Brain "rest" is defined - more or less unsuccessfully - as the state in which there is no explicit brain input or output. Could it be a dynamical state comparable to any known dynamical state?

We have proposed that the brain stays near the critical point of a second order phase transition, where neuronal groups generate a diversity of flexible collective behaviors, due to the known abundance of metastable states at the transition. It is from this viewpoint, that the dynamics of brain resting might correspond to a critical state.

This conjecture is tested here comparing fMRI brain resting state data from healthy subjects with a paradigmatic critical system, the Ising model.

The analysis shows striking similarities between the two systems, lending support to the conjecture that the functioning brain operates near a critical point.

Networks are collections of nodes joined by links. Sites are connected by a link if their mutual correlation is larger than a certain value \( \rho \).

Voxel-based correlation networks

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The Ising model is a toy model of a magnet, it simulates the local interactions between spins. Depending on the temperature, there is collective order or disorder; a continuous 2nd order phase transition.

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