Lecture 1: Introduction

“Who am I? Why am I here?”
Course info

• The basics
  ‣ Instructor: Ravi Srinivasan (rav@math.utexas.edu)
  ‣ Course website: http://www.ma.utexas.edu/users/rav/ComplexNetworks/
  ‣ All materials, including syllabus, solutions, etc. available through website

• We’ll talk more about the course structure later
Course info

- What is this course about?
- Why should I care?
- What kind of work is involved?
- Should I take this course?
- Topics (not) to be covered
What is this course about?

• Complex networks
  ▶ “complex” ~ “social” (but could also be biological, physical, ...)

• Conceptual, analytical
  ▶ Connected to real-world questions
  ▶ Interesting mathematics
  ▶ Mix of rigor (proofs) and heuristics (simulations, scaling arguments)
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Why should I care?

How is this going to turn out?
Why should I care?

• #Coincidence

Come and see what we’re building

When: Tuesday, January 15, 2013 - 10:00 am PT
Why should I care?

• Dawn of age of social computing
  ‣ Can be used to solve large, macroeconomic problems
  ‣ Energy efficiency, transportation, social mobility/inequality, decision-making, selling you stuff

• Availability of (too much?) data
  ‣ How many here have a Facebook account they check regularly?
  ‣ 40% increase in data per year, doubling every ~2 years (72 hours of video uploaded on YouTube every minute)
Why should I care?

• **Personal information about users**
  - Online history (browsing, purchasing), sociological profile (age, gender, location, income)

• **Relational information between users**
  - Connections (friends, collaborators), contacts (e-mails, IMs, phone calls)
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What kind of work is involved?

More this...

than this...
What kind of work is involved?

More this...

and this...
What kind of work is involved?

• No exams

• 50% problem sets
  ‣ Weekly or bi-weekly
  ‣ Learn together, but solutions are your own

• 20% scribing lectures (in pairs)
  ‣ Using LaTeX template, scribed notes to be posted online

• 30% final project (in at most pairs)
  ‣ Summary of research article(s) on chosen topic
What kind of work is involved?

• Programming
  ‣ Would like to incorporate some programming into HW, projects
  ‣ Are you comfortable writing code? Python?

• Grading
  ‣ Rule of thumb: hard problems, generous grading
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Should I take this course?

- New, experimental course
  - Should be taken for enjoyment, but will take some time and effort
  - Stick around for two weeks and see how it feels

- Necessary mix of skills
  - Comfortable with probability, linear algebra
  - Can tolerate sophisticated arguments, consider implications
  - Dealing with contradictions: How can two models predict different results?
Should I take this course?

- No textbook!
  - No single source to learn material: requires discipline/self-motivation
Topics (not) to be covered

• Not a programming class, or solely based on algorithms

• Not a course on game theory or machine learning
  ‣ Little time/energy to spend on these important topics, but may touch upon them tangentially

• A math course, at the end of the day
  ‣ “Worst” case: will learn some useful results in probability, linear algebra, and graph theory
Topics (not) to be covered

• Part I: Structure
  ‣ small-world, random graphs, connectedness, routing, ...
  ‣ power laws, reinforcement, PageRank/HITS
  ‣ clustering, communities, partitioning
  ‣ evolving networks, prediction

• Part II: Dynamics
  ‣ epidemics, gossip algorithms
  ‣ influence, greedy algorithms
  ‣ inference

• Part III: ?
Disclaimer

“The secret to creativity is knowing how to hide your sources.” -A. Einstein

“Originality is nothing but judicious imitation.” -Voltaire

“Let’s make my life easier.” -Me

- Material gleaned from similar courses taught by others
  - Particularly “COMS 4995-1: Introduction to Social Networks” by Prof. Augustin Chaintreau, CS Department at Columbia University
  - Full list of references and resources to be made available on class website
Disclaimer

• Class website will improve in content over the coming week(s)

• Choice of topics likely to change depending on difficulty, pace
Let’s get started!