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The problem with computational neuroscience

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Neuroscience, being biology, is largely empirical. Quite a lot is known about sub-cellular processes and single-cell dynamics, although these are still very active fields. Much is known about the response of single neurons in-vivo in the cerebral cortex, especially to visual stimuli. How does one put all of this together to understand how the brain works? Maybe we can't; unless a system is linear, reductionism is bound to fail.

Computational neuroscience, although many would disagree with me, has served two main goals. First, it is used to "explain" or at least describe empirical data in a self-consistent way, i.e. with models.

Secondly, it is used to address the bane of reductionism. Namely, our models should be able to describe the wide range of dynamics seen throughout the brain in a single, unified framework. It is assumed this has something to do with "complexity".

Unfortunately, computational neuroscience has failed on both accounts: to a lesser extent in the former case, and rather dramatically in the latter. In this talk I will discuss these issues more in depth..