

Postdoctoral research topic

- Title of the proposed topic: Lifelong Learning in Perception
 - Research axis of the 3iA: *axis I* - the fundamental elements of AI
 - Supervisor (name, affiliation, email): Marco Gori, University of Siena and UCA (3iA chair)
 - Potential co-supervisor (name, affiliation): Frédéric Precioso
 - The laboratory and/or research group: SAILAB and MAASAI
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Description of the project: By and large, most studies of machine learning and pattern recognition are rooted in the framework of statistics. This is primarily due to the way machine learning is traditionally posed, namely by a problem of extraction of regularities from samples of a probability distribution. This post-doc research project promotes a truly different way of interpreting the learning of perceptual tasks as a lifelong process where there is no neat difference between training and test sets, while the emphasis is centered around the crucial role of “time.” Amongst possible research directions, we solicit a view of learning as the outcome of “laws of nature” that govern the interactions of intelligent agents with their own environment. In this context, the agent is expected to acquire skills on the task at hand gradually during its own life. This leads to replace traditional benchmarks with appropriate virtual world to define the framework where the agent lives. Amongst others, we stimulate studies where before thinking of leaning algorithms, one foresees pre-algorithmic frameworks for the conception of information-based laws inspired from classic principles of theoretical physics.

These questions concern the current hot machine learning topics of Lifelong Learning (from <http://lifelongml.org/> , “*on developing versatile systems that accumulate and refine their knowledge over time*”), or continuous learning which targets tackling catastrophic forgetting via model adaptation. Even though this research activity finds applications in any field of machine learning with tasks based on perceptual inputs, we expect to address also computer vision challenges and, particularly, the emergence of visual features that are invariant under motion. In this context, the adoption of eye movement models makes it possible to regard any visual interaction as a process characterized by the motion of the focus of attention, which strongly motivates the need for motion invariance features. Unlike current computer vision system, we assume that the visual agents that are studied in this research operate in a truly unsupervised way. The most important expectations of this research is that of achieving object recognition visual skills by a little supervision, thus overcoming the need for the expensive accumulation of huge labelled image databases.

Context: This post-doc position will be held in INRIA Sophia Antipolis Mediterranee, member of the 3IA Institute, in the research team Maasai.

Background & Skills: Applicants must hold a PhD in mathematics, theoretical physics, or Computer Science with strong skills in Machine Learning.