she can know afterward. After considering and refuting some counter-arguments, I will close with a discussion of the implications of this argument for machine consciousness, and vice versa.

6.2. Keynotes in AI

Ben Goertzel, Exploring open-ended intelligence using patternist philosophy (Ben Goertzel’s presentation with novel ideas towards the end https://www.youtube.com/watch?v=C8m_PxuQkF8, accessed on 5 October 2021).

Abstract: The patternist philosophy of mind begins from the simple observation that key aspects of generally intelligent systems (in particular those aspects lying in Peirce’s

Third metaphysical category) can be understood by viewing such systems as networks of patterns organized to recognize patterns in themselves and their environments. Among many other applications this approach can be used to drive formalization of the concept of an “open ended intelligence”, a generally intelligent system that is oriented toward ongoingly individuating itself while also driving itself through processes of radical growth and transformation. In this talk I will present a new formalization of open-ended intelligence leveraging paraconsistent logic and guided by patternist philosophy, and discuss its implications for practical technologies like AGI and brain-computer interfacing. Given the emphatically closed-ended nature of today’s prevailing AI and BCI technologies, it seems critical both pragmatically and conceptually to flesh out the applicability of broader conceptions of intelligence in these areas.

Summit Panel: Artificial Inventors, AI, Law and Institutional Economics Stephen Thaler (Creativity Engines Inc.); Kate Gaudry (Kilpatrick Townsend & Stockton LLP). Commenting Panelist: Peter Boltuc (University of Illinois Springfield; Warsaw School of Economics).

Stephen Thaler, The Artificial Sentience Behind Artificial Inventors.

Abstract: Using a new artificial neural network paradigm called vast topological learning [4], a multitude of artificial neural networks bind themselves into chains that geometrically encode complex concepts along with their anticipated consequences. As certain nets called “hot buttons” become entangled with these chains, simulated volume neurotransmitter release takes place, selectively reinforcing the most advantageous of such topologically expressed ideas. In addition to providing important clues about the nature and role of sentience (i.e., feelings) within neurobiology, this model helps to explain how an artificial inventor called “DABUS” has autonomously generated at least two patentable inventions [8–10].

Kate Gaudry, Potential Impacts of Various Inventorship Requirements.

Abstract: Though many entities are discussing A.I. and patents, this umbrella topic covers a vast diversity of situations. Not only can artificial intelligence be tied to inventions in multiple ways, but the involvement of various types of parties can shift potential outcomes and considerations. This presentation will walk through various potential scenarios that may arise (or arise more frequently) as A.I. advances and consider when and how patents may be available to protect the underlying innovation.

Peter Boltuc, as a session chair I decided to desist from presenting his commentary since the session went out of time. Intended remarks pertained to technical interpretation of court decisions and Kate Gaudry’s writings pertaining to limits of machine personhood.

Oron Shagrir with Philippos Papayannopoulos, and Nir Fresco, have talked of ‘Two kinds of computational indeterminacy’.

Jun Tani Exploring Robotic Minds Under the Framework of Predictive Coding and Active Inference.

Abstract: My research has investigated how cognitive agents acquire structural representation via iterative interaction with their environments, exercising agency and learning from resultant perceptual experience. Over the past two decades, my group has tackled this problem by applying the framework of predictive coding and active inference to development of cognitive constructs of robots. Under this framework, intense interaction occurs between top-down intention, which acts proactively on the outer world, and the resultant bottom-up perceptual reality accompanied by prediction error. The system tries to minimize the error or free energy either by modifying the intention or the outer world by acting on it. I argue that the system should become “conscious” when some computational efforts are required to minimize this error. Otherwise, everything just goes smoothly and automatically wherein no space for consciousness remains. My talk highlights our on-going cognitive neurorobotics studies which examine (1) development of primary intersubjectivity in dyadic imitative interaction robots, (2) emergent behavior observed in a goal-directed planning robot under real-time embodied constraints.

6.3. Panel: Gödel, Church, and Turing in Retrospect

Oron Shagrir, Who is the human computer? (Oron Shagrir, an older presentation on the topic <https://www.youtube.com/watch?v=m9LyV6wuKPg>, accessed on 21 November 2021).

Abstract It is often said that when the founders of computability talked about computers, they referred to a human computer. My aim is to distinguish between different approaches to the concept of a human computer, and to argue that the founders of computability and their interpreters take a stand between them. I will then conclude by commenting on the relations between human computation and physical computation.

Nathan Salmón, The Decision Problem for Effective Procedures.

Abstract: It is proved that the notion of an effective procedure (such as the truth-table method for determining provability in the propositional calculus, or the effective procedure for bisecting an angle using only a compass and a straightedge) is not itself decidable. The proof does not invoke Gödel numbering, Church's thesis, Turing's thesis, or the Church-Turing thesis. It instead proceeds directly from the intuitive notion of an effective procedure. While the result itself is perhaps none too surprising, it has a potentially awkward consequence for the task of solving decision problems (e.g., for solving the decision problem for provability in the propositional calculus).

The paper by **Gary Mar** on: Gödel on –Creativity of Mathematics versus Turing's Mechanistic View of the Mind: An Irreconcilable Dichotomy?—Is being published in this issue.

The longer papers related to the conference on philosophy and computing have been invited to *Philosophy and Science* [*Filozofia i Nauka*] a journal of the Polish Academy of Science and other publications. Closely related material may appear in a future issue of *The Journal of Artificial Intelligence and Consciousness*.

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