

Modeling Networks and Network Populations via Graph Distances

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Abstract Networks have become a key data analysis tool. They are a simple method of characterising dependence between nodes or actors. Understanding the difference between two networks is also challenging unless they share nodes and are of the same size. We shall discuss how we may compare networks and also consider the regime where more than one network is observed.

We shall also discuss how to parametrize a distribution on labelled graphs in terms of a Frechét mean graph (which depends on a user-specified choice of metric or graph distance) and a parameter that controls the concentration of this distribution about its mean. Entropy is the natural parameter for such control, varying from a point mass concentrated on the Frechét mean itself to a uniform distribution over all graphs on a given vertex set.

Networks present many new statistical challenges. We shall discuss how to resolve these challenges respecting the non-Euclidean nature of network observations.

Keywords Statistical network analysis; Network variability; Graph metrics; Random graphs

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