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A Research Blueprint for the SOM Neurocomputational Cognitive Modeling of Brain Disorders

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Abstract

Three guiding questions of a research blueprint for the study of brain disorders, using self-organising map (SOM) neural network modeling, are proposed: a) What does the current research on computational psychology/psychiatry and cognitive neuroscience suggest about atypical brain development and the associated behaviour? b) What cortical structures and functions are involved in certain brain disorders (e.g., autism, schizophrenia) and how is memory implicated? c) How well do existing neurocomputational SOM models explicate possible functional and structural aspects of brain-behavioural disorders?

My current investigation focuses on the closer examination of the modulation of standard & oscillating inhibition-excitation in SOM neural networks and the cognitive modelling implications for existing brain-disorder theories. This includes the computational, mathematical and functional study of the standard-TN (Topological Neighbourhood) SOM and a proposed oscillating-TN SOM, and drawing connections between i) the model, ii) functional and structural elements at the cognitive neuroscientific level, and iii) atypical behavioural phenotypes.