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Brain network structure and dynamics: Mathematical modelling of epileptic seizures

Spectral graph theory of graphs containing only attractive (or positive) interactions has been the subject of detailed studies. However, in brain networks, these graphs can carry interactions which are repulsive (or negative) to a degree. We have investigated how properties of signed graph adjacency matrices change for differing ratios of negative interactions to positive interactions by considering graph structures of the correlational matrices from intracranial electroencephalogram (iEEG) data during an episode of epileptic seizure. Furthermore, we have also examined how non-linear dynamics on such graphs describes the seizure behaviour. Joint work with M. Cavers and P. Federico (University of Calgary).