



2015 Annual International Conference on Biologically Inspired Cognitive Architectures (BICA 2015)

Sixth Annual Meeting of the BICA Society

November 6-8 (Friday - Sunday): Lyon, FRANCE

(<http://liris.cnrs.fr/bica2015>).

Sponsored by: The BICA Society; The University of Lyon; LIRIS; Elsevier B.V.

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Call for Papers

Biologically Inspired Cognitive Architectures (BICAs) are computational frameworks for building intelligent agents that are inspired by biological intelligence. These agents serve both as theoretical models (e.g., in cognitive science, neuroscience, economics and social sciences), and as intelligent controllers for autonomous systems (robots, games characters, smart human/machine interfaces, health applications, etc).

Biological intelligent systems (animals, including humans) have many qualities that are often lacking in artificially designed systems; their purpose goes beyond interacting with a closed environment or solving predefined logical problems. At the time when our understanding of natural intelligence is exploding, thanks to modern brain imaging, ethological studies, and the development of cognitive models mapping brain structures with functions, our ability to learn lessons from nature and to build biologically inspired intelligent systems has never been greater. At the same time, the growth in computer science and technology has unleashed enough design creativity and computational power to generate an explosion of applications in multiple domains.

Research in Biologically Inspired Cognitive Architectures contributes to the development of these applications by addressing the numerous questions raised by the problem of replicating natural intelligence, specifically, the complexity of higher cognitive abilities of the human mind, in an artificial system (widely known as the BICA Challenge). These questions are trans-disciplinary in nature and promise to yield multi-directional flow of understanding between all the involved disciplines.

With the scope of BICA 2015 covering all areas of BICA research listed below, this year's major thrust will be on learning from experience of sensorimotor interaction. Here, the key questions are:

- Learning: how a system that has no direct ontological access to reality can construct knowledge about reality based on regularities of interaction?
- Self-motivation: what key motivational drives (e.g., emotions, behavioral preferences, social interactions) should we incorporate in models of self-motivated cognitive systems?
- Methodology: how to assess active open-ended learning? What methods can we draw from biology to define and assess intelligent behaviors beyond predefined tasks and pre-modeled problems?
- Models of interaction with the environment: can we define models of interaction alternative to the traditional perception-cognition-action cognitive cycle?
- What emergent mathematical foundations can support sensorimotor and other forms of learning?

In addition to these focus topic areas of BICA 2015, we encourage submission of papers in all areas relevant to BICA research, especially in the following areas:

Neuroscience:

- “B” in BICA: useful biological constraints for cognitive architectures
- Bridging the gap between artificial and natural information processing
- Cognitive and learning mechanisms informed by neuroscience
- Neural correlates of cognitive and meta-cognitive processes
- Robustness, scalability and adaptability in neuromorphic systems
- Neurophysiological underpinnings of reinforcement learning
- Physiological mechanisms of memory formation and (re)consolidation
- Representation of contextual and conceptual knowledge in neural systems

Social, Economic and Educational Sciences:

- Mixed-initiative systems based on inspirations from biology
- Agents possessing human-level social, narrative, and emotional intelligence
- BICA in pedagogy, learning, and tutoring technologies and education
- BICA models of self and their application to self-awareness
- Representation, perception, understanding, processing, and expression of emotions
- Virtual characters and narratives, artificial personalities and human-compatibility of BICA
- Agent-based modeling of intelligent social phenomena (are there any?)
- Application of BICA technologies in elderly care

Cognitive Science:

- Perception, reasoning, decision making and action in BICA
- Combining natural and artificial approaches to cognition
- Comparison of different forms of learning, memory, and cognitive development
- Theory-of-Mind, episodic and autobiographical memory in cognitive systems
- Introspection, metacognitive reasoning and self-awareness in BICA
- Models of learning and memory: robustness, flexibility, transferability
- Natural and body language and its role in intelligence, cognition and interaction
- Unifying frameworks and constraints for cognitive architectures: the grand unification

Artificial Intelligence:

- Creativity, goal reasoning and human-level autonomy in artifacts
- Embodied vs. ambient intelligence: embedding or embodiment?
- Natural language capabilities and social competence of BICA
- Learning by reading, by observation, by reasoning and by analogy
- Robust and scalable machine learning mechanisms in BICA
- Self-regulated learning, bootstrapped and meta-learning, and the critical mass

- The place for BICA in tomorrow's textbook of artificial intelligence

General:

- Mathematical basis for BICA and fundamental theoretical questions in BICA research
- Alternative substrates for implementation of BICA: smart materials, quantum and biocomputing
- Alternative approaches to the development of BICA: evolutionary, system-theoretic, educational
- Fundamental academic, practical and theoretical questions in BICA research and technology
- Cognitive Decathlon and Grand Challenges for BICA as components of the BICA Challenge
- Critical mass for a universal human-level learner and a roadmap to solving the BICA Challenge
- Metrics, tests, proximity measures and the roadmap to human-level / human-compatible AI
- Leveraging the cloud, world-wide-web, and social-media: possible role for BICA?
- Cybersecurity and secure authentication methods based on BICA
- Interdisciplinary research opportunities involving BICA
- International trends and opportunities in funding BICA related research

Format

The format of the conference is a 2.5 day meeting including paper presentations, panel discussions, invited talks, and technology demonstration showcases. Symposia and other mini-events (including special sessions, breakout groups, brainstorming, think-tanks, socials, and more) as part of the conference will be added as needed (proposals are solicited). We additionally solicit proposals for panel topics. The working language is English. As part of our rich social and cultural program included in the registration, we are planning a Welcome Reception and a boat trip on the Rhône and Saone rivers with a banquet on the boat.

Publication Venue and Submission

All the BICA 2015 papers and abstracts will be included in the electronic volume of proceedings distributed to the conference participants (this volume will not constitute a separate publication). Additionally, each article will be published in one of the two official BICA 2015 venues:

- A special volume of Elsevier's [Procedia Computer Science](#), indexed by Web of Science CPI and Scopus, to name just a few.
- The [BICA Journal](#) – an Elsevier journal indexed in Scopus, submitted for indexing in Web of Science.

Submission Categories:

In accordance with the publication venues, there are the following categories of submission:

1. Papers for the special volume of *Procedia Computer Science*:
 - 2 page abstract.
 - 6 page paper. Every additional page in excess of this limit should be covered by a fee of 50 EURO at the time of registration
2. Papers for the *BICA Journal* (no extra-page charge):
 - Letters (brief communications of new findings): 3,000 to 6,000 words.
 - Full Research Articles: approximately 8,000 to 12,000 words. Reviews or vision papers may be submitted by invitation only.
3. Stand-alone abstracts (500 words) considered unpublished but included in the conference program brochure and in the electronic volume.

Preparation of Submissions:

Templates and complete instructions for preparation of submission are available on the BICA2015 website <http://liris.cnrs.fr/bica2015/wiki/doku.php/submission>.

None of the initial submission is required to be camera-ready. However, all final paper submissions must be in a camera-ready form prepared based on the provided Procedia templates and must conform to the [Procedia Computer Science Guide for Authors](#). This is necessary for the production of the combined electronic volume of BICA 2015 proceeding. Elsevier will typeset the publications accepted in the BICA journal.

Core Organizing and Scientific Committee

- [Amélie Cordier](#) (Lyon 1, France) General Chair.
- [Olivier Georgeon](#) (Lyon 1, France) Program Chair.
- [Salima Hassas](#) (Lyon 1, France), Organizing committee member.
- [Laetitia Matignon](#) (Lyon 1, France), Organizing committee member.
- [Frederic Armetta](#) (Lyon 1, France), Organizing committee member.
- [Alexei Samsonovich](#) (GMU, USA) Co-Chair.
- [Kamilla R. Jóhannsdóttir](#), scientific committee Member.
- [Antonio Chella](#) (University of Palermo, Italy), scientific committee Member.
- [Christian Lebière](#) (CMU, USA), scientific committee Member.
- [Paul Robertson](#), (DOLL Inc, USA), organizing committee member.

Important Dates and Deadlines

- Deadline for proposals of sub-events* – May 1st.
- Paper and abstract submission opens – May 10th.
- **Deadline for initial submission of papers and abstracts – June 1st.**
- Paper review feedback and notification of acceptance – July 10th.
- Final paper due – August 1st.
- Early-bird registration due – August 10th.
- Regular registration due August 20th.
- Late-breaking stand-alone abstract due – October 1st.
- Conference – November 6-8.

* (including symposia, workshops, socials, technology demos, panels, etc.)



Photo by Jacques Saadé