Multi-Agent Systems for Power Engineering Applications—Part 1: Concepts, Approaches, and Technical Challenges

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ABSTRACT

The paper highlights issues of studying artificial intelligence (AI). The path taken here is to engage the reader in a discussion of interdisciplinarity/crossdisciplinarity of AI studies. It begins with a basic assumption and key argument that *anti*-disciplinarity rather than *inter-* or *multi*-disciplinarity will bring a new dynamic to scientific research dealing with "artificial intelligence" and "artificial sociality". Discussion of the social scientists' concerns and problems is reported in what follows. On this base the authors develop their ideas which may help theorists and empirical researchers to tackle questions of AI development in a society. In a conclusion the paper makes correlations of the research outcomes with a reality of higher education.

Keywords: artificial intelligence, artificial sociality, interdisciplinary research, antidisciplinarity, human-machine interaction

INTRODUCTION

It is really a truism to say that technology nowadays is increasingly embedded throughout society, and is becoming commonplace in almost everything we do in everyday life. Current social reality shows that the boundaries between humans and technology are shrinking

to the point where socio-technical systems are becoming natural extensions of a human being.

The methodological point of the departure for studying new social reality where in constant interaction are not only biological species and Homo Sapiens but also algorithms – we called it elsewhere *"artificial sociality"* – cannot and should not be neither disciplinary nor inter- disciplinary as it is understood today in the literature. Fact of the matter is that in mainstream professional literature there is no basic agreement on these definitions. The areas of research are so dynamic, new phenomena continually emerging, melding, and transforming scientific inquiry. What is considered interdisciplinary today, tomorrow might be considered disciplinary.

We believe that *anti*-disciplinarity rather than *inter*-disciplinarity is pushing scientific fields forward and accelerating scientific discovery in a new reality of "artificial sociality".

The paper we propose to the 22nd World Multi-Conference on Systemics, Cybernetics and Informatics (WMSCI 2018) is developed and based on field researches that have been organized and conducted at the American- Russian Research Laboratory Tandem at St Petersburg   State   University (www.tandem.spbu.ru) in 2016-2018. It is

developed in a context of issues relating to the processes of internationalization of artificial intelligence

research and instrumentalist policies which are transforming social sciences today in the world.

The aim of this paper is to look at the current situation in "artificial intelligence" (AI) and "artificial sociality" (AS) studies in more details in order to highlight some inherited flaws and to suggest some critical observations that may indicate possible directions for future research. We hope to encourage dialogue between proponents of those who are doing disciplinary and interdisciplinary research in natural sciences, technology, and social sciences.

ANTIDISCIPLINARITY

There are several specific features that characterize current state of affairs in "artificial intelligence" and "artificial sociality" studies.
First, despite of the claim that such studies have to be multi- and interdisciplinary, most knowledge about AI and AS comes from engineering and computer sciences. The field as a whole might be described as multidisciplinary in the sense that scholars from, say, psychology, communications, engineering, computer science, and other disciplines study AI and are interested in one another's work. Nonetheless, research is still done predominantly from each investigator's own intellectual tradition. Researchers typically don't go beyond the classes of variables of concern to their discipline.

Furthermore, the interdisciplinary character that needs to be accomplished in studying AI, establish a number of problems for the research. Scholars from different disciplines bring to the field various assumptions, various research practices, and different understanding of the same concepts and theoretical schemes. Thus, the differences are in place at the very basic level of studying AI. For example – the very concept "intelligence", obviously the most fundamental notion for the field – has different
meanings and interpretation for different scholars and that complicates the further research.

The thesis that we want to advance here is, therefore, that AI as a field of study has to evolve novel perspective of *anti-disciplinary* subject that cut across old-style disciplinary boundaries. It is the field that inherently has to build bridges between engineering, natural sciences, social sciences, and humanities.

Second, in comparative perspective the far greater publications are coming from engineering and computer sciences, and, to a lesser extent, by philosophy and psychology. The views concerning AI in society have changed drastically over the last half century. During the immediate post-World War II period the importance of AI seemed to be of interest only for philosophers and meta-theoretical discussions about a reality of such a thing as artificial intelligence per se. By that time, a generation of philosophers had systematically documented and supported two contradictory conclusions: 1) AI can be and will be a reality very soon; 2) AI cannot be and never will be a reality. This situation has been changed in the last quarter of the XX century. AI has become a subfield for computer science that involves the design of computer programs and automated equipment, such as industrial robots in ways that at least resemble human thought processes [1,3]. Current field is dominated by three major disciplinary frameworks. These "big Three" are computer science, psychology and philosophy. Each of the disciplines is characterized by specific research questions and modes of explanation concerning human sociality under "the end of human exceptionalism".

Third, there is no professional connectedness among social science scholars who study AI. What is most striking about sociological literature on AI is how small it is. This is not a coherent literature in the sense that papers reference each other and a body of well- established findings is understood. To expand and

extend this literature, the sociological study of AI needs a broader empirical and theoretical base.

SOCIAL SCIENCES: TOWARDS NEWFORMS OF INQUIRY

Most papers produced by social scientists that deal with computers and society look at the role of information in human history, discuss the social context and consequences of information technology, introduce readers to the ways computers work, debate the effects of computers on individual health and psychology, detect issues of privacy and security. This way or another to the social scientists computer on the one hand is a society's technological product, and on the other hand it is a source of technological progress and hence a source of social change. That was the case in the XX century when debates about post-industrial society flourished all over the world, this continue to be the case in the XXI century when ideas of 'digital society' and post-human evolution spread across scholarly disciplines.

There have appeared new notions in sociological discussions in recent years. However, these notions are basically limited to quite a narrow circle of technical terms that have been introduced to our daily life, such as "Internet", "networks", "cyber", "digital", "social media", "new media". Sociologists adopt these terms for their study and just add them to the word "society" and continue discussions under rubrics respectively: "Internet Society", "Network Society", "Digital Society", "Cyber Society", "Social Media Society", "NewMedia Society".

Therefore, it is not trivial to formulate productive theoretical and methodological framework for studying artificial intelligence and artificial sociality through the lenses of sociology and social sciences in general. We believe that the new ways of studying new systems of communications and information production, storage, and distribution have to be developed in the social sciences. The very essence and role of the computer as a media

tool has to be reconsidered by the social sciences. In fact, computer and software revolutions brought to fore a number of absolutely new scholarly disciplines, which, what is interesting, cannot be studied without new computers and software. These disciplines are (to name a few) Internet studies, cyberculture studies, digital humanities, new media studies, game studies. These and other newcomers to the science definitely need more attention from theoretician in sociological and other social disciplines. Unfortunately, these disciplines continue to be of interest basically to schools of management and sales practitioners.

We agree with scholars who argue that for the theoretical understanding of current interconnectedness between society and AI, society and computer applications, it is important to address "software" as a theoretical category. An understanding that the Software but not a Computer or a Network is a new medium that connects people and AI is the first premise for this paper. Transition from physical and electronic communication and media technologies to the computer software established a new stage for social analytics. New social/quasi-social formations require new forms of inquiry. Accordingly, having software as a focus of new studies in the area of communications and information technologies bring researchers to the necessity of developing new methodological orientations. The question is who are to develop new methodologies? How will social scientists grapple with issues related to studying computer-mediated communication or communities that exist only in electronic forms?

GRASPING ARTIFICIAL SOCIALITY

Further, the new occurrences in everyday life of today that we call 'artificial sociality' embrace three quite different yet related types of phenomena. The first one is human-human interactions that proceed

through machines –for instance, in social networks. The second is human-machine   interactions: fromprogrammers to computer service, from users at work to playing games children. The third is a computer-computer   (screen-to-screen) communication. The social nature of AI could be conceived in two ways. "Strong" artificial sociality does not yet exist; it would be in the ability of the AI to interact spontaneously and be emotionally involved in interaction. "Weak" artificial sociality is an empirical fact of theparticipation of AI in various socialinteractions. In this sense, it is expanding more and more today.

The development of artificial sociality led tonew phenomena that affect the ability of people to interact and to sustain relationships. The variety of these phenomena permeating everyday life raises attention of scientists, journalists, artists, entrepreneurs, and common users. Social sciences accumulate data and describe new phenomena; nevertheless, in our view, they are not yet able to grasp them at a conceptual level. To adopt Fuller's analogy of the High and Low Church [2], there has been a stream of research less concerned with understanding artificial intelligence and artificial sociality in and of themselves, and more with making these phenomena accountable to public interests, representing a style and a mode of analysis inherent to the "Low Church". Put differently, current research questions basically concern policy, governance, and funding issues. Yet a more fundamental set of questions emerges when one addresses artificial intelligence in terms of developing adequate and consistent theoretical and methodological groundings. How is AI designed to solve instrumental problemsinteract / communicate with another AI and with a person? How is the process of interactionorganized? How do people perceive AI? What are human emotions, and what are their analogues in the case of AI? How can engagement and synchronization with the partner be achieved for the machines? What are the similarities and differences in language performance for human consciousness and AI? Does the way of framing and solving problems for the human mind change because of artificial sociality? What about the usage of language andnon-verbal images? What emotions does a person experience, and how do they change during the "learning" skills of interaction with the machine? How does the perception of one's own body change? The list of questions goes onand on.

To make a correlation of our research outcomes with reality of higher education, we believe that very important things to support today in academe are the efforts that will:

- Increase the numbers of scholars, engineers, educators, students prepared to design, develop, adopt and deploy cyber-based tools and environments for science and engineering research of AI and AS that will help interestedindividuals all around the world to be involved in new inquiries

- Increase the number of research of human-machine-human interactions

- Produce and deploy in the cyberinfrastructure   pedagogical   materials   and   learning technologies for preparing the workforce that are broadly adaptable to life in everyday life of artificial sociality.

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REFERENCES
A. Barr, E.A. Feigenbaum, Handbook of Artificial Intelligence, Volume 2. Los Altos, CA: William A. Kaufmann, Inc., 1982.

S. Fuller, Philosophy, Rhetoric, and the End of Knowledge: The Coming of Science and Technology Studies, Madison: Universityof Wisconsin Press, 2003.

P. McCorduck, Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence, San Francisco: W.H. Freeman, 1979.