TOPOLOGY SEMINAR

An application of neighbourhoods in directed graphs in the classification of binary dynamics

By

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Abstract: A binary state on a graph means an assignment of binary values to its vertices. For example, if one encodes a network of spiking neurons as a directed graph, then the spikes produced by the neurons at an instant of time is a binary state on the encoding graph. Allowing time to vary and recording the spiking patterns of the neurons in the network produces an example of a binary dynamics on the encoding graph, namely a one-parameter family of binary states on it. The central object of study in this talk is the neighbourhood of a vertex v in a graph $\mathcal{G}$, namely the subgraph of $\mathcal{G}$ that is generated by v and all its direct neighbours in $\mathcal{G}$. We present a topological/graph theoretic method for extracting information out of binary dynamics on a graph, based on a selection of a relatively small number of vertices and their neighbourhoods. As a test case we demonstrate an application of the method to binary dynamics that arises from sample activity on the Blue Brain Project reconstruction of cortical tissue of a rat.

Date: Feb 15, 2021
Time: 13:30 UTC+3
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