

**MAE 298, Understanding Networks**  
Spring Quarter 2006  
**Problem Set # 2, Due Tuesday, May 16th**  
**Response Paper**

The idea of response paper is to go into more in depth in one topic and review several current research papers in this area. You should be understanding the strengths of each, and likewise where there is room for improvement and perhaps also contrast different approaches used in the different studies. You should be thinking beyond what you just read, and not just take other peoples work for granted or assume that, just because the work is published, that it is completely correct.

Consequently, your reaction paper should cover a few (two or preferable three) research papers. Your writeup should be about 2-3 pages. The organization should be roughly as follows. About one page should be used to summarize the main content and results of the papers you are discussing. How do they fit in the field, and what you have learned in class so far? What is the connection between the papers you are discussing? About one page should be a judgment of what is in the papers. What struck you as particularly interesting? What were the authors missing? Was anything particularly unrealistic? This section should go into a bit of depth. A statement like "This was a nice paper, or "I didnt like this paper by itself is not enough. About one page should be a discussion of what you feel may be an interesting step to take beyond what the papers are doing. Perhaps you have an idea of a better model for something? A better algorithm? Or their papers suggest techniques that you would like to apply elsewhere? Obviously, your ideas here may not be completely worked out.

You have your choice of topic and papers. Suggested ones are listed on the next page. You should choose papers that tie in with your class project. The writeup you create for this homework assignment might serve as as the literature review for your final class project.

## Community structure in networks

- MEJ Newman, M Girvan, “Finding and evaluating community structure in networks”, Physical Review E, **69**, 026113 (2004).
- Filippo Radicchi, Claudio Castellano, Federico Cecconi, Vittorio Loreto, and Domenico Parisi, “Defining and identifying communities in networks”, Proceedings of the National Academy of Sciences, vol. 101, no. 9, 2658-2663, 2004.
- Gary Flake, Steve Lawrence, C. Lee Giles, Frans Coetzee, “Self-Organization and Identification of Web Communities”, IEEE Computer, 35:3, March 2002.

## Food networks/Foodwebs

- B. Drossel, A. J. McKane, “Modelling Food Webs”, in “Handbook of graphs and networks” S. Bornholdt and H. G. Schuster (eds). Can be downloaded at: <http://arxiv.org/abs/nlin.AO/0202034>
- Fill in your own choice of paper here if you choose this topic.

## Road networks

- V. Kalapala, V. Sanwalani, A. Clauset, and C. Moore, “Scale invariance in road networks”, Physical Review E **73**, 026130 2006.
- DW Helbing, KW Nagel, “The physics of traffic and regional development ”, Contemporary Physics, 2004.
- Perhaps find a reference for using GIS data to understand networks.

## Power grid

- R. Albert, I. Albert, and G. L. Nakarado, “Structural vulnerability of the North American power grid”, Physical Review E, **69**, 025103 (2004). Available at: <http://xxx.lanl.gov/abs/cond-mat/0401084>
- D. J. Watts, “A simple model of global cascades on random networks”, Proc. Natl. Acad. Sci., **99** (2002), pp. 57665771.

- D. S. Callaway, M. E. J. Newman, S. H. Strogatz, and D. J. Watts, “Network robustness and fragility: Percolation on random graphs”, *Phys. Rev. Lett.*, 85 (2000), pp. 54685471.

### **WWW and WWW search**

- DM Pennock, GW Flake, S Lawrence, EJ Glover, C Lee Giles, “Winners don’t take all: Characterizing the competition for links on the web”, *Proceedings of the National Academy of Sciences*, vol. 99, no. 8, 5207-5211, 2002.
- L Page, S Brin, R Motwani, T Winograd, “The pagerank citation ranking: Bringing order to the web”, 1998.
- TH Haveliwala, “Topic-sensitive pagerank: A context-sensitive ranking algorithm for web search”, *IEEE Transactions on Knowledge and Data Engineering*, 2003

### **Decentralized search**

- J. Kleinberg, “Complex Networks and Decentralized Search Algorithms”, *Proceedings of the International Congress of Mathematicians (ICM)*, 2006 (to appear).  
<http://www.cs.cornell.edu/home/kleinber/>
- F. Menczer, “Growing and navigating the small world Web by local content”, *Proceedings of the National Academy of Sciences*, 99(22): 14014 - 14019, 2002.

### **P2P architectures**

- I. Stoica, R. Morris, D. Karger, F. Kaashoek, H. Balakrishnan. “Chord: A Scalable Peer-to-peer Lookup Service for Internet Applications”. *ACM SIGCOMM*, 2001.
- M Ripeanu, “Peer-to-Peer Architecture Case Study: Gnutella Network”, *Proceedings of International Conference on Peer-to-peer Computing*, 2001

## FKP/Optimization/Network Growth

- JM Carlson and J Doyle, “Complexity and robustness”, Proc. Nat. Acad. Sci. 99 , 2538-2545 (2002).
- A. Fabrikant, E. Koutsoupias, C. Papadimitriou, “Heuristically optimized Tradeoffs: a new paradigm for power laws in the internet” , In: Proceedings of the 29th International Colloquium on Automata, Languages and Programming (2002). *Interesting model proposed, but note the conclusions about the degree distribution being a power law are incorrect. The proof of the real distribution is in the technical paper listed next:*
- N. Berger, B. Bollobas, C. Borgs, J. T. Chayes and O. Riordan, “Degree distribution of the FKP network model”, In: Proceedings of the 30th International Colloquium on Automata, Languages and Programming (2003).
- M.J. Alava, S.N. Dorogovtsev, “Preferential compactness of networks”, <http://arxiv.org/abs/cond-mat/0407643>, (2004).

## Software networks

- CR Myers, “Software systems as complex networks: Structure, function, and evolvability of software collaboration graphs”, Physical Review E, 68, 046116 (2003).
- S Itzkovitz, U Alon, “Subgraphs and network motifs in geometric networks” Physical Review E, 2005.
- Jesus M. Gonzalez-Barahona, Luis Lopez, Gregorio Robles, “Community structure of modules in the Apache project”, Proceedings of the 4th Workshop on Open Source Software, 2004, <http://librosoft.dat.escet.urjc.es/html/downloads/woss-icse-2004.pdf>

## Interacting networks

- Massoud Amin, “National Infrastructures as Complex Interactive Networks”, in Automation, Control, and Complexity: An Integrated Approach, Samad & Weyrauch (Eds.), John Wiley and Sons, pp. 263-286, 2000.  
[http://160.94.126.215/amin/Amin\\_Chapter14.pdf](http://160.94.126.215/amin/Amin_Chapter14.pdf).
- M. Kurant and Patrick Thiran, “Layered Complex Networks”, Phys. Rev. Lett. 96, 138701 (2006).