BRIGHAM AND WOMEN'S HOSPITAL

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Department of Medicine
Channing Division of Network Medicine

Channing Network Science Seminar

February 8 (Friday), 2019, 11am @ 5th-floor conference room

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Physical properties of minimally wired networks in 3D

Abstract: While most networks represent abstract relationships, networks such as the brain and vascular networks are actual physical objects where nodes and links cannot cross each other and where length of the wiring has a cost. To understand and model these systems, we propose a modelling framework whose goal is to produce 3D network layouts which minimize the wiring length while avoiding crossing among elements. We analyze the physical properties of such 3D layouts and find two general regimes: a weakly interacting regime, where links are very thin and rarely interact; and a strongly interacting regime, where link interactions are dominant. We further analyze the nature of the transition between the two regimes and find that it is a smooth crossover with no phase transition. Finally, we discuss some of the implications and applications of our model for modelling brains.

Bio: Nima Dehmamy is Postdoctoral Research Associate at the Center for Complex Networks Research at Northeastern University, working with Prof. Albert-László Barabási. His research focuses on dynamical processes in complex systems, graph learning, and dynamics of learning in artificial neural networks. He has worked on modelling dynamics of shocks in financial markets, formation of spatial networks, and approximation of weights in artificial neural networks. He received his Bachelor's degree in physics from Sharif University of Technology, Tehran, Iran, and his PhD in physics from Boston University.

Hosted by Yang-Yu Liu