

# Preface

## Merging Biologically Inspired Cognitive Architectures and Cybersecurity

*The challenge to replicate all the key features of the human mind in a digital environment using a biologically inspired approach (the BICA Challenge) is the spirit and the core of the new frontier that every year attracts more and more young scientists. Its counterpart challenge of Cybersecurity acquires priority as we advance deeper and deeper into the uncharted territory. After many decades of progress in the field of artificial intelligence, problems that we are facing today require a fresh, multidisciplinary view. We need to learn from scratch how to achieve goals that could never be taken seriously in the past, with an understanding that a novel approach is necessary, because essential qualities of biological intelligent systems such as robustness, flexibility, adaptability, communicability, and reliability are still unmatched by their artificial counterparts.*

This volume includes papers from the First International Early Research Career Enhancement School (FIERCES) on Biologically Inspired Cognitive Architectures and Cybersecurity, which is the second meeting of the FIERCES series. The school was held in Baltschug Kempinski hotel in Moscow, Russia, during August 1–6, 2017. Combining two hot topics—BICA and Cybersecurity, its mission was to facilitate interaction and collaboration among top experts in the field (including such names as Agnese Augello, Piotr Boltuc, Peter Gärdenfors, Olivier Georgeon, Ricardo Gudwin, Ignazio Infantino, Frank Krueger, Adriano Manfre’, Giovanni Pilato, Aaron Sloman, Filippo Vella) and young researchers, who devoted themselves to the solution of the BICA Challenge, by bridging cross-disciplinary, cross-generation, and cross-cultural barriers.

Biologically Inspired Cognitive Architectures (BICA) is computational blueprints for building intelligent agents, inspired from biological prototypes. During the meeting, they helped us to utilize the vast accumulated knowledge about the brain in order to learn from nature how to build intelligent systems. At the same time, new techniques and concepts in digital security complemented the main focus

of the school and the book. As a consequence, this first school on BICA and Cybersecurity was interdisciplinary in nature and yielded bidirectional flow of understanding between experts in all involved disciplines.

Therefore, topics of articles included in this volume extensively cover the most advanced scientific fields relevant to BICA that are traditionally considered at the international level of significance and discussed at many mainstream national and international conferences on artificial intelligence, neuroscience, and cognitive modeling, including conferences organized by BICA Society. The list of the latter is quite long. Beginning with the AAAI Fall Symposia on BICA (2008, 2009), the Annual International Conference on BICA has been held every year since 2010, demonstrating progressively growing popularity. Locations of the conference included Washington, DC (2010); Palermo, Italy (2012); Kiev, Ukraine (2013); Cambridge, Massachusetts (2014); Lyon, France (2015); and New York, USA (2016). The 2017 BICA event in Moscow, however, was unique in its kind, because it brought the conference and the school together.

In this year, we received a record number of qualified submissions for a BICA event. Not all papers submitted and not all works presented at the school were selected for publication. In selecting papers, we paid attention to their scientific quality and relevance to the two challenges. All works included in this volume have been carefully peer-reviewed and refereed and reflect the high level of ongoing research and development in participating leading universities and research centers around the world, including those in the USA, France, Germany, Italy, Spain, Japan, Brazil, China, Ukraine, Belarus, and also in Russia (Moscow, St. Petersburg, Novosibirsk, and other Russian cities). The list of our reviewers was equally widely distributed around the globe. Some good papers were rejected, because they were too long, and were redirected to a journal venue. Each accepted paper was reviewed and peer-refereed by at least two independent anonymous reviewers. Overall, all authors, reviewers, and participants did a great job. The result is what you see in this book.

Papers included in this volume are a mixture of tutorials, research articles, focused on fundamental and applied areas of cognitive, social, and neurosciences and artificial intelligence, and position papers. Topics include, but are not limited to, cybersecurity, cognitive modeling, automated planning and behavior generation, soft computing, knowledge engineering, semantic search, ontologies and knowledge management, acquisition, representation and processing of knowledge, applied intelligent systems, intelligent tutoring, instrumental systems for artificial intelligence.

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