

Human – AI Symbiosis

Artificial Intelligence (AI) alone will not be able to overcome problems that arise in complex environments with fast alternating data. From data acquisition to data analysis, AI may help for faster response, nonetheless, human intervention is always necessary at the crucial point of decision making. The aim of Human-AI symbiosis is to fuse the best of the two worlds towards specific tasks. We might be in the advent of such a new era of AI where humans and AI will co-exist in the domain of decision making in a less producer-consumer manner and in a more cooperative one. Trustworthy AI, eXplainable AI, Human-in-the-loop, Human Intelligence Amplification, Dynamic Data Visualizations and alike are aspects of this, up until now, scattered novel domain. We should try and find ways to incorporate human knowledge within the developed AI systems either ML or DL other than data preparation. A study should be undertaken towards a more systematic analysis of the relation between AI and humans in both directions. This panel will try to discuss all the above matters and conclude in novel ideas that scaffold the novel and promising domain of Human – AI symbiosis.

Statement of Prof. Federico Alvarez Garcia

The Human-AI symbiosis is a key aspect of the future development of a AI technology which can contribute increased abilities and support in daily activities in a safe and ethical manner. The advances in AI during the last decade led to automatization of some of the tasks human used to carry out before technology helped them to avoid taking care, especially of repetitive and with high accuracy by the AI systems. One good example is the driving assistance technologies or photos classification.

Going beyond the usual AI towards a real symbiosis there are different aspects which can really change the way AI and humans are collaborating in a symbiotic manner. Some examples happening now are:

First of all in the decision making process. This is something which not only requires AI powerful algorithms but also the AI to integrate the human behaviour in the implementation and knowledge gained. This is crucial in some areas such as health, where the information captured from patients is crucial to take decisions, and AI cannot take decisions on its own but to support human decisions... maybe not the case in some years from now when AI will dominate the medical decision making (e.g. in diagnosis or treatment proposals)?. Not only accurate AI algorithms are expected to be used, but explanatory AI is one of the areas which can lead to a reinforced trust in AI and improved decision-making from both sides with continuous feedback.

Secondly there are areas where the symbiosis will enhance the human activity such as augmented senses. We can have good examples in the literature especially in some domains such as security, but more and more the widespread of AI to enhance the way we perceive the world can lead to an enhanced sensorial experience providing novel capabilities to the humanity. Examples of the wide use of computer vision (e.g. to recognise the environment, classify objects,...), enhanced hearing or augmented contextual understanding can be found currently and will grow in a near future, perhaps in some years we will rely less in our perception and more in the AI input?

Third element is privacy-respectful AI and the use of human data. Human-AI symbiosis doesn't mean that there is a full exploitation of the humans' data with no control. It is fundamental than human ethical and user privacy is respected to collectively embrace the full symbiosis and the powerful changes it can bring to humanity. However, how can AI fully understand ethics and other abstract concepts such as freedom or politics?

Statement of Dr. T. Giannakopoulos

Artificial intelligence and machine learning applications have already penetrated a wide range of everyday activities and more complex organisational procedures varying from the health to the defence domains. This has, for obvious reasons, resulted in increasing the ever-existing fear of the public that AI will soon replace humans in every decision making process, not to mention the "traditional" fear of a potential danger for the existence of human civilization.

At the same time, our current distance from the so-called artificial general intelligence and the fact that most real-world AI applications are rather "narrow", indicates that a fully autonomous AI framework is something that still is unrealistic.

Sure, some particular, well-defined and narrow tasks can be fully handled by ML models but certain domains will benefit from the complementarity of humans and AI. For example, decision making procedures for sensitive applications related to health, security and defence will be enhanced by the symbiosis of AI and humans: ML models can be used to extract predictions, forecasts and data representations with very high efficiency, while humans can offer an intuitive approach to deal with uncertainty in the final decision making. The challenge during this process of AI-human symbiosis is to get the best from both sides.

Statement of Dr. N. Vretos "The Human Intelligence Amplification Paradigm"

Recent years have seen a disruptive breakthrough of different AI ideas and tools that have been developed and tremendously altered our lives in unprecedented ways. Nevertheless, not everything is completely understood as yet and there is still need to investigate the way humans alter their ways due to the immersion of AI in their life. On the other hand, because of these changes AI evolved towards directions that were not conceived when Cybernetics coined the term in the half of the previous century. A simple example of this "development tango" between AI and humans is the change in many medical processes. The ability of new machinery and algorithms, able to allow humans to go deeper in their thoughts and analysis, thanks to the information given to them after a "smart AI gleaning" in colonoscopy or MRI data or even in eCRF (electronic Case Report Form) data, while at the same time, AI algorithms have different "needs" and shift from the "many data" doctrine to the "smarter data" one where humans are the only capable (until now) to provide this "smart HUMAN gleaning" of data with such characteristics that algorithms generalize better and in the same time work and learn faster.

It is thus evident that Humans and AI change their relation from a master-slave one to a more productive one of symbiosis. The potential and power that can be produce if one is able to harvest the power of such a collaboration will certainly provide humanity with a totally new

approach in the core of human abilities. AI is probably the first tool, made by humans, that will go beyond a simple meeting of their basic (survival) needs to a new way of interacting with tools. All machineries build by humans altered in different ways our lives by shortening distances, allowing to see further, helped us calculate faster and more accurately among others. AI, on the other hand, other than doing just that has another quality that is: *assist us to think "in **better** terms" (not necessarily better)*.

Human Intelligence Amplification (HIA) is the use of machine learning algorithms to amplify human ability to reason. Human brain is able to create different connection between neurons that allow for different signals to pass through different brain channels and provide abstractness and critical thinking among others. These links between neurons are made through a lifetime of training and (direct or indirect) learning as well as accumulation of knowledge through proxies and/or other means (genetic or others). HIA is the idea of creating such synapses **outside the brain** and probe humans on different directions even before the thought is created on the human brain. In the application domain, HIA can go from a simple notification in ones watch or phone to a specialized brain chip implant that will assist people in their everyday life or, even better, a Siri or an Alex specialized on scientific research.

The ultimate frontier in people capabilities, assisted by tools, should be and is the way we think; it is, after all, our main differentiating factor from other living creatures on this planet. After creating tools to go faster, higher and stronger we need to create ones that makes us smarter, to change the Olympic motto to Citius, Altius, Fortius e Scitius.

Organiser

Nicholas Vretos, PhD, Research Fellow, Centre for Research and Technology – Hellas / Information Technologies Institute, The Visual Computing Lab <http://vcl.iti.gr/>

Panel

Nicholas Vretos, Phd

Dr. Nicholas Vretos (Member IEEE) obtained the degree of BSc in Computer Science from the University Pierre et Marie Curie (Paris VI) in 2002 and his Ph.D. from the Aristotle University of Thessaloniki in 2012. During elaboration of his thesis, he taught as assistant and worked as a research assistant in Artificial Intelligence and Information Analysis Laboratory. He has worked in more than 15 European and National projects as Technical Manager/ WP Leader/researcher. He has published more than 70 articles in scientific journals and conference proceedings and several book chapters. He is a member of the IEEE and has committed as a reviewer for several journals and conferences in the field of image and video processing. His main interests are in Human Intelligence Amplification, Human – AI symbiosis, Robots symbiotic ML, image and video processing, semantic analysis, neural networks, 3-D data processing.

Federico Alvarez, Phd

Prof. Federico Álvarez García (Member, IEEE) received the degree (Hons.) in telecom

engineering and the Ph.D. degree (cum laude) from the Universidad Politécnica de Madrid (UPM), in 2003 and 2009, respectively. Since 2003, he has been working for the research group in the Visual Telecommunications Applications Group (GATV), UPM, where he is currently working as a Full Professor. He has been participating with different managerial and technical responsibilities in several national and EU projects, being a coordinator of five EU projects in the last six years. He had participated in national and international standardization fora (DVB, CENELEC TC206, etc.) He is a member of the program committee of several scientific conferences and the author and coauthor of over 60 papers and several books, book chapters, and holds patents in the field of ICT networks and audiovisual technologies.

Thodoris Giannakopoulos, Phd

Theodoros Giannakopoulos was born in Athens, Greece, in 1980. He received the Degree in Informatics and Telecommunications from the University of Athens (UOA), Athens, Greece, in 2002, the M.Sc. (Honors) Diploma in signal and image processing from the University of Patras, Patras, Greece, in 2004, and the Ph.D. degree in the Department of Informatics and Telecommunications, UOA, in 2009. He has worked as a Machine Learning researcher in both academia and the industry for more than 15 years and he is currently a Researcher in the Computational Intelligence Lab of Institute of Informatics and Telecommunications, NCSR Demokritos, where he leads the Multimodal Analysis Group (<http://magcil.github.io>). His main research interests are pattern recognition, music information retrieval, speech analytics, and multimodal machine learning. For more info, please visit <https://tyiannak.github.io> and <http://scholar.google.com/citations?user=BeloqhwAAAAJ>