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SEMINAR

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304 Whitehead Hall
Refreshments: 3:30 p.m.
Seminar: 4:00 p.m.

RANDOM DOT PRODUCT GRAPHS AND SOCIAL NETWORKS

Abstract

We present a method for generating random graphs based on the familiar notion of dot product. To every vertex x of graph on n vertices we assign a vector $\mathbf{x}$. (These vectors may have been generated by some random process.) Then we insert an edge joining x and y with probability $\mathbf{x} \cdot \mathbf{y}$. Naturally, we must choose our vectors wisely so that the dot products evaluate in $[0, 1]$. Random dot product graphs are a generalization of Erdős-Rényi random graphs.

We show how random dot product graphs may be used to model social networks. The vertices of a social network are human beings. There is an edge joining x and y if x and y communicate with one another. These graphs (and similar graphs derived from Web pages and their links) have been observed to have certain properties, most notably low diameter (the celebrated "six degrees of separation") and a power-law distribution on vertex degrees. One model of random dot product graphs recovers these properties.

Finally, we consider the inverse problem: Given a social network (or several graphs stemming from multiple observations of the same group of people), how should we assign vectors to individuals to obtain the "best" model of the observed network(s)? Our method does not select vectors wisely.

This work on random dot product graphs is a natural evolution of some of my previous work on intersection graphs and (deterministic) dot product graphs.

The presentation is based on joint work with Christine Nickel and Miro Kraetzl.