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

- giovanni.neglia@inria.fr
- INRIA, Lagrange building, last floor, L108
- For slides, assignements, etc.
  - www-sop.inria.fr/members/Giovanni.Neglia/perf13/