

Neural Fields, Synaptic Plasticity, and Self-Organisation

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Abstract.

Neural field models describe the coarse-grained activity of populations of interacting neurons and, accordingly, give rise to rich patterns of spatiotemporal dynamics. These patterns have been linked to a variety of contexts, ranging from understanding epileptic seizures to the generation of electroencephalographic signals. Among the most important of these patterns are persistent localised solutions, also known as activity bumps, which are widely regarded as neural analogues of functional working memory.

This talk has two main objectives. Firstly, we address the issue of how lateral (i.e., intra-field) connectivity can be learned, enabling the network to exhibit stable dynamics. The proposed learning rule is shown to give rise to a continuous attractor structure, which is typically found in biological systems, such as the *Drosophila* head-direction circuit. Afterwards, we examine how external stimuli, typically arising from sensory stimuli or other cortical areas, are mapped onto the neural field's spatial domain through a process of self-organisation.