

Mathematical Sciences
Center for Faculty Development¹

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United States Military Academy, West Point NY

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Mathematical Topics in Social Network Analysis

Abstract:

What is mathematical sociology? How are eigenvectors, Markov models, mathematical statistics, Fourier analysis, and graph theory commonly used in the social sciences? This talk will focus on mathematical problems and applications in the social science domain. During the Cold War, physics was extremely important for success. We needed better armor, better ammunition, better power, better nuclear technology, and we accomplished that goal. Today's conflicts face different scientific challenges. We need predictive models of social and cultural response. We need to know how to combat the spread of extremist ideology. We need to fix responsibility and accountability in socially networked organizations. We need to evaluate second and third order effects of policy decisions. While these problems have traditionally fallen in the domains of anthropology, geography, sociology, and political science, mathematical techniques are required to produce useful solutions. Special attention will be focused on methods of social network analysis to include centrality, diffusion of ideology, dependence graphs, and longitudinal network analysis to include Markovian models, change detection, and Fourier analysis.

¹ POC - PROF Brian Winkel, Dept of MathSci, USMA, West Point NY 10996 -- 845-938-3200

About the Speaker

Major Ian McCulloh is a Ph.D. student at Carnegie Mellon University in the School of Computer Science and affiliated with the Center for Computational Analysis of Social and Organizational Systems. He conducts funded research in the area of statistics and social network analysis in support of the U.S. Army Research Institute, the U.S. Army Research Labs, USAFRICOM, the National Security Agency, the Office of Naval Research and the National Science Foundation. He is currently teaching an elective course in mathematical sociology in the USMA Department of Behavior Sciences and Leadership and co-advising several cadet honors theses in different departments at the Academy. He is a founding member of the USMA Network Science Center and a former faculty member in the USMA Department of Mathematical Sciences. He will join the Department of Civil and Mechanical Engineering in 2010.