

Ref:Ro J Neurol. 2017;XVI(Suppl.2)
DOI: 10.37897/RJN.2017.S2.6

PERCEPTION, MEMORY AND CORTICAL LEVEL LEARNING PROCESSES CONSIDERATIONS

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The essential interconnected processes of intelligence from an engineering perspective are perception, memory, learning and behaviour generation. Human brain has capacities like patterns meaning decryption, learning, memorizing and adaption through self-organization. Structural and functional complexity is revealed by analysis: hierarchical organization, recurrent connected networks, temporal variance, nonlinear and adaptive functions using dynamic reconfiguration of processing units according to interactive, parallel, different and spatial patterns. The neural systems process real-time data, information and knowledge being constrained by energy and space. The output integration of processing clusters is based on time synchronization. The memorization systems of the brain are purpose and storing duration specific having various spatial and temporal features. A cognitive learning system based on the interaction between states space and adaptive learning dynamics can be envisioned as the following triplet: functional architecture, dynamic representation and learning dynamics. The learning is a dynamic conse-

quence of the information processing and system plasticity; the equations describing the learning process can be seen as the interaction between perception (information encoding), cognition (persisting stage) and action (rebuild).

The brain complexity as non-linear and dynamic system, hierarchical organized imposes a multi-disciplinary analysis (neurology, neuroscience, biology, biochemistry, mathematics, systems engineering, nanotechnology, pharmacology, neuroinformatics, computer science). The understanding of the information and knowledges processing mechanism of neuron and neural networks is the mandatory base of bottom-up or top-down approach structural-functional models building.

The brain can be modelled as a real-time operating network of networks (multiagent systems). The mind as complex process is responsible with essential intelligence attributes exhibiting: perception, learning, planning, actions, execution and reasoning, all being based on the inner world model and real-time interaction.