

## Advances in Artificial Intelligence and Cognition

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The Symposium “Advances in Artificial Intelligence and Cognition” aims at creating a common ground of discussion between scholars whose work is at the intersection between Cognitive Science and Artificial Intelligence. After decades of mutual and pioneering collaboration, in the last decades joint efforts between these fields have significantly decreased. Both Artificial Intelligence and Cognitive Science have produced several sub-disciplines, each one with its own goals, methods and criteria for evaluation. The aim of this symposium is in pointing out how a stronger collaboration is still needed in order to contribute to the development of artificial systems endowed with human-level intelligence.

In particular, the first contribution is mainly devoted to analyze these aspects by adopting the “social cognition” perspective. The second contribution elaborates on the dichotomy human vs. artificial from a philosophical perspective, pointing out that some analogies are ill-posed and may be irrelevant from a cognitive perspective, while others may be of interest. The third contribution analyzes, from a “developmental robotics” perspective the importance of using humanoid robots as tools to investigate human cognitive skills in order to fully acknowledge the role of embodiment and interaction (with the environment and with others) for the emergence of motor and perceptual skills, sensorimotor coordination, cognitive and social abilities. The fourth contribution, finally, explores the crucial role of ethics in the emerging field of social robotics.

This symposium takes inspiration from the themes characterizing the series of the international workshop AIC

(Artificial Intelligence and Cognition). AIC started in 2013 and it is now at its third edition (Lieto and Cruciani 2013; Lieto, Radicioni and Cruciani, 2014). This workshop has produced a recognized level of discussion in Europe on the cross-border themes between AI and Cognitive Science. Selected and expanded versions of its scientific papers have been published in dedicated special issues on international journals such as Connection Science and Cognitive Systems Research (edited by Lieto and Cruciani (2015), and Lieto and Radicioni (2015), respectively). As a future direction, this symposium intends to promote joint collaboration with European and Extra-European events with similar goals and objectives. In this perspective, the symposium on “Advances in Artificial Intelligence and Cognition” represents a first step towards the goal of reaching a wider audience for the discussion of the AIC themes in well established international scientific conferences.

### **Understanding and Augmenting "Natural" Intelligence through the "Artificial" one**

*Cristiano Castelfranchi*

Computational tools are a crucial instrument for understanding/modeling individual cognition (they are useful not just as experimental platforms but for providing new concepts for theory). In particular, they are important for building a Science able to understand the underlying "mechanisms" and to provide "explanations", not just for probabilistic "predictions". In this panel I will talk about the

crucial issue of "motivation" (as the core of cognition) and about the architecture and "autonomy" of artificial agents. I will argue that computational tools are even more important for social theory and for modeling "collective cognition and action". Finally I will argue that AI can be not just useful for a scientific revolution in Cognitive Social Sciences, but for building a new "augmented" Intelligence (both, individual and collective) within an "augmented" reality based on the conjunction of "virtual" and "real" environment and based on an "hybrid" society with (undistinguished) artificial (software or robot) and human agents.

### **On the need of "humanoid" representations in Artificial Intelligence**

*Marcello Frixione*

Do we need "humanoid" representations in AI, in a sense similar to which we speak of humanoid robots in robotics? Humanoid robots are a robots whose shape and structure is human-inspired. Of course, humanoid robots can be attractive in many respects. However, from other points of view, an excess of anthropomorphism is not desirable. For example, a robot that needs to sleep eight hours a day is not very appealing. Nor it is a robot whose development lasts approximately a quarter of its lifespan. Analogously, it could be argued that an anthropomorphic approach to the development of knowledge representation systems is not a promising strategy. The mainstream of knowledge representation research in AI seems to share this prejudice. However, there are good reasons to suspect that some dose of human inspiration in knowledge representation could be welcome, also from the technological point of view. At least because at present human beings are the only known systems that are able to solve many important knowledge representation problems (undistinguished) artificial (software or robot) and human agents.

### **Brain for Robots**

*Giulio Sandini*

Simulating and getting inspiration from biology is not a new endeavor in robotics. However, the use of humanoid robots as tools to study human cognitive skills it is a relatively new area of the research which fully acknowledges the importance of embodiment and interaction (with the environment and with others) for the emergence of motor and perceptual skills, sensorimotor coordination, cognitive and social abilities. Within this stream of research "developmental robotics" is a relatively new area of investigation where the guiding philosophy – and main motivation – is that cognition cannot be hand-coded but it has to be the result of a developmental process through which the system becomes progressively more skilled and acquires the ability to understand events, contexts, and actions, initially dealing with immediate situations and increasingly acquiring a predictive capability. The aim of this talk is to present the guiding philosophy – and main

motivation – and to argue that, within this approach, robotics engineering and neuroscience research are mutually supportive by providing their own individual complementary investigation tools and methods: neuroscience from an "analytic" perspective and robotics from a "synthetic" one. agents.

### **Robots, Artificial Intelligence and the ethics of deception**

*Amanda Sharkey*

Computational Do attempts to create robots and other Artificial Intelligence entities that can interact with humans necessarily involve some form of deception? Such entities are often presented as though they are able to understand more of the human world than they really can. Robot ethics is an emerging discipline that seeks to identify and consider the effects on society of technological developments. The extent to which robots and related artefacts can be said to involve deception will be discussed, together with the positive and negative aspects of such deception. There are many potential advantages of social robots, ranging from entertainment to the provision of companionship to isolated individuals. At the same time, serious concerns about such robots include the possibility that they will be trusted too much and hence used inappropriately, and that they will result in a reduction in the kinds of meaningful human interaction that make life worth living.

### **References**

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