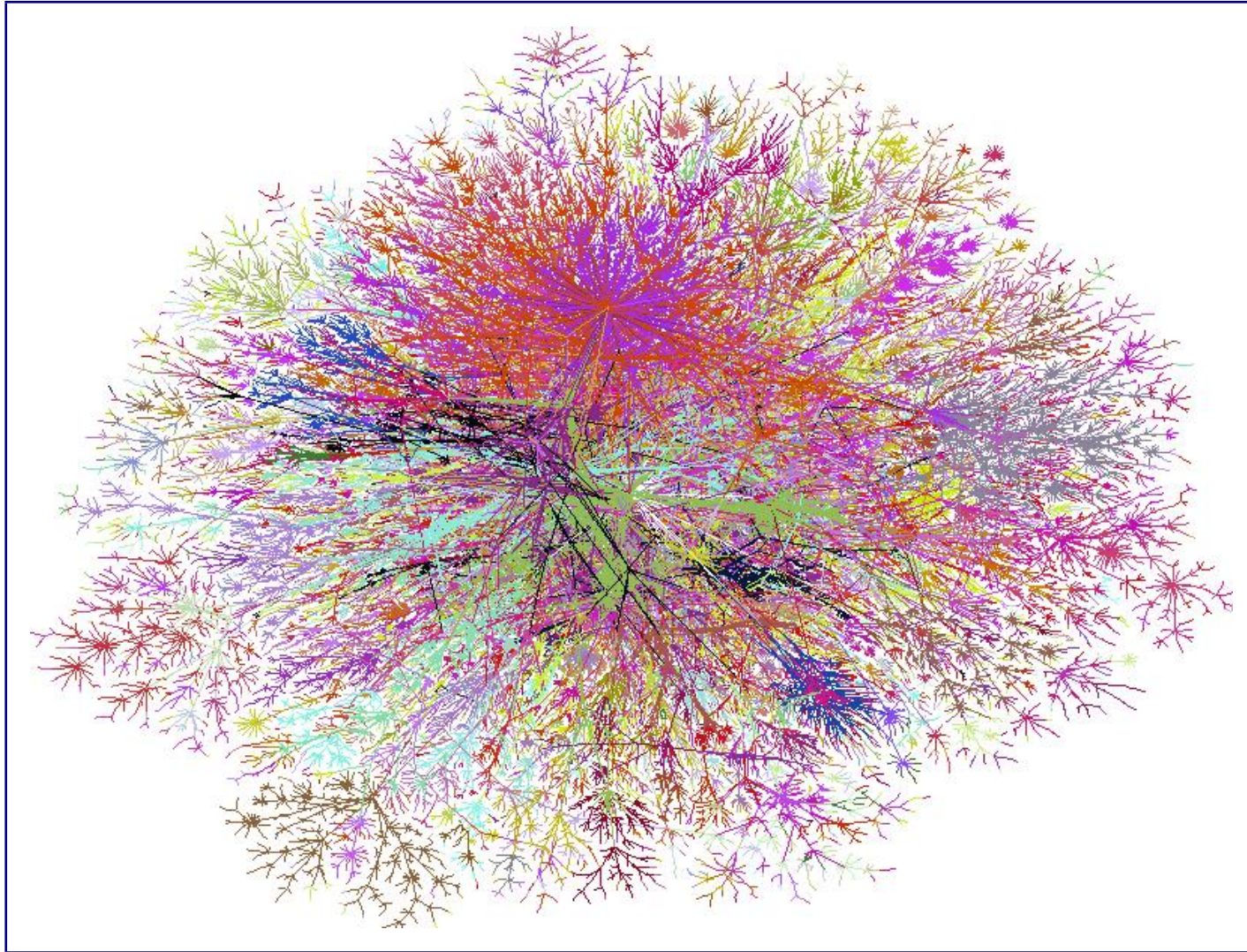


MAE 298

June 6, 2006



“Wrap up”

Review

- What are networks?
- Structural measures to characterize them
- Network models (theory)
- Real-world networks (guest lectures)

What are networks

- Nodes and edges
- Geometric versus geometry free
- dynamic topologies versus static
- Social, technological, biological
- Interplay of topology and function!

Structural characteristics

- Degree distribution (concentrated versus heavy-tailed)
 - Properties of power laws!
- Clustering coefficient
- Betweenness centrality
 - (# of geodesic paths through a given node)
- Eigenvalue spectrum
 - cover time of graph
 - identify bottlenecks
 - one algorithm for clustering
- Structural equivalence (if have same neighbors)

Network growth models

- Erdős-Renyi random graph
 - Emergence of the giant component (phase transition)
- Preferential attachment
- Optimization (FKP, CIPA, etc)
- Small worlds

Network models: applications

- **Robustness** to node and edge deletion as a function of topology
- Decentralized search and WWW search
(Six-degrees of separation (Millgram), Page rank algorithm)
- Percolation and spreading as a function of topology
SIR models (pde's versus network view)
- Algorithms for self-organization of sensor networks
- Simple models of the power grid
- Simple views of interacting networks

Real-world networks

- Software networks (Chris Bird)
- Protein interaction and gene expression networks (Eivind Almaas)
- Internet and overlay networks (Ram Keralapura)
- Biological networks and evolution (Sergei Nuzhdin)
- Estuaries and policy networks (Mark Lubell)
- Urban transportation (Michael Zhang)

Interplay of topology and function!

Together with your own original research projects, we
have covered a lot of ground this quarter!

(Hope you have found it provocative and interesting)

Further resources

**(Will try to organize these on the web somewhere:
UCD networks-research wiki?)**

- Seminar series
- Other UCD classes
- Meetings and symposiums
- Summer schools

Complex systems seminar series

“Science of Complex Systems”

Weds, 4:10-5pm

1147 Mathematical Sciences Building

<http://cse.ucdavis.edu/csseminar/>

Other UCD classes

- Your input needed here....
- STATS 250 “Data visualization”
Graduate topics course, Prof. Duncan Temple Lang
Winter 2007

STATS 250 “Data visualization”

- Content will depend on student interest
- Focus is on developing reusable and extensible scientific software and making it available to people in various disciplines.
- Data visualization where data and observations are the focus, not shapes, surfaces and physical models. However, the interplay of data with models is important.
- perception theory; taxonomy of display types; models for graphics in R, Matlab, etc.; graph algorithms and tools for data analysis; GIS; virtual reality; Bayesian computation.
- inter-system interfaces; models for merging different systems and languages; meta-computing - writing software that writes software

Meeting and symposiums

SOCIAL NETWORK THEORY WORKSHOP

Saturday, June 10

Wickson 2124

Sponsored by the Animal Behavior Graduate Group

Network theory is emerging as a major tool in various fields for quantifying network structure and for analyzing how network structure might influence outcomes. This approach has produced interesting new insights for community ecology (food web networks, mutualism networks), epidemiology (spread of disease), genetics (genetic networks), and various issues in the social sciences. Put another way, applications of network theory are appearing regularly in recent issues of Science and Nature.

This workshop will examine how social network theory (SNT) can be used to generate new insights and new questions or issues for animal behavior. Featured speakers from other universities include: Darren Croft (U. Leeds), Jessica Flack (Santa Fe Institute) and Dan Promislow (U. Georgia). The workshop will also feature talks by students and faculty here at UCD, and lots of discussion on future directions. We expect this workshop to provide many of the ideas that will go into a proposed conceptual overview paper on SNT and animal behavior.

RSVP to: Professor Andy Sih, asih@ucdavis.edu

Summer schools

- Summer School on Game Theory in Computer Science.
26.-30.6.2006,
Aarhus, Denmark. <http://www.brics.dk/game06/>
- Les Houches Summer School - Complex Systems.
3.-28.7.2006, Les Houches, (Chamonix) France.
http://w3houches.ujf-grenoble.fr/sessions_ete/ete-85/poster-summer-85.html
- The Santa Fe Institute, Complex Systems Summer School
An annual event, since about 1991.
Applications due December, for the next year's school.
This year, two schools: Santa Fe and Beijing.
<http://www.santafe.edu/education/indexCSSS.php>

THANKS!!!

Good luck!

Stay in touch!