



Hamilton Institute

Computational Analysis of Dynamic Networks
(and its applications to the social life of zebras)

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Abstract:

Computation has fundamentally changed the way we study nature. Recent breakthroughs in data collection technology, such as GPS and other mobile sensors, are giving biologists access to data about wild populations that are orders of magnitude richer than any previously collected. Such data offer the promise of answering some of the big ecological questions about animal populations. The data are not unique to animal domain but is now prevalent in human interactions: emails, blogs, and online social networks. Unfortunately, our ability to analyze these data lags substantially behind our ability to collect it. In particular, interactions among individuals are often modeled as social networks where nodes represent individuals and a link exists if the corresponding individuals have interacted during the observation period. The model is essentially static in that the interactions are aggregated over time and all information about the time and ordering of social interactions is discarded. We show that such traditional social network analysis methods may result in incorrect conclusions on dynamic data about the structure of interactions and the processes that spread over those interactions. We have extended computational methods for social network analysis to explicitly address the dynamic nature of interactions among individuals. We have developed techniques for identifying persistent communities, influential individuals, and extracting patterns of interactions in dynamic social networks. We will present our approach and demonstrate its applicability by analyzing interactions among zebra populations.

Bio:

Dr. Tanya Berger-Wolf is an assistant professor at the Department of Computer Science at the University of Illinois at Chicago where she heads the Computational Population Biology Lab. Her research interests are in applications of combinatorial optimization analysis and algorithm design techniques to problems in population biology of plants, animals, and humans, from genetics to social interactions. Dr. Berger-Wolf has received her B.Sc. in Computer Science and Mathematics from Hebrew University (Jerusalem, Israel) and her Ph.D. in Computer Science from University of Illinois at Urbana-Champaign in 2002. She has spent two years as a postdoctoral fellow at the University of New Mexico working in computational phylogenetics and a year at the Center for Discrete Mathematics and Theoretical Computer Science (DIMACS) doing research in computational epidemiology. She has received numerous awards for her research and mentoring, including the US National Science Foundation CAREER Award in 2008 and the UIC Mentor of the Year Award in 2009.

Venue: Seminar Room, Hamilton Institute, Rye Hall,
NUI Maynooth

Time: 2.00 - 3.00pm (followed by tea/coffee)

Travel directions are available at www.hamilton.ie