

# Dynamical Criticality and Griffiths Phases in Models of Large Connectomes

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In this talk, I discuss critical dynamics of simple nonequilibrium models on large connectomes, obtained by diffusion MRI, representing the white matter of the human brain; as well as on the neuron level fruit-fly connectome. First I overview graph theoretical and topological analysis of these networks, pointing out that universality allows selecting a representative human network, the KKI-18, which has been used for dynamical simulations [1]. The critical and sub-critical behaviour of simple, two- or three-state threshold models is discussed with special emphasis on rare-region effects leading to robust Griffiths phases (GP) [2-3]. Numerical results of synchronization phenomena, studied by Kuramoto type models, are also shown, leading to a continuous analog of the GP, termed as "frustrated synchronization" [4-5]. The models presented here exhibit dynamical scaling behaviour with exponents in agreement with brain experimental data if local homeostasis is provided [6]. I provide a comparison of the results about criticality obtained for the human and fruit-fly connectomes in the rest and task states [7-8].

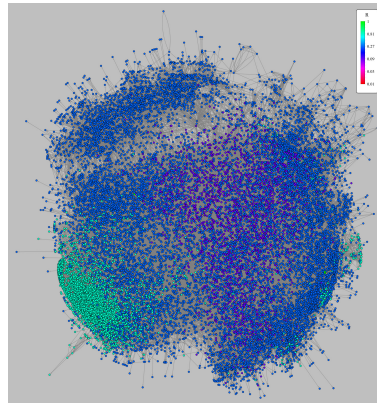


Figure 1: Frustrated synchronization map of the critical Kuramoto model on the fruit-fly connectome.

## References

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