Basic Information

Course Head
Prof. Benjamin Golub
Department of Economics
ben.golub@gmail.com

Office hours
Wednesday 8:15-9:15pm
or by appointment
Littauer (North Yard) 308

TA
Krishna Dasaratha
Ph.D. Candidate, Department of Economics
dasarath@g.harvard.edu

Office hours
Tuesday 4:30-6:00pm
Science Center 116

Meeting time
Lecture Wed. 3:00-5:45pm, 10-15 min break
No recitation

Location
Harvard Hall 201
Course description
Markets increasingly use and create networks, both social and technological. Some examples: the complex trading networks that underlie modern financial markets and supply chains; social media platforms; dating apps. These profoundly affect the economy and society more broadly: financial interdependencies are critical in economic crises, while rumors on Twitter have come to play a central role in our politics. How can we make sense of these phenomena—as individuals, within companies, and as policymakers? This seminar teaches models from the economics and statistics of networks that are essential to the task. Topics include the network origins of recessions, the diffusion of information and rumors, racial segregation, and matching markets. We emphasize how network models relate to key ideas from microeconomics.

Textbooks and readings
- The main textbook that we will use for basic concepts and techniques of network analysis is EK:
  - There is a full-text version available online.
- We will also read the book HN:

A more advanced textbook that may occasionally be referenced:

In addition, course material will include readings from the media, primary research literature, etc.

Assignments and evaluation
The assignments and their contributions to the grade are as follows. All assignments should be submitted on Canvas in electronic form by their due dates and times.

- 40% problem sets (due weekly, with some exceptions, on Thursday):
  - quantitative exercises;
  - written responses;
- 40% midterms: in-class, open book;
  - Wed., March 13;
- 20% presentation or research assignment
  - Due April 17 and/or 24, in class.

Late policy: lowest two problem sets, free extension.
Course Calendar

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lec 2h30m</td>
<td>Lec 2h30m</td>
<td>Lec 2h30m</td>
<td>Lec 2h30m</td>
<td>Lec 2h30m</td>
<td>Lec 2h30m</td>
<td>Lec 3-4pm midterm 4-6p</td>
<td>Spring Break</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3/27</th>
<th>4/3</th>
<th>4/10</th>
<th>4/17</th>
<th>4/24</th>
<th>5/1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lec 2h30m</td>
<td>Lec 2h30m</td>
<td>Lec 2h30m</td>
<td>Lec 1h Talks 1h30m</td>
<td>Talks 2h30m</td>
<td>Midterm 3-4pm</td>
</tr>
</tbody>
</table>

Topics: A Core List

Introduction

- Basic reading: EK Ch. 1
- Supplemental reading for first lecture

Basic game theory

- Basic reading: EK Ch. 6
- Key concepts: best response, dominant strategy, dominated strategy, Nash equilibrium

Network goods and platforms in equilibrium

- Basic reading: EK Ch. 17
- Key concepts: equilibrium with network effects, tipping points, surplus

Basic graph theory

- Basic reading: EK Ch. 2

Network games and coordination

- Basic reading: EK Ch. 19, HN Ch. 3, 4
- Key concept: cascade, simple vs. complex contagion, bank run, higher-order beliefs, common knowledge

Viral processes

- Basic reading: EK Ch. 21
- Key concepts: tipping points, basic reproductive number, statistical analysis of viral processes

Network structure and formation

- Basic reading: EK Ch. 3, 4, 20
- Key concepts: strong and weak ties, homophily, power laws, rich get richer, small world phenomenon, networks are *structured and legible*

Communication, learning, and network centrality

- Basic reading: EK Ch 16, HN Ch. 2, 7
- Key concepts: Bayesian vs. non-Bayesian updating, network centrality, PageRank

Application to current issues and debates