Course Syllabus

Week 1: What are networks and what use is it to study them?

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    Concepts: nodes, edges, adjacency matrix, one and two-mode networks, node degree

    Activity: Upload a social network (e.g. your Facebook social network into Gephi and visualize it).

Week 2: Random network models:] Erdos-Renyi and Barabasi-Albert

Concepts: connected components, giant component, average shortest path, diameter, breadth-first search, preferential attachment

Activity: Create random networks, calculate component distribution, average shortest path, evaluate impact of structure on ability of information to diffuse

Week 3: Network centrality

Concepts: betweenness, closeness, eigenvector centrality (+ PageRank), network centralization

Activity: calculate and interpret node centrality for real-world networks (your Facebook graph, the Enron corporate email network, Twitter networks, etc.)

Week 4: Community

Concepts: clustering, community structure, modularity, overlapping communities Activities:] detect and interpret disjoint and overlapping communities in a variety of networks (scientific collaborations, political blogs, cooking ingredients, etc.)

Week 5: Small world network models, optimization, strategic network formation and search

Concepts: small worlds, geographic networks, decentralized search

Activity: Evaluate whether several real-world networks exhibit small world properties, simulate decentralized search on different topologies, evaluate effect of small-world topology on information diffusion.

Week 6: Contagion, opinion formation, coordination and cooperation

Concepts: simple contagion, threshold models, opinion formation

Activity: Evaluate via simulation the impact of network structure on the above processes

Week 7: Cool and unusual applications of SNA

- Hidalgo et al. Predicting economic development using product space networks (which countries produce which products)

- Ahn et al., and Teng et al. Learning about cooking from ingredient and flavor networks

- Lusseau et al. Social networks of dolphins others TBD

Activity: hands-on exploration of these networks using concepts learned earlier in the course

Week 8: SNA and online social networks

Concepts: how services such as Facebook, LinkedIn, Twitter, CouchSurfing, etc. are using SNA to understand their users and improve their functionality

Activity: read recent research by and based on these services and learn how SNA concepts were applied