SHORT-TERM SYNAPTIC PLASTICITY AND HETEROGENEITY IN NEURAL SYSTEMS

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In order to boost the understanding of neural systems by means of theoretical models, one has to identify the key mechanisms relevant for the phenomenon of interest, and consider them in the model. In this work, I will review some relevant results on neural dynamics and information processing which arise when considering several key mechanisms, in particular, short-term synaptic plasticity and neural heterogeneity. The inclusion of short-term synaptic plasticity leads to enhanced memory capacities [1,2], a higher robustness to noise [2], and other dynamical behavior [3]. On the other hand, considering some level of neural heterogeneity in the model (as it is found in experimental measurements) allows neural systems to optimize information transmission in rate coding and temporal coding, two strategies commonly used by neurons to codify information in many brain areas [4]. We briefly discuss the implications of having both short-term plasticity and neural heterogeneity in neural systems.

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