

Evolving Connectionist Systems: The Knowledge Engineering Approach

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Evolving Connectionist-based Systems (ECOS) are systems that develop their connectionist structure, their functionality and their internal knowledge representation through continuous learning from data and interaction with the environment. ECOS can also evolve through generations of populations using evolutionary computation, but the focus of the tutorial is on the adaptive learning and improvement of each individual connectionist system. The learning process can be: on-line, off-line, incremental, supervised, unsupervised, active, sleep/dream, etc. These general principles can be applied to develop different models of ECOS, including: simple evolving neural networks, evolving spiking neural networks, evolving neuro-fuzzy systems, evolving quantum-inspired neural networks, integrated hybrid models [1].

The emphasis here is on two knowledge engineering aspects of the evolving system:

(1) structural and functional adaptation of the system to new data, possibly in an on-line or real time mode; (2) knowledge representation and knowledge extraction.

ECOS are demonstrated on several challenging problems from bioinformatics, medical decision support, autonomous robot control, adaptive multimodal information processing, environmental risk prognosis, financial on-line prediction.

The tutorial targets computer and information graduate students, researchers and practitioners. Pre-requisite is a basic knowledge on neural networks and statistics.

[1] N.Kasabov, *Evolving connectionist systems: The Knowledge Engineering Approach*, Springer, 2007, (www.springer.de).

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