

Special Issue of the *Neurocomputing Journal* on ***Adaptive Incremental Learning in Neural Networks***

Contributions from the International Conference on Adaptive and Intelligent Systems, 2009

Guest Editors

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Scope

Adaptation plays a central role in dynamically changing systems. It is about the ability of the system to “responsively” self-adjust upon change in the surrounding environment. Like in living creatures that have evolved over millions of years developing ecological systems due to their self-adaptation and fitness capacity to the dynamic environment, systems undergo similar cycle to improve or at least do not weaken their performance when internal or external changes take place. Internal change bears on the physical structure of the system (the building blocks: hardware and/or software components). External change originates from the environment due to the reciprocal action and interaction. These two classes of change shed light on the research avenues towards smart adaptive systems. The state of the art draws the picture of challenges that such systems need to face before they come reality. A sustainable effort is necessary to develop intelligent hardware on one level and concepts and algorithms on the other level. The former level concerns various analog and digital accommodations encompassing self-healing, self-testing, reconfiguration and many other aspects of system development and maintenance. The latter level is concerned with developing algorithms, concepts and techniques which can rely on metaphors of nature and which are inspired from biological and cognitive plausibility.

To face the different types of change, systems must self-adapt their structure and self-adjust their controlling parameters over time as changes are sensed. A fundamental issue is the notion of “self” which refers to the capability of the systems to act and react on their own. It covers all stages of the system’s working and maintenance cycle starting from online self-monitoring to self-growing and self-organizing. Relying on the two-fold plausibility which is the basis for many computational models, neural networks can be encountered in various real-world dynamical and non-stationary systems that require continuous update over time. There exist many neural models that are theoretically based on incremental (i.e., online, sequential) learning addressing in particular the notions of self-growing and self-organizing. However, their strength in practical situations that involve online adaptation is not as efficient as desirable.

The present special issue aims at presenting the latest advances of neural adaptive models and their application in various dynamic environments. The special issue is intended for a wide audience including neural network scientists as well as mathematicians, physicists, engineers, computer scientists, biologists, economists and social scientists. The special issue will cover various topics of neural networks related to the self-organization, self-monitoring and self-growing concepts. It also aims at presenting a coherent

view of these issues and a thorough discussion about the future research avenues. A sample of the targeted topics, which is suggestive rather than exhaustive, includes:

- **Theories and Algorithms**
 - Self growing neural networks
 - Online adaptive and life-long learning
 - Constructive learning
 - Plasticity and stability in neural networks
 - Forgetting and Unlearning in neural networks
 - Incremental adaptive neuro-fuzzy systems
 - Incremental and single-pass data mining
 - Incremental neural classification systems
 - Incremental neural clustering
 - Incremental neural regression
 - Adaptation in changing environments
 - Concept drift in incremental learning systems
 - Self-monitoring in incremental learning systems
 - Incremental diagnostics
 - Novelty detection in incremental learning
 - Time series prediction with neural networks
 - Incremental feature selection and reduction
 - Adaptive decision systems
 - Principles and Methodologies of self-organization
 - Neural algorithms for self-organization
 - Perception and evolution in learning systems
- **Applications : Adaptivity and learning in**
 - Smart systems
 - Ambient / ubiquitous environments
 - Distributed intelligence
 - Intelligent agent technology
 - Robotics
 - Game theory
 - Industrial applications
 - Internet applications
 - E-commerce, etc

Schedule

- Submission due date: December 15th, 2009
- First acceptance notification: February 20th, 2010
- Revised manuscripts due: April 15th, 2010
- Final acceptance notification: June 15th, 2010
- Final version due: July 15th, 2010
- Intended publication date: 3rd/4th quarter, 2009

Submission

This special issue of the journal will target high quality papers selected from the International Conference on Adaptive and Intelligent Systems (ICAIS'09). The selected papers must be significantly extended by at

least 30% and improved to meet the requirement of the journal. The special issue welcomes also regular papers beyond the ICAIS'09 circle.

Manuscripts submitted to the Special Issue of *Neurocomputing* on *Adaptive Incremental Learning in Neural Networks* should be formatted according to the journal template: http://www.elsevier.com/wps/find/journaldescription.cws_home/505628/authorinstructions and must be submitted through the online submission system of the journal <http://ees.elsevier.com/neucom/>. Please choose article type "**SI: Incremental Learning**" when submitting your manuscript.