Welcome to Winter Quarter!

Greetings from an unusually wet and rainy Santa Barbara! This has been another exciting quarter for the IGERT program, with much more we're still looking forward to. On March 3rd we will welcome a number of talented prospective trainees to campus for Preview Day, and get to meet the future colleagues that will round out the final new cohort of our program. Meanwhile, the current trainees have been hard at work, and the first-year students have started the hands-on experience of the training modules. We're happy to share a sample of a few of the wonderful projects that trainees are working on in this newsletter, and an abstract of our full offering of 28 modules is available on our website. With many trainees electing to design their own modules, we can’t wait to see what the rest of this year holds in store for us!

Highlight: Brian Uzzi Visit

Northwestern Professor Collaborates with IGERT Faculty to Study the Network Science of Teams

Brian Uzzi, Professor of Leadership and Organizational Change at Northwestern University, along with three of his graduate students, came to UCSB for a three-day visit in early February. Professor Uzzi is a co-PI on a five-year, $6 million Department of Defense Multidisciplinary University Research Initiative (MURI) to study the Network Science of teams. UCSB Principals are IGERT faculty members Professors Ambuj Singh, Francesco Bullo, and Noah Friedkin. Together with additional collaborators at USC, MIT, and UIUC, these scholars are working towards developing quantitative network-based models of adaptive team behavior. This multi-university, interdisciplinary team of researchers in sociology, cognitive and social psychology, behavioral sciences, machine learning, data mining, statistics, controls and dynamical systems, as well as network science, demonstrates the importance of training in Network Science.
DESIGNING AN INTERDISCIPLINARY EDUCATION: TRAINING MODULES AT A GLANCE

Modules: New Innovations in Network Science

Modules are a crucial part of the trainee's development, offering a quick introduction to research along with the opportunity to partner across discipline and work within multiple areas of network science. The program's flexibility combined with the trainees' ambition has led to the creation of a number of completely new modules designed by students themselves based on areas they want to learn more about and grow in. Indeed, from the initial selection of 8 pre-designed modules, students can now choose from over 25 modules or decide to design one on their own. Here are a few of the modules trainees are working on this quarter:

Modeling Gene Network Evolution

This module, supervised by IGERT faculty member Stephen Proulx, falls under the research areas of Biological Networks as well as Dynamics and Control. Second-year trainee Lilla Bartko is working to develop population genetic models of gene network evolution under migration selection balance. Using computational programming to determine the stability of the dynamical systems that describe gene frequencies, this module will help future researchers have new tools to address the issues raised when populations exchange genes across spatially heterogeneous landscape and the system develops a genetic load that prevents perfect adaptation to all locations at one time.

Understanding and Modeling Complex Network Processes

Under the direction of IGERT PI, Professor Ambuj Singh, trainee Furkan Kocaysufuglu and associate Minh Hoang are tackling a significant issue with many real-world applications. Falling under the research areas of Algorithms, Models, and Mining as well as Human Networks, Furkan and Minh are starting with a conundrum of the age of big data: how easy it is to get lost in information overload and fail to see the big picture of how network processes happen. The starting point of their module is simply the question: Can we summarize the spread of information in social networks by a small yet interpretable set of cascading subgraphs, each of which represents a set of connected users frequently participating in the same network processes? These collaborators seek to solve this problem for large-scale social networks and formulate it as a Binary Matrix Factorization with network constraint. Further, they propose a greedy approximate algorithm as well as two scalable variants of this problem.

Models of Social Power Evolution

This module, first worked on in Winter 2016 by trainee and Mechanical Engineering student Axel Haner, has been taken up again by first-year trainee and Sociology student Devin Cornell. Supervised by IGERT faculty member Noah Friedkin, this module falls under the research areas of Algorithms, Models, and Mining, Dynamics and Control, and Human Networks. Put simply, this module is concerned with understanding models for the process through which a group reaches an opinion, and how that opinion influences future decisions made by the group. The Degroot-Friedkin and Modified Degroot-Friedkin models of social power evolution are examined in this module, with the key distinction being how the mechanism of reflected appraisal is implemented.