International Journal of Software Science and Computational Intelligence
Volume 12 • Issue 3 • July-September 2020

Computational Intelligence From Autonomous System to Super-Smart Society and Beyond

Rodolfo A. Fiorini, Politecnico di Milano University, Milan, Italy
https://orcid.org/0000-0001-5344-7218

ABSTRACT

In this article the author discusses main implications of current autonomous system (AS) through the symbiotic autonomous system (SAS) and the symbiotic system science (SSS) towards the incoming super-smart society, by bringing to light SSS fundamental considerations, according to experience and talks gained on scientific system development in the past fifty years, and formulating the proposal for a new understanding of them, at an effective scientific and operative level towards a real super-smart society. SSS is a growing scientific area which is taking a leadership role in fostering consensus on how best to bring about symbiotic relationships between current AS and incoming SAS in a mixed or hybrid society, called super-smart society. In order to achieve an antifragile behavior, next generation human-made system must have a new fundamental component able to address and to face effectively the problem of multiscale ontological uncertainty management, in an instinctively sustainable way: active, practical wisdom by design!

KEYWORDS

Autonomous System, Brain-Inspired Systems, CICT, Cognitive Informatics, Cognitive Intelligence, Cognitive Robotics, Computational Intelligence, Symbiotic Autonomous System, Symbiotic System Science

INTRODUCTION

The information age has transformed our society into a continuously growing, global self-organizing network of networks of systems and autonomous digital systems. The growth is fueled by advancements in both hardware and software technologies such as internet of things (IoT) (Gupta & Agrawal, 2019; Ahuja & Wheeler, 2020) artificial intelligence (AI), etc. Even in mere operative terminology, minimizing or avoiding (if possible) representation uncertainty and ambiguities is mandatory to achieve and keep high quality result and service (Fiorini, 2017a, 2019a). In the past decades, we learned how traditional, reductionist, human-made system can be quite fragile to unexpected perturbation, because statistics by itself can fool you, unfortunately (Taleb & Douady, 2015). In present paper the author discusses main implications of current Autonomous System (AS) through Symbiotic Autonomous System (SAS) and Symbiotic System Science (SSS) towards the incoming super-smart society, by bringing to light SSS fundamental considerations, according to experience and talks gained on scientific system development in the past fifty years, and formulating the proposal for a new understanding of them, at an effective scientific and operative level, towards a mixed or hybrid society, called super-smart society.

DOI: 10.4018/IJSSCI.2020070101

TOWARDS REAL COMPUTATIONAL INTELLIGENCE SYSTEM

While we cannot predict the future, we can prepare for its potential outcome as best as we can. Knowledge and Education are our key facilitators (Fiorini, 2018; Ali, 2019; Kinsner, 2019). Therefore, we need to reframe uncertainty-as-problem in the past into the evolutive concept of uncertainty-as-resource for arbitrary multiscale system (Fiorini, 2019b; 2019c). The key change performance factors are knowledge and education, solving the major "information double-bind" (IDB) problem, just at the inner core of human knowledge extraction by experimentation in current science (Fiorini, 2015a). The new system must be based on an integrated approach; not only on the body of knowledge (BoK), but on the body of experience (BoX) too (Kinsner, 2019); not only on statistical algorithm, but on combinatorial one too, coupled together (Fiorini, 2016).

The digital transformation (Maheshwari, 2019) everyone is talking about today is fueled by advances in technology (Manasrah, Aldomi & Gupta, 2019), mostly transducers, i.e., sensors and actuators, and semantics extraction tools (i.e., AI) supporting data analytics (Ali, 2019). This transformation has already started, and for better understanding the digitization of our society, we can abstract all information into three spaces around us: physical, cyber and societal. The physical-space is the foundation that constitutes all living and non-living things around us. The cyberspace consists of digital representations of objects from all information spaces including itself, and facilitates interconnection, communication, and control. Last but not least, the societal-space consists of dynamic networks that operate our cities, nations and ultimately our civilization (Nagan, 2013). If we shall manage the incoming Fourth Industrial Revolution (Schwab, 2015) with the same blindness and forms of denial with which we managed the previous industrial revolutions, the negative effects on our society will be exponential (Zucconi, 2016; Nagan, 2013; 2016). Certainly, it is hard to predict the long-term effects of advanced AI and related technologies such as IoT and blockchain (Singh & Vardhan, 2019; Sumathi & Sangeetha, 2020). One thing is quite clear, today intellectual leadership in knowledge can no longer be separated or divorced from social responsibility for its impact, be that at either environmental or societal level or both. In fact, technology is creating a bridge between our machines and us. Biointerfaces are enabling seamless communications between our body, our mind and machines. A symbiotic relationship will be established with the person wearing devices, first improving the personal wellbeing (Fiorini et al., 2017) and then the user's physical performances and ultimately their intellectual performances as well, facilitating the emergence of SASs (Symbiotic Autonomous Systems) (Mason Dambrot et al., 2018). In this latter area, DBS (Data Base Systems) and the progressively more sophisticated chips controlling it create a new way of interacting with the functioning of a person's brain, changing the way it works (Wang & Chakraborty, 2019). This is the path leading to "augmented humans" (Mason Dambrot et al., 2018), "humans 2.0" (Bostrom, 2005; Rana & Samples, 2019), and "transhumanism" (MacFarlane, 2020). Although these three terms are sometimes used interchangeably, it is more convenient to take the view of a progression where the first step is leading to augmenting the physical abilities of a person (imagine having a wavelength converter embedded in the eye that allows that person to see in the infrared or UV spectrum), then reaching a point where many persons are markedly different from natural people because of their extended capabilities. These could include specific "improvements" like a permanent, seamless, connection to the web, made possible by advanced BCIs (Brain-Computer Interfaces) (Wang & Chakraborty, 2019). This stage would characterize the development of "human 2.0", and its main difference from augmenting the physical and cognitive abilities of one person is the generalization that it will involve many people. Lastly, "transhumanism" carried to the extreme may signal a transition to a new species not driven by evolution, but, rather, by technological development (Bostrom, 2005). Although transhumanism is rooted in the concept of leveraging science and technology, in the mind of some unleashed visionaries it is looking not at a symbiosis between us and our artefacts but to the possibility of changing, at a fundamental level, the characteristics (or some of them) of humans (Wilber, 2000).

Related Content

Machine Learning Techniques in Handwriting Recognition: Problems and Solutions

Hong Lee, Brijesh Verma, Michael Liand Ashfaqur Rahman (2012). *Machine Learning Algorithms for Problem Solving in Computational Applications: Intelligent Techniques (pp. 12-29).*

www.irma-international.org/chapter/machine-learning-techniques-handwriting-recognition/67694

Extracting Rules for Decreasing Body Fat Mass Using Various Classifiers from Daily Lifestyle Habits Data

Sho Ushikubo, Katsutoshi Kanamoriand Hayato Ohwada (2016). *International Journal of Software Science and Computational Intelligence (pp. 54-70).*

www.irma-international.org/article/extracting-rules-for-decreasing-body-fat-mass-using-various-classifiers-from-daily-lifestyle-habits-data/172127

Implementing Web and Mobile Applications From Linked Open Data

Leila Zemmouchi-Ghomari, Djamaleddine Belilet, Ikram Mekidecheand Abdessamed Réda Ghomari (2022). *International Journal of Software Science and Computational Intelligence (pp. 1-18).*

www.irma-international.org/article/implementing-web-and-mobile-applications-from-linked-open-data/301567

On Cognitive Models of Causal Inferences and Causation Networks

Yingxu Wang (2011). *International Journal of Software Science and Computational Intelligence (pp. 50-60).*

www.irma-international.org/article/cognitive-models-causal-inferences-causation/53162