

# What is Network Science?

Panel ACM CoNEXT 2008

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All you ever wanted to know and  
did not dare ask about

# *Network Science*

R. Guérin – ACM CoNEXT 2008 Panel  
Madrid, Spain, December 2008



# Disclaimers

- I don't know what Network Science is
- You don't know what Network Science is
- You probably wont know more after the panel
- Everybody think they know what Network Science is
  - Science of Networks (a la Computer Science)
  - Network of Sciences (connecting Graph Theory to Linear Algebra)
  - Networking for Science (NetSci for drug discovery)
  - Science of all things that are Networked

but they are just fooling themselves

# I Was Not Kidding

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# What Can We Infer?

- I don't know what Network Science is, but I know what it is NOT
  - IT IS NOT THE SCIENCE OF **COMMUNICATION** or **COMPUTER** NETWORKS
- But that's actually a GOOD thing
  - In case you did not realize, the Internet HAS HAPPENED (it did get its Turing award)
  - In short you need good plumbers to keep it running and unclogged, but too much science is probably the last thing it needs

# So What If You Don't Want to Be a Plumber?

- Network Science is a great opportunity to reinvent yourself
  - You were doing networks, right?
  - How different can one network be from another?
- Network Science = Equal opportunity employment for the excess of computer network researchers we produced during the bubble
  - But you need to move fast, as the good spots are being claimed quickly

# Jokes Aside

- Don't try to define/pigeonhole Network Science
  - The great thing about it is that it is so many different things
- There is one common thread though, and communication networks may have played a role in its emergence
  - It deals with phenomena that arise when a large number of entities suddenly find themselves able to interact (cheaply) with each other
- The other key feature is that it is by its very nature ***multi-disciplinary***
  - You really need to pull together things from several disciplines to be successful
- In short, it's a great opportunity, it's a lot of fun, but more importantly it forces you to learn ***new*** things

# What Undergraduate Curriculum?

- Freshman/Sophomore – beyond standard skills (math, programming, etc.)
  - Linear algebra and matrix theory
  - Probability and statistics
  - Algorithms and data structures
- Junior/Senior – more advanced skills
  - Graph theory
  - Game theory (algorithmic)
  - Optimization
  - Operations research (Markov chains, queueing, random walks, etc.)
  - Micro-economics
  - Machine learning
  - Sociology (quantitative models)
- Case studies, case studies, case studies...
  - Epidemiology
  - Information diffusion (rumors spread) in social networks
  - Searches and information retrieval
  - Etc.