Network science, the study of complex networks, is an emerging discipline at the interface of mathematics, statistics, computer science, materials science, physics, biology, and social sciences. Active research areas in this emerging field include network modeling and inference, flows on networks, structural and dynamic modeling of networks in materials, social and biological systems, with applications to defense and homeland security. Analyzing network data and structures has become a major endeavor across sciences and engineering. The number of publications in network science grows exponentially; research centers and institutes focusing on research in complex network systems sprouted out rapidly around the world at leading universities.

Knowing the topology of a network is crucial for understanding the structure, functionality, and evolution of the whole network and its building constituents. It has many important applications, including the study of network vulnerabilities, identification of functional relations between sub-groups in the given network, finding of hidden group activities, etc. Real world networks are often huge; therefore algorithmic tasks in complex networks pose a significant computational challenge.

The development of analytic techniques that can describe the spread of infection or information or the transport of electrons or phonons in dynamic networks is a major and important challenge. The changing structure of networks over time is inherent in the study of a broad array of phenomena. The importance of dynamics in networks is long recognized, and the increasing accessibility of network data led to renewed interest in this area.

Most of the theoretical modeling work done on the dynamics of networks focuses on the statistical equilibrium of those models (e.g. growing networks by preferential attachment) or on one-time disruption events. At the same time, computational tools for analyzing and visualizing time-varying networks remain relatively few in number, especially if compared to the number of advanced techniques for modeling and analyzing static networks. There is thus both need and opportunity for more thorough mathematical and statistical analysis for modeling dynamic networks as well as the development of advanced computational algorithms for study of complex networks. This needs a well-orchestrated interdisciplinary effort.

The organizers hope that this Summer School will contribute to the exchange of ideas between different disciplines and will expose the next generation of network scientists to these ideas.
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<tr>
<td>5/20/2013</td>
<td>Fan Chung Graham</td>
<td>University of California at San Diego</td>
<td>&quot;Random Walks on Web: Graphs I&quot;</td>
<td>Fan Chung Graham</td>
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<td>5/21/2013</td>
<td>Aaron Dutle</td>
<td>New York University</td>
<td>&quot;Degree Sequence and Joint Degree Metric Models&quot;</td>
<td>Joel Spencer</td>
<td>New York University</td>
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<td>5/26/2013</td>
<td>Peter Mucha</td>
<td>Univ. of North Carolina, Chapel Hill</td>
<td>&quot;Communities in Networks: Methods I&quot;</td>
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<td>5/27/2013</td>
<td>Joel Spencer</td>
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<td>5/28/2013</td>
<td>Ilya Safro</td>
<td>Sonja Petrovic</td>
<td>PSU</td>
<td>Peter Mucha</td>
<td>Univ. of North Carolina, Chapel Hill</td>
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### Organized Group Activities

**LUNCH BREAK**

**Sonja Petrovic**
- Penn State University
- "Algebraic Statistics for Network modeling: Estimation for Large Sparse Data"
- "Algebraic Statistics for Network modeling: Testing Goodness of Fit of the Model"

**Ilya Safro**
- Harvard University
- "Multiscale Methods for Networks"
- "The Combinatorial Interpretation of Formulas in Coalitional Theory"

**John Spouge**
- National Center for Biotechnology Information
- "Finding Networks of Transcription Factors and Their Function with Position and Sequence"

**György Korniss**
- Institute for Exploration of Complex Networks
- "Spread and Opinion Dynamics in Social Networks"

**Mingming Chen**
- Rensselaer Polytechnic Institute
- "Spatial graph models for information networks II"

**Noemi Derzsy**
- Rensselaer Polytechnic Institute
- "Spatial graph models for information networks I"

**Xin Lin**
- Rensselaer Polytechnic Institute
- "Efficient Network Traversal for Monte Carlo Simulations of Spread of Disease"

**Rapei Xu**
- Rensselaer Polytechnic Institute
- "Threshold-limited spreading in social networks with multiple initiators"

**Ferenc Molnar**
- University of Minnesota - Twin Cities
- "On measuring the Quality of a Network Community Structure"

**Pranesh Singh**
- Rensselaer Polytechnic Institute
- "Spatial graph models for information networks II"