



Performance Evaluation of Networks, part II

Giovanni Neglia

Network Science

1. Common properties to many existing networks

- Social nets, transportation nets, electrical power grids, Internet AS net, P2P nets, gene regulatory net,

2. Important dynamic processes on these networks show the same properties



Our course: an introduction to Network Science

1. Common properties to many existing networks

- Which ones? Hubs, small world, cluster, heavy tails
- Why do they arise?

2. Important dynamic processes

- Contagion
- Consensus
- Games

Material

▣ Slides

▣ A book covering complex networks and game theory:

- Network, Crowds, and Markets, Easley and Kleinberg, available online at <http://www.cs.cornell.edu/home/kleinber/networks-book/>

▣ References Contagion

○ Mean Field

- Mean Field Methods for Computer and Communication Systems: A Tutorial, Jean-Yves Le Boudec
- A class of mean field interaction models for computer and communication systems, Benaïm, Le Boudec, Jrnl Performance Evaluation, Vol. 65 Issue 11-12, Nov., '08

Material

▣ References Contagion

- A survey with pointers to continuous time Markov processes and links to stochastic approximation and propagation of chaos
 - Ch. 2 of Nicolas Gast's PhD thesis "Optimization and Control of Large Systems, Fighting the Curse of Dimensionality"
- Dynamical Processes on Complex Networks, Barrat, Barthélemy, Vespignani, Cambridge Press
 - Random graphs models, ch.3
 - Methodological approaches, ch. 4
 - Epidemiological models, ch. 9

Material

□ References Contagion

○ Routing in DTNs

- Markovian models
 - Message Delay in Mobile Ad Hoc Networks, R. Groenevelt, G. Koole, and P. Nain, Performance, Juan-les-Pins, October 2005
 - Impact of Mobility on the Performance of Relaying in Ad Hoc Networks, A. Al-Hanbali, A.A. Kherani, R. Groenevelt, P. Nain, and E. Altman, IEEE Infocom 2006, Barcelona, April 2006
- Fluid models
 - Performance Modeling of Epidemic Routing, X. Zhang, G. Neglia, J. Kurose, D. Towsley, Elsevier Computer Networks, Volume 51, Issue 10, July 2007, Pages 2867-2891

Material

□ References Games

- Game Theory and Strategy, Straffin, Mathematical Association,
 - Two-person zero-sum games
 - Matrix games
 - Pure strategy equilibria (dominance and saddle points), ch 2
 - Mixed strategy equilibria, ch 3
 - Game trees, ch 7
 - About utility, ch 9

Material

□ References Games

- Game Theory and Strategy, Straffin, Mathematical Association,
 - Two-person non-zero-sum games
 - Nash equilibria and its limits (equivalence, interchangeability, Prisoner's dilemma), ch. 11 and 12
 - Strategic games, ch. 14
 - Evolutionary games, ch. 15

Evaluation

- ❑ 80% final exam
- ❑ 20% assignments (every two weeks)

Contacts

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