Neural information processing: normal and pathological

Péter Érdi*

* Henry Luce Professor of Complex System Studies
Center for Complex System Studies, Kalamazoo College, Kalamazoo, MI and
Dept. Biophysics, KFKI Research Institute for Particle and Nuclear Physics of the Hungarian
Academy of Science, Budapest
E-mail: perdi@kzoo.edu
URL: http://cc.kzoo.edu/perdi/

Abstract: A large class of neurological and psychiatric disorders could be characterized by pathological neural information processing. Anxiety, autism, depression and schizophrenia belong to this class.
First, the concept of "neurological disorders as dynamical diseases" are briefly reviewed. Second, a case study will be given to demonstrate how computational modeling offers a new mental strategy for drug discovery by integrating conventional electrochemical/biophysical and neurochemical models.
A characteristic electrical pattern, namely the slow rhytmic activity (called theta rhythm) plays an important functional role in the hippocampus and related areas. Specifically, septo-hippocampal theta activity might have a controversial role: it is known to be strongly involved in enhancing cognitive functions, but might be correlated to anxiety. The 'optimal performance' of the system may be the result of a finely tuned control system.