BRIGHAM AND WOMEN'S HOSPITAL
HARVARD MEDICAL SCHOOL

181 Longwood Avenue
Boston, Massachusetts 02115-5804

Department of Medicine
Channing Division of Network Medicine

Channing Network Science Seminar

April 03, 2015, 11am @ 5th floor conference room

Speaker: Navid Dianati, Ph.D
Northeastern University and Harvard University

A family of network growth models with arbitrary degree distribution and high clustering from interacting random walkers in a metric space.

Abstract: Many real world networks, such as social networks, are primarily formed through local interactions between agents embedded in a metric space. Despite the local nature of the interactions, such networks frequently develop features such as scale-free degree distributions and the small-world property, implying long-range connectivity. However, most existing network growth models either focus entirely on reproducing the topological features of the network at the expense of the metric nature of the underlying space, or neglect the physical agent dynamics responsible for the formation of the network. Here we construct a class of network growth models based on local interactions on a metric space, capable of producing arbitrary degree distributions as well as a naturally high degree of clustering akin to certain biological networks. In this model, agents stochastically traverse the space and form bonds only when they meet at designated locations we refer to as "rendezvous points." The spatial distribution of the rendezvous points determines key characteristics of the network such as the degree distribution. For any arbitrary (monotonic) degree distribution, we are able to analytically solve for the required rendezvous point distribution. As a specific example, we study the case of random-walking agents and scale-free distributions, but we prove that most results can be generalized to other degree distributions and any linear stochastic dynamics.

Bio: Navid Dianati is a postdoctoral research fellow at Lazer Lab, Northeastern University and a fellow at the IQSS, Harvard University. Navid holds a PhD in physics and a master's degree in applied mathematics from the University of Michigan. His research interests are in the modeling of high-dimensional dynamical systems, modeling and statistical analysis of complex networks, and the mathematical foundations of data mining.

Hosted by Yang-Yu Liu