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Brain Function Assessment in Learning

First International Conference, BFAL 2017
Patras, Greece, September 24–25, 2017
Proceedings

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Preface

This volume contains the refereed papers presented at the International Conference on Brain Function Assessment in Learning, BFAL 2017, held on September 24–25, 2017 in Patras, Greece. The conference is the first in a multidisciplinary domain that regroups specialists in neuroscience, computer science, medicine, education, human-computer interactions, and social interaction. It promotes a cross-disciplinary approach to better understanding how to use the brain's capabilities to improve cognition and learning. The benefits cover a large variety of applications and this conference opens the way to collaborative projects and research as the synergy of all these disciplines is important to strengthen the impact and scope of the results.

The convergence of cognitive studies, tools of artificial intelligence, neuroscience approaches, and health applications opens a new era of multidisciplinary research tracks. The emergence of new assessment devices allows new ways of experimentation in laboratories, with light, non-intrusive, and low-cost sensors. Industrial representatives of relative technology were also invited to present their tools and equipment.

The conference gives the participants the opportunity to examine multiple applications of brain function assessment in learning–mainly in the education and health fields–which are becoming more and more promising. For example, knowing the brainwave activity and the condition of a user, researchers can detect whether he/she is not concentrating, or is over busy, hyperactive, anxious, not motivated, and they can apply corrective methods to provide calm, relaxation, and better receptivity to allow a better transfer of knowledge and life conditions.

There were 28 submissions. Each submission was reviewed by at least 1, and on average 2.4, Program Committee (PC) members, according to a double-blind process. The PC decided to accept 22 papers. Sixteen of these were accepted as full papers, and 6 were accepted as posters. The program also included 2 invited talks from well known researchers.

We would like to thank all the 32 members of the multidisciplinary Program Committee for their constructive work in making suggestions and improvements to the papers, and all the authors for contributing to an innovative program. This conference would never exist without the strong involvement of Kitty Panourgia, the organization chair, and her excellent NEOANALYSIS team (Katerina Milathianaki, Isaak Tselepis, Natalia Kakourou, and Alexia Kakourou).

The conference was organized under the auspices of the University of Patras and we would like to thank the university authorities and administration for contributing to the emergence of this new multidisciplinary conference.

July 2017

Claude Frasson
George Kostopoulos

Organization

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Intelligent Control and Cognitive Control: Issues and Challenges

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Round Table Discussion

Panel Members: Claude Frasson, Peter P. Groumpos, George Kostopoulos, Kyriakos Sgarbas

Summary or Abstract

From the Call for Papers: The theme of conference is **Brain Function Assessment in Learning** and its multiple applications-mainly in the Education and Health Fields - which will become more and more promising. For example, knowing the brainwave activity and the condition of a user, we can detect if he/she is not concentrated, over busy, hyperactive, anxious, not motivated, and we can apply corrective methods to provide calm, relaxation and better receptivity to allow a better transfer of knowledge and life conditions.)

The proposed Round Table (RT)

Today the whole world is phasing with an unprecedented set of problems never had before. Challenging and difficult problems relating to the Energy and Environment, the Health and Ecology, the business and Economics and the ongoing process of Spiritual Decline. We stand at the Abyss, at the steadily approaching threshold of unimaginable chaos, calamity and destruction of our planet earth. IS THERE ANY SOLUTION? YES, there exists a lasting solution to these issues facing humankind. It derives from the notion of the power of ideas and an idea so powerful that its effect upon the World will be most profound. Ideas come from the human brain. The most powerful brain executives-attributes are Intelligence and Cognition.

Much has been written on Cognitive Control (CC) in the neuroscience and psychology literature. In contrast, from an engineering perspective, cognitive control is in its very early stage of development. Looking back on the history of the field of control engineering in the 20th century, we see a trend in the evolution of controllers from simple structures such as open-loop and proportional–integral–derivative (PID) controllers to much more sophisticated ones with features such as optimality, adaptivity, robustness, and intelligence to some extent.

Cognitive Control (CC) is defined as the ability to flexibly adapt behavior to current demands, by promoting task-relevant information and behaviors over temporally-extended periods and in the face of interference or competition.

On the other hand the area of "**Intelligent Control (IC)** is a fusion of a number of research areas in systems and control, Computer science and operation research among others, coming together, merging and expanding in new directions. By others **Intelligent control** (**IC**) is a class of ***Control techniques*** that use various artificial intelligence computing approaches like neural networks, Bayesian probability, fuzzy logic, machine learning, evolutionary computation and genetic algorithms. New control techniques are created continuously as new models of ***intelligent behavior*** are created and computational methods developed to support them ignoring completely that in most of these controls, human intelligence and cognition play a major and crucial role in developing all above controls and been called **Intelligent Control (IC).**

In the RT the basic and fundamental question of how Intelligent Control and Cognitive Control can be related mathematically and what is the role of Learning and thus creating new Knowledge.Learning is the most important thing that living creatures do. As far as any living creature is concerned, any action that does not involve learning is pretty much a waste of time. This is especially so for a human one. An organism cannot properly animate itself without first learning how to. Humans, before they can satisfy their own needs, first have to learn these needs, to understand and carefully evaluate them before they decide how to satisfy them. Indeed not an easy task.

Knowledge is a familiarity, awareness, or understanding of someone or something, such as facts, information, descriptions, or skills, which is acquired through learning or experience by perceiving, observing, discovering, innovation, or all kind of education forms.

Knowledge can refer to a theoretical or practical understanding of a subject. It can be implicit (as with practical skill or expertise) or explicit (as with the theoretical understanding of a subject); it can be more or less formal or systematic. In philosophy, the study of knowledge is called epistemology; the Greek philosopher Plato famously defined knowledge as "justified true belief", though this definition is now thought by some analytic philosophers to be problematic while others defend the platonic definition. In Plato's *Theaetetus*, Socrates and his student, Theaetetus discuss three definitions of *knowledge*: knowledge as nothing but perception, knowledge as true judgment, and, finally, knowledge as a true judgment with an account. However today each of these definitions is shown to be unsatisfactory. Knowledge acquisition involves complex cognitive processes: perception, communication, and reasoning; while knowledge is also said to be related to the capacity of *acknowledgment* in human beings. However, several definitions of knowledge and theories to explain it exist. There are also many different categories of knowledge. Understanding the different forms that knowledge can exist in, and thereby being able to distinguish between various types of knowledge, is an essential step for knowledge management (KM).

The panelist will address the above concepts and present their views as how intelligence and cognition can indeed provide solutions to today's problems of the society. The need to combine Intelligence and Cognition to a Unified theory of **Intelligent Cognitive Control (ICC)** will become evident. This RT will address **ICC** and scientifically search mathematical foundation for the ICC in order to search, investigate, analyze and provide solutions to the problems that the world is facing. Advanced revolutionary new theoretical and computational methods will be needed for advancing all the scientific sectors: healthcare, energy and environment, engineering, manufacturing, ecology, psychology, business and economics, education, philosophy and human productivity.

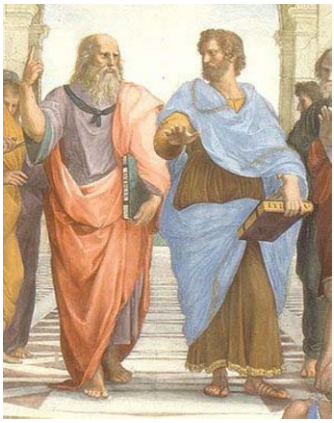

Figure 1. Raphael, detail of Plato and Aristotle, *School of Athens*, 1509-1511, fresco (Stanza della Segnatura, Palazzi Pontifici, Vatican)

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