

INTERPLAY BETWEEN STRUCTURE AND DYNAMICS IN NEURAL NETWORKS

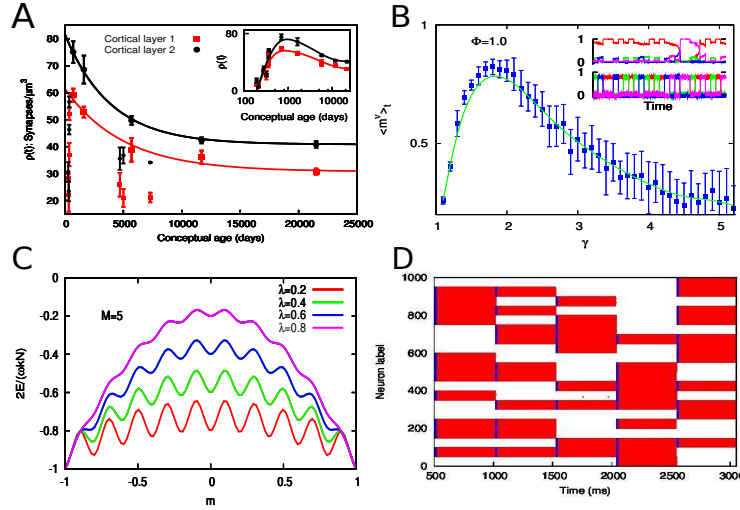
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The structure of neural networks in nature develops under the influence of neural activity – via processes such as synaptic plasticity and pruning – and in turn affects neural behaviour in many ways. We explore these mutual influences for simple neural network models with some biological ingredients, relating rules for synaptic growth and death with physiological data [1] (e.g., changes in synaptic density, Fig. A), and showing how topological features can in their turn be key to performance at certain tasks [2] (like pattern identification, Fig. B). In particular, we propose a mechanism whereby robust short-term memory of information not previously learned can come about due solely to network topology [3] (Figs. C and D).



[1] S. Johnson, J. Marro, and J.J. Torres, *J. Stat. Mech.* (2010) P03003

[2] S. Johnson, J.J. Torres, and J. Marro, *EPL* **83**, 46006 (2008)

[3] S. Johnson, J. Marro, and J.J. Torres, *submitted*, arXiv:1007.3122