CSE 516A: Multi-Agent Systems

Introductory Lecture
Prof. Sanmay Das
Plan for today
Welcome & introductions
What is this class about?
Class logistics
What is this course?

Multi-agent system: a system where multiple autonomous entities with different information sets and goals interact.

Let’s see some examples of the kinds of things we’re going to study.
Duke-NUS Medical School - Duke-NUS.edu.sg
Be a Medical Leader of the 21st Century. Apply For Our Programs Now

University of Phoenix® - Phoenix.edu
Make a Difference. College Health Care Programs for the 21st Century.

Caribbean Medical School - umhs-sk.org
Small Class Sizes. Financial Aid. $50 Million Campus. 93% USMLE Pass

Medical Schools - US News & World Report
See the top ranked medical schools in primary care and research and find the best medical school for you at US News.

Harvard Medical School - Harvard University
Official site providing an overview of academic and research programs, resources, news and events, and links to other web sites located throughout the Harvard...

Best Medical Schools: Research - US News & World Report
See the top ranked medical schools for research at US News. Use the best medical school rankings to find the best research program for you.

University of Nicosia
nicosia.sgul.ac.cy/Apply-Now
Medical Degree From St. George's 2015 Admissions Now Open!

UW School of Medicine
www.uwmedicine.org/
Ranked Number 1 in Primary Care by US News World Report

Aruba medical school
www.aureusuniversity.com/
Most Affordable, Highest Rated. No Mcat, US/Canada Residency, USMLE Prep

Top Caribbean Med School
www.avalonu.org/
Internationally Accredited. Best clinical rotations. MCI approved.

UAG Medical School
www.uag.edu/
Program of Med. in the Community hands-on practice since year 1.
Sponsored Search Auctions

Each sponsored search listing occupies a slot.

Advertisers pay per-click.

Google’s problem: how to allocate slots.

Advertiser’s problem: how much to bid for a click.

Key idea: must reason about the actions of other (intelligent) agents.

Aside: Why does Google clearly delineate sponsored results?
Reasoning about others

Can I get two volunteers to play a game?

<table>
<thead>
<tr>
<th>A’s Action</th>
<th>B’s action</th>
<th>Cooperate</th>
<th>Defect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperate</td>
<td>1 year, 1 year</td>
<td>3 years, Free</td>
<td></td>
</tr>
<tr>
<td>Defect</td>
<td>Free, 3 years</td>
<td>2 years, 2 years</td>
<td></td>
</tr>
</tbody>
</table>

Time in prison for A, B
## Best Medical Schools: Research

- Ranked in 2017 | Best Medical Schools: Research Rankings Methodology
- A medical career starts with finding the program that best fits your needs. With the U.S. News research, narrow your search by location, tuition, school size and test scores.
- For full rankings, MCAT scores and student debt data, sign up for the U.S. News Med

<table>
<thead>
<tr>
<th>Research rank</th>
<th>School name</th>
<th>Tuition</th>
<th>Total medical school enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Harvard University</td>
<td>$58,050 (full-time)</td>
<td>720</td>
</tr>
<tr>
<td>#2</td>
<td>Stanford University</td>
<td>$54,327 (full-time)</td>
<td>487</td>
</tr>
<tr>
<td>#3</td>
<td>Johns Hopkins University</td>
<td>$50,160 (full-time)</td>
<td>471</td>
</tr>
<tr>
<td>#4</td>
<td>University of California—San Francisco</td>
<td>$33,420 (in-state, full-time); $45,665 (out-of-state, full-time)</td>
<td>633</td>
</tr>
<tr>
<td>#5</td>
<td>University of Pennsylvania (Perelman)</td>
<td>$54,036 (full-time)</td>
<td>629</td>
</tr>
<tr>
<td>#6</td>
<td>Columbia University</td>
<td>$57,634 (full-time)</td>
<td>660</td>
</tr>
<tr>
<td>#7</td>
<td>Duke University</td>
<td>$55,180 (full-time)</td>
<td>478</td>
</tr>
<tr>
<td>#7 Tie</td>
<td>Washington University in St. Louis</td>
<td>$60,798 (full-time)</td>
<td>507</td>
</tr>
</tbody>
</table>
Incentives in voting

Polling for “top medical school”
3 candidates: Harvard, UCSF, JHU, WUSTL
Method: Rank candidates, assign 3,2,1,0 points

Person 1: Harvard > UCSF > WUSTL > JHU
BREAKING NEWS
TRUMP CASTS VOTE IN PRESIDENTIAL RACE
Incentives in voting

Polling for “top medical school”
3 candidates: Harvard, UCSF, JHU, WUSTL
Method: Rank candidates, assign 3,2,1,0 points

Person 1: Harvard > UCSF > WUSTL > JHU
You think: WUSTL > Harvard > UCSF > JHU
What would you do?
What happens when you graduate?

Apply to residencies

<table>
<thead>
<tr>
<th></th>
<th>WUSTL &gt; UCSF &gt; Harvard</th>
<th>WUSTL</th>
<th>Chris &gt; Alice &gt; Bob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bob</td>
<td>WUSTL &gt; Harvard &gt; UCSF</td>
<td>UCSF</td>
<td>Alice &gt; Chris &gt; Bob</td>
</tr>
<tr>
<td>Chris</td>
<td>Harvard &gt; WUSTL &gt; UCSF</td>
<td>Harvard</td>
<td>Alice &gt; Chris &gt; Bob</td>
</tr>
</tbody>
</table>

Suppose we match (Alice, UCSF), (Bob, WUSTL), (Chris, Harvard)?

Alice and WUSTL would rather be together than with their assigned matches: **unstable**

What about: (Alice, WUSTL), (Bob, UCSF), (Chris, Harvard)?
How AI changed organ donation in the US

By Garinna Punith - September 13, 2018

Just the job: how AI is helping build a better life for refugees

Known as 'Annie', new software aim

Helen Warrell NOVEMBER 30, 2018

Making admissions more efficient

With economists’ input, New York City developed a new admissions system that matched more students to high schools.
Just Allocations

Lots of work nowadays on Fairness, Accountability, Transparency, and Ethics (FATE) in AI

Related question in our context: *(Distributive / Social) Justice*

- How should goods, responsibilities, wealth, opportunities, and privileges be distributed among members of society?
- We will think about this in *local* contexts often characterized by non-market mechanisms
### Who will win the 2020 Democratic presidential nomination?

<table>
<thead>
<tr>
<th>Contract</th>
<th>Latest Yes Price</th>
<th>Best Offer</th>
<th>Best Offer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elizabeth Warren</td>
<td>33¢</td>
<td>33¢</td>
<td>69¢</td>
</tr>
<tr>
<td>Joe Biden</td>
<td>26¢</td>
<td>26¢</td>
<td>75¢</td>
</tr>
<tr>
<td>Bernie Sanders</td>
<td>17¢</td>
<td>17¢</td>
<td>84¢</td>
</tr>
<tr>
<td>Andrew Yang</td>
<td>12¢</td>
<td>12¢</td>
<td>89¢</td>
</tr>
<tr>
<td>Kamala Harris</td>
<td>11¢</td>
<td>12¢</td>
<td>89¢</td>
</tr>
<tr>
<td>Pete Buttigieg</td>
<td>8¢</td>
<td>9¢</td>
<td>92¢</td>
</tr>
</tbody>
</table>
In January 2016...
Where do these numbers come from?

A prediction market

Applies principles from information aggregation in financial markets to predicting event probabilities

Does it work? Why? What’s the meaning of a stock price?
Syllabus and course logistics

Let’s look over the syllabus and discuss