NYU TANDON SCHOOL OF ENGINEERING

Network Science and Optimization

Prof. Yury Dvorkin

Agenda for Today

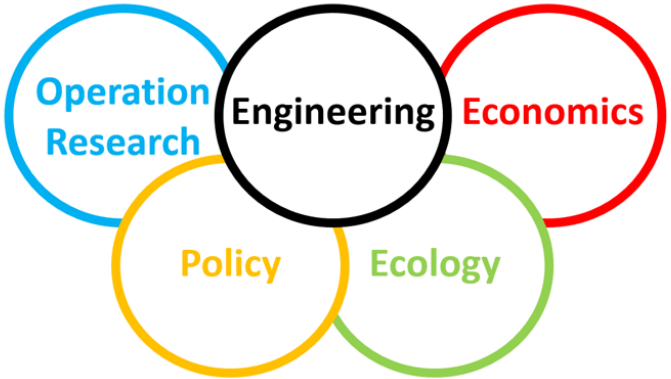
- Introduction
- Course description and objectives
- Course organization
- Review of power engineering
  - Very limited, but necessary

About Me

- Education:
  - B.Sc., Moscow Power Engineering Institute, 2011
    - Taking same classes you are taking now
  - Ph.D., University of Washington, 2016
    - Optimization for large infrastructure networks
- Employment:
  - Schneider Electric
    - Designed distribution substations
  - University of Washington
    - RA and TA
  - Los Alamos National Laboratories
    - An OR viewpoint on power systems
  - Tandon @ NYU

About My Research

- Multi-disciplinary network problems merit alike solutions
  - Physics: nonlinear circuit with stochastic, non-stationary parameters
  - Mathematics: large network with time-dependent dynamics
  - Economics: multi-actor, regulated resource allocation
- Mathematical modeling helps simultaneously account for multiple perspectives



Let's Get to Know Each Other

- Please introduce yourself. For example:
  - Your name and background
  - Your degree and what year you are in the program (B.Sc, M.Sc., Ph.D.)
  - What is your concentration area? (Power, communication, control, non-EE, etc.)
  - What are your career after graduation? (Indsutry, R&D, Research, Ph.D, etc.)
  - What are your programming skills? (C, Python, Matlab, etc.)
  - I can teach you better if I know more about you
- Why are you taking this class?
- Mention if you …
  - Know what LP, or MIP, or QCQP stand for
  - You have have experience with GAMS, Julia/JuMP, AMPL, YALMIP, etc
  - Interested in algorithms
  - Like open source programming

About the Class

Course Organization – Meetings & Contacts

- Lecture
  - Thursday, 9:50 AM - 12:20 PM
  - 20 min break

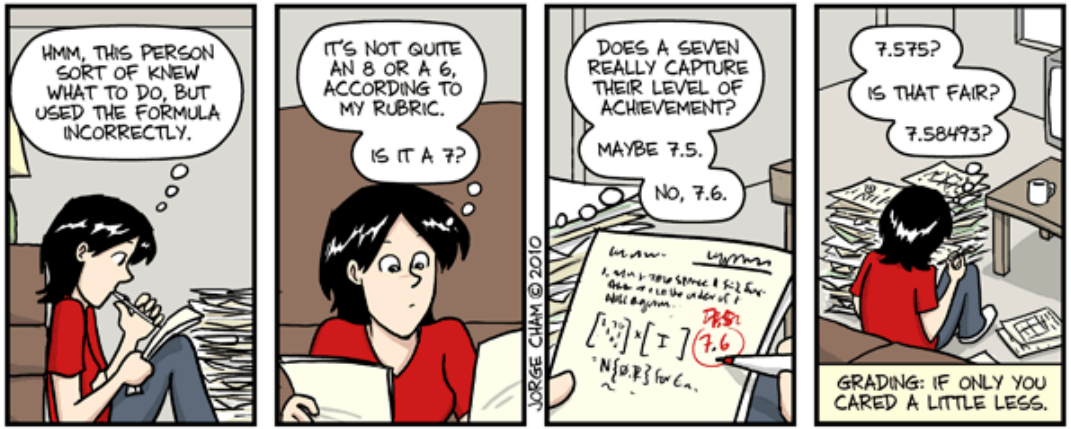
- Office hours:
  - Always in my office (370 Jay St, 10th floor, Rm 1002)
  - Thursday, 9:00-9:50 AM (right before lectures)
  - By appointment (email me ahead of time)
- Email: dvorkin@nyu.edu
- Class webpage on NYUClasses (please check that you can access it)
- Please *DO NOT* call/msg me (e.g. phone, FB, Twitter, etc)

Course Organization – Prerequisites

- Calculus
- Linear algebra
  - Will be reviewed when the time comes
- Probability
  - Will be reviewed next time

Course Organization – Structure

- Structure & Grading
  - Lecture attendance – 10%
    - Awarded based on attendance *and* participation
  - Homework – 50%
    - Five assignments (10% each)
  - Midterm – 20%
    - 1-page cheat sheet is allowed
  - Final – 20%
    - 1-page cheat sheet is allowed
- Grading
  - Partial credit
  - Curving might be applied



Course Organization – Lectures

- Dates:
  - January: 30
  - February: 6, 13, 20, 27
  - March: 5, **12**, 26
  - April: 2, 9, 16, 23, 30
  - May: **7**
- Important dates:
  - March 16 – NO CLASS (Break)
  - March 12 – Midterm
  - May 7 – Final
- Each lecture lasts 2h:30m
  - My suggestion: 2 blocks X 60-65 minutes minutes + 20 min break

Course Organization – Lectures & Difficulty

- Tentative schedule
  - Topic 1: Introduction to Network Science
  - Topic 2: Power laws
  - Topic 3: Random Graphs
  - Topic 4: Small world and growth problem
  - Topic 5: Centrality measures
  - Topic 6: Link analysis
  - Topic 7: Structural equivalence
  - Topic 8: Network communities
  - Topic 9: Graph portioning algorithms
  - Topic 10: Community detection
  - Topic 11: Diffusion and random walk on graphs
  - Topic 12: Epidemics
  - Topic 13: Epidemics on networks
  - Topic 14: Information flow
  - Topic 15: Diffusion in innovations
  - Topic 16: Social influence
  - Topic 17: Segregation model
  - Topic 18: Link prediction and optimization
  - Topic 19: Node labeling and optimization
  - Topic 20: Time evolution and optimization of networks

Course Organization – Lectures & Attendance

- No matter how late you are, you can always join the class
  - Is there a point in joining for the last 30 minutes? – It's up to you, but if I were you I would come anyway.
- Being at the right time and at the right place is a useful life lesson
- Anyone from Wuhan? If you are affected, let me know and reasonable accommodations can be provided (e.g. zoom)

'Get your sh together': NYU professor's response to student who complained after he was dismissed from class for being an hour late takes web by storm**

By DAILY MAIL REPORTER
PUBLISHED: 00:54 EST, 14 April 2013 | **UPDATED:** 03:11 EST, 14 April 2013

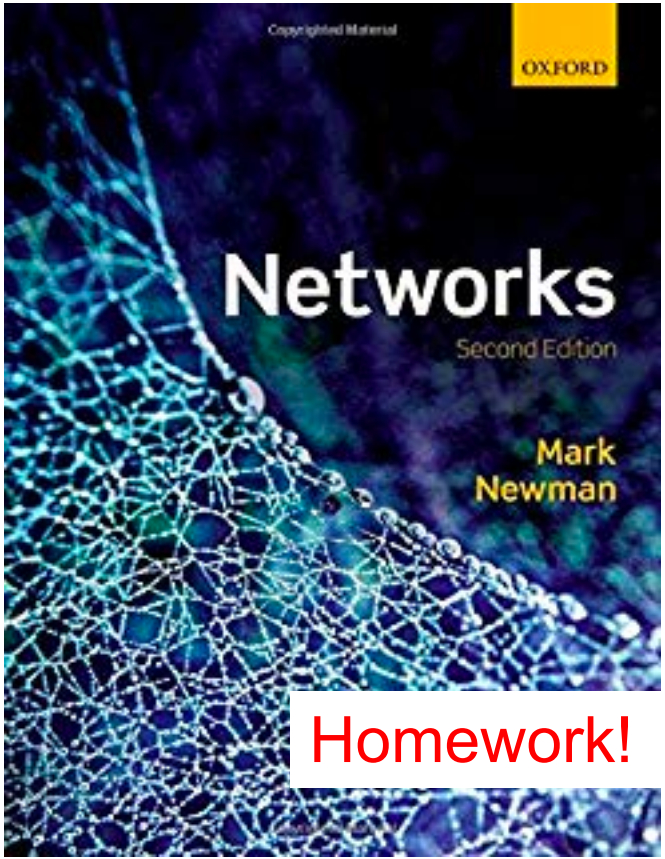
Share

A New York University professor's email response to a student who dared question why he was dismissed from class after turning up an hour late has gone viral.

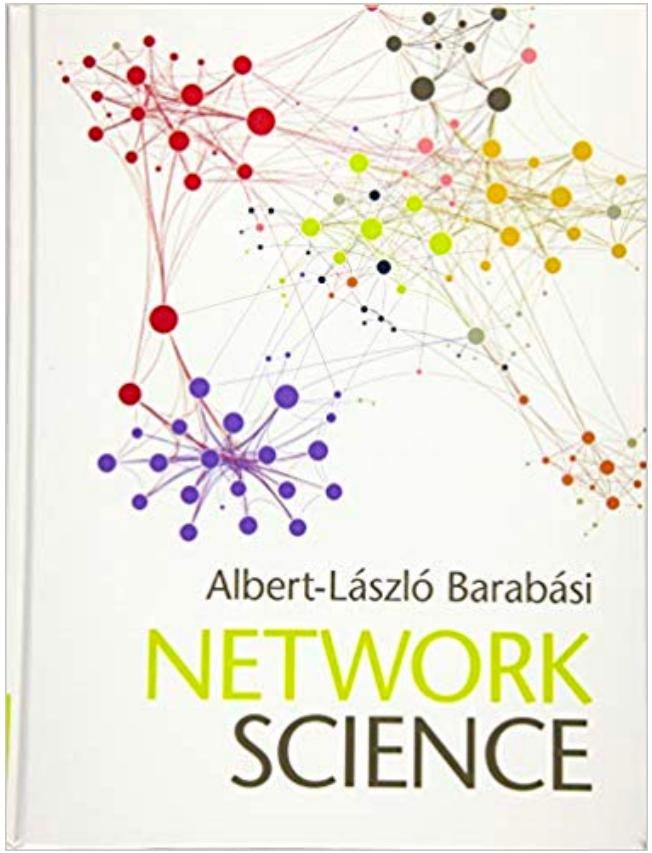
NYU Stern Professor Scott Galloway gave some valuable life advice to the student which spread around the campus - and subsequently social media - like wildfire.

The unidentified student turned up to the professor's 6pm brand management class an hour late and was immediately told to leave.

Course Organization – Text & Reading



Homework!



Course Organization – Homework

- (Planned) Release date (no later)
  - Homework 1: February 13
  - Homework 2: February 27
  - Homework 3: March 5
  - Homework 4: April 9
  - Homework 5: April 23
- Due to in 1 week after the release date
  - Submit before the lectures
- Submit a hardcopy (easier and faster to grade)
- Document your homework clearly and coherently
  - Don’t forget to write up everything to earn partial credit

Course Organization – Midterm Exam

- Topics:
  - Topic 1: Introduction to Network Science
  - Topic 2: Power laws
  - Topic 3: Random Graphs
  - Topic 4: Small world and growth problem
  - Topic 5: Centrality measures
  - Topic 6: Link analysis
  - Topic 7: Structural equivalence
  - Topic 8: Network communities
  - Topic 9: Graph portioning algorithms

Midterm

- Problems are “conceptually” similar to your HW
  - Not the same problems! Not the same problems with different problems
- Working on HW 1-3 will help you succeed at the midterm
- 1-page cheat sheet & calculator are allowed

Course Organization – Webpage

- Hosted by NYUClasses:
- Make sure you have access, because:
  - Lecture slides (posted after lectures)
  - Homework assignments
  - Discussions are welcome
- Please *NO* online homework submissions!

Course Organization – Question Policy

- First rule: If in doubt, ask me
  - Applied to the class matters only
  - Might be applicable to other classes
- The best way to signal your question is to raise your hand
  - It also helps you demonstrate your participation and counts toward your grade
- What if I don’t see your hand?
  - Don’t hesitate to interrupt me before I switch to a new topic and lose my train of thought
- It might be useful to think for a moment about your question
  - Formulate short questions – concision facilitates communication
  - Try to formulate ”yes” or ”no” questions – you are more likely to get a direct answer ☺
- Also, let me know if I go too fast (or slow)

Course Organization – Circumstantial matters

- Examples:
  - Illness
  - Travel plans
  - Family circumstances
  - Etc…
- Contact Judith Simonsen, Coordinator of Compliance
  - http://engineering.nyu.edu/people/judith-simonsen
  - She will contact me
- If you have a life situation that you are not sure of and don't know how to address
  - School of Engineering Counseling Center
  - http://engineering.nyu.edu/academics/support/trio/counseling

Course Organization – Your feedback

- Evaluation at the end of the class
  - Useful for next year's students
- You can submit your anonymous feedback during this semester
  - Link: http://www.anonymousfeedback.net/send-anonymous-email.html
  - Use my NYU email: dvorkin@nyu.edu
  - Please be thoughtful and constructive
  - Important: this feedback will help me improve this semester so you can benefit, not only next year's student
- Examples of feedback useful by every following lecture:
  - Office hours
  - Lecture topics & Project and homework issues
  - Scheduling issues
  - Etc… You name it!

Course Organization – DHA

- DHA is important
  - Especially for undergraduate students!
- It is your responsibility to ensure your DHA compliance
- If you neglect DHA, you will lose learning opportunities and may fail this class

Course Organization – DHA

- What is DHA? – Don't Hesitate to Ask
- Frankly, I made it up* to illustrate my point that you should not hesitate to ask questions and email me
- Easier to help you if I am aware of your difficulty

* OK, that's my last warning: I will make such jokes to keep you awake during the semester

Course Organization – NYU Policies

- NYU Tandon Policy on Academic Integrity:
  - http://engineering.nyu.edu/online-asynchronousorientation/academic-integrity.php
  - Respect and dignity of self and others
  - Academic and personal integrity
  - Responsibility and accountability for one's actions
  - Embracing human and intellectual diversity and inclusiveness
- If you are an object of harassment/assault/ indecent behavior by someone in this class, inform me & relevant NYU offices
  - Your safety, dignity, and comfort are NYU's priority
- Students with Disabilities
  - http://www.nyu.edu/students/communities-and-groups/students-with-disabilities/how-to-register.html
  - Please let me know if you have documented disabilities that may affect your participation in this class; reasonable accommodation will be made according to NYU policies

Questions?

- Let's take a short recess
- Think about the questions you want to ask me
- Ask me after the break