Editorial

Conference Theoretical and Foundational Problems in Information Studies †

Mark Burgin

Department of Computer Science, University of California, Los Angeles, CA 90095, USA; markburg@cs.ucla.edu † Presented at the Conference on Theoretical and Foundational Problems in Information Studies, IS4SI Summit 2021, online, 12–19 September 2021.

Abstract: This paper has a two-fold goal. In the first part, the area of theoretical and foundational information studies is delineated. In the second part, the general overview of the conference “Theoretical and Foundational Problems in Information Studies” (TFP) is given.

Keywords: information; general theory; special theory; quantum information; artificial intelligence; knowledge; meaning; information processing; mathematics; physics; computer science; ontology

1. Theoretical Information Studies and Foundations of Information

Information theory constitutes the basic component of theoretical information studies; however, there are also other components, including the applications of information studies to the theoretical areas of science and humanities, e.g., in relation to theoretical physics or theoretical computer science. Another component consists of information-oriented and information-based theories in different areas, e.g., genetics, which treats hereditary information or theoretical computer science, and studies information processing.

Therefore, theoretical information studies include the following areas.

– Information theory;
– Theoretical computer science as it studies information processing by technical devices;
– Theoretical linguistics as it studies information processing by natural and artificial languages;
– Semiotics as it studies symbolic information processing;
– Psychology as it studies information processing by people;
– Pedagogy as it studies information transmission and knowledge acquisition;
– Application of information theory to theoretical physics (information and the Universe);
– Application of information theory to theoretical computer science (information, computation and networking);
– Application of information theory to the theory of complexity (information and complexity);
– Application of information theory to mathematics (information and structure);
– Application of information theory to theoretical linguistics (information and language);
– Applications of information theory in ecology (information and environment);
– Application of information theory to decision making (information and decision-making);
– Applications of information theory in economics and finance (information and economy);
– Application of information theory to pedagogy (information and education);
– Applications of information theory in sociology (information and society);
– Applications of information theory in psychology (information and creativity);
– Applications of information theory in biology and medicine (information and the organism);
– Applications of information theory in anthropology (information and human beings);
– Application of information theory to semiotics (information and symbols);
– Application of information theory to epistemology (information and cognition);
– Application of information theory to esthetics (information and beauty);
– Application of information theory to ethics (information and moral);
– Application of information theory to law (information and law);
– Application of information theory in humanities;
– Information-oriented and information-based physical theories;
– Information-oriented and information-based psychological theories;
– Information-oriented and information-based biological theories;
– Information-oriented and information-based theories of decision making;
– Information-oriented and information-based economic theories;
– Information-oriented and information-based sociological theories;
– Information-oriented and information-based ecological theories;
– Information-oriented and information-based epistemology;
– Information-oriented and information-based esthetics (information and beauty);
– Information-oriented and information-based ethics (information and moral);
– Information-oriented and information-based anthropological theories.

Theoretical information studies also have diverse applications to a variety of practical problems.

The foundations of information and information studies include the following areas:
– Mathematical foundations of information and information studies;
– Logical foundations of information and information studies;
– Philosophical foundations of information and information studies;
– Methodological foundations of information and information studies;
– Linguistic foundations of information and information studies;
– Physical foundations of information and information studies;
– Biological foundations of information and information studies;
– Psychological foundations of information and information studies;
– Sociological foundations of information and information studies;
– Technological foundations of information and information studies;
– Ecological foundations of information and information studies;
– Anthropological foundations of information and information studies.

This shows that the goal of the foundations of information and information studies is to provide sound reliable and flexible foundations for information studies and their applications in general, as well as for theoretical information studies in particular.

2. The Conference

The conference, titled “Theoretical and Foundational Problems in Information Studies” (TFP), had participants from six continents, i.e., from all inhabited continents. They included top information science experts who had contributed the most to this exciting area as well as theoreticians from other disciplines who had used information theory in their studies. Coming from 33 countries, the participants delivered many interesting talks with new innovative results and prolific insights.

The conference had seven special sessions:

Special Session New Directions in Information Processing
Session organizer: Rao Mikkilineni

Special Session Neosentience, Biomimetics, and the Insight Engine 2.0
Session organizer: Bill Seaman

Special Session Information in Natural Sciences
Session organizer: Annette Grathoff

Special Session Information in Social Sciences
Session organizer: Peter Carr

Special Session Information, Knowledge, and Meaning
Session organizer: Rafal Maciag
Special Session Information Phenomenon
Session organizer: Krassimir Markov
Special Session Information in Practical Problems
Session organizer: Arkadiy Dantsker

Here, only a very brief overview of these special sessions is given, while more detailed expositions can be found in the editorials of the session organizers.

The Special Session New Directions in Information Processing united presentations on the role of information theory in the development of information technology. Researchers suggested and considered various innovative machines, methods, and ideas in the area of information processing, such as the design of autopoietic machines, quantum computing, data streaming in natural and artificial neural networks, the principles of knowledge and database creation, the temporal theory of the brain, processing information by molecules, the evolution of the extended mind, consciousness, machines, and ethics.

The main goal of the Special Session Neosentience, Biomimetics, and the Insight Engine 2.0 was to present diverse ideas and research results related to an intelligent autonomous learning robotic system via transdisciplinary information processes and information exchanges, enabling neosentience to arise via the system’s functionality in the form of The Insight Engine 2.0. The researchers discussed the problems of 3D visualization, the embodied, embedded, active and extended approaches to human cognition, n-dimensional combinatoric bio-algorithm development, mindful awareness, second-order cybernetics, neuroscience and computational neuroscience, neuroscience and the arts, computational creativity, artificial general intelligence, AI and ethics; robotics and situated knowledge production, the history of AI, computational intuition, autonomous adaptive intelligence, and attention schema theory.

The presenters in the Special Session Information in Natural Sciences discussed the role of information in natural sciences and the essence of information in nature considering quantum information, negative probability, impact of arithmetic on physics and cryptography, topological quantum theory, biomathics, and nonlinear phenomena in physics and biology.

The presenters in the Special Session Information in Social Sciences talked about the role and essence of information in society considering synergy in scientific collaboration, the problem of fake news, pricing theory as an information tool in finance, information aspects of aboriginal ontology, self-learning as an important cognitive process in social environment, the role of information in fighting the COVID pandemic, processing legal information, and problems of human values related to information functioning in contemporary society.

The Special Session Information, Knowledge, and Meaning dealt with problems of the theory of meaning, conceptual spaces, NLP procedures, vagueness, and errors. In addition, it included an interesting group of presentations that discussed how numbers and arithmetic convey information about the multitude of things reflecting on the new advancements in the domain of numbers and arithmetic. In particular, problems of non-Diophantine arithmetics and their applications in science and technology were discussed.

The Special Session Information Phenomenon was dedicated to the foundational problems in information studies. The presentations in this session treated problems in such areas as information definition, information quality, natural typology of information, the paradigm of the information discipline, hilmorphic theory, structural analysis, probability in the context of information, as well as the phenomenology and ontology of information.

Finally, the Special Session Information in Practical Problems was dedicated to the applications of information theory and innovative mathematical theories to imperative practical problems, such as pollution of water resources, monitoring and safety management of thermal processes, the recovery of blurred images, and ways to provide more renewable energy.
3. Conclusions

The conference “Theoretical and Foundational Problems in Information Studies” (TFP) brought together experts from different disciplines, allowing them to present their pioneering results, hold fruitful discussions on various topics, and formulate innovative directions for future research.

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