Instructor and CAs

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Course Overview

Website:
http://web.stanford.edu/class/cs224c/

Ed Discussion:
https://edstem.org/us/courses/57892/discussion/
Learning Objectives

**Quantitative analysis of social phenomena**

Models of network structure

**Methods for text analysis**

**Applications to social science fields**, such as political science, sociolinguistics, sociology, and economics
Additional Learning Objectives

✦ Reading and understanding contemporary research papers
✦ Presenting concise and informative summaries of research
✦ Executing computational social science research
<table>
<thead>
<tr>
<th>Attributes</th>
<th>CS224C: NLP for Computational Social Science</th>
<th>CS224U: Natural Language Understanding</th>
<th>CS224N: Deep Learning for NLP</th>
<th>CS124: From Language to Information</th>
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<tr>
<td>Audiences</td>
<td>Undergrad, Grad, and Non-CS major</td>
<td>Undergrad, Grad</td>
<td>Undergrad, Grad</td>
<td>Undergrad</td>
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<tr>
<td>Suggested Prerequisites</td>
<td>CS106B or equivalent</td>
<td>One of LINGUIST 180/280, CS 124, CS 224N, or CS 224S</td>
<td>Calculus and linear algebra; CS124, CS221, or CS229.</td>
<td>CS106B</td>
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<tr>
<td>Evaluation</td>
<td>Project, Quiz, Reading</td>
<td>Homework, Quiz, Project</td>
<td>Homework, Project</td>
<td>Programming homework, quiz, midterm</td>
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<tr>
<td>Keywords</td>
<td>Applications in NLP Social science</td>
<td>Hands-on NLP Linguistics</td>
<td>Advanced NLP Deep Learning</td>
<td>Introduction to NLP, IR Social Networks</td>
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<td>Format</td>
<td>Lectures Discussion</td>
<td>Lectures, Working Sessions, Podcast</td>
<td>Lectures Working Sessions</td>
<td>Flipped Class</td>
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<td>Interdisciplinary</td>
<td>*****</td>
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<td>Example Topics</td>
<td>NLP basics, cause inference, hypothesis testing, social influence, prosocial behavior, stigma/social movement</td>
<td>Word embedding, BERT, rational speech acts model, analysis methods in NLP, neural IR</td>
<td>Word vectors, language model, neural networks, parsing, pretraining, prompting, QA</td>
<td>Logistic regression, sentiment, IR, neural networks, chatbots, recommender systems, Pagerank and networks</td>
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Course Setup

(1) Lectures given by the Instructor
   NLP basics
   Statistical and casual inference

(2) Discussion led by students
   Key techniques and theories in readings will be covered in lectures
Lectures: key topics

1. Computational basics
2. Working with text data
3. Inferring sentiment and affect
4. Topic modeling for the social sciences
5. Word embedding and representation
6. Deep learning for CSS
7. Causal inference
8. Statistical Hypothesis testing
Discussion Led by Students

Focused Areas:

1. **Social Influence**: emotion contagion, weak and strong ties, social comparison

2. **Language and Persuasion**: argumentation, deception, persuasion

3. **Network and Influence**: echo chamber, segregation

4. **Hate Speech, Fake News and Misinformation**: rumors, deepfake, prebunking

5. **Prosocial Behavior**: politeness, positive reframing, social support

6. **Prejudice and Stigma**: microaggression, bias, stigma and social movement
Grading

Project (55%)
  10 for proposal
  15 for midway
  25 for final report
  2.5 for project pitch, and 2.5 for poster presentation

Presentation (10%)

Reading Responses (13.5%, 1.5 points for each reading response)

Homework (20%, 5 points for each homework)

Class Participation (2%)
Project

Group Project
  2~3 people per group
  Please discuss your project idea with instructor/TA early in the course

Literature Review + Proposal (10%)
Experiment Protocol or Midway (15%)
Final Paper (20%)
Role-Playing Paper Reading & Discussion

Instructors 🧑🏫

Peer reviewer 👽

Academic researcher 👨‍🔬

Industry practitioner 👍

Social impact Assessor 🌍

Hacker 🎖️

https://colinraffel.com/blog/role-playing-seminar.html
Role-Playing Paper Reading & Discussion

Instructors (2) 20 mins
You are the instructor who needs to provide a comprehensive overview of the paper. What did it study? What's the novelty? What's the methods and results?

Peer reviewer (1) 10 mins
The papers have not been published yet and is currently submitted to a top conference where you've been assigned as a peer reviewer. Complete a full review of the paper answering all prompts “strengths, weaknesses, questions”

Academic researcher (1) 10 mins
You're a researcher who is working on a new project in this area. Propose an imaginary follow-up project not just based on the current but only possible due to the existence and success of the current paper.

Industry practitioner (1) 10 mins
You work at a company or organization developing an application or product of your choice (that has not already been suggested in a prior session). Bring a convincing pitch for why you should be paid to implement the method in the paper, and discuss at least one positive and negative impact of this application.

Social impact assessor (1) 10 mins
Identify how this paper self-assesses its (likely positive) impact on the world. Have any additional positive social impacts left out? What are possible negative social impacts that were overlooked or omitted?

Hacker (1*) 10 mins
You're a hacker who needs a demo of this paper ASAP. Implement a small part or simplified version of the paper on a small dataset or toy problem. Prepare to share the core code of the algorithm to the class and demo your implementation. Do not simply download and run an existing implementation – though you are welcome to use (and give credit to) an existing implementation for “backbone” code.
Presentation

The group works together to deliver a presentation

Work together to well cover the material
Make easy-to-understand slides
Be prepared for Q&As
Please send your draft slides to the instructor/TA 1 day before the class

Grading: 5 points (group), 5 points (each role)
Presentation: **Dos and Don’ts**

**Dos**
- Coherent
- Interactive and engaging

**Don’ts**
- Simply summarizing the content
- No question/interest from the audience
Sign up for Role-Playing Presentation

https://docs.google.com/spreadsheets/d/1fSb_IOVdiwHP_2nX9PkbNcLGO2yQmEH4dHC3AFZkDq4/edit?usp=sharing
Reading Responses

Reply to Ed discussion posts about the reading assigned for a particular class

*No need to do reading response if you are the discussion leader*

You’re also welcome to post any other thoughts about the readings

- critique certain features of the papers
- identify potentially important issues not covered in the papers
- suggest new research questions stimulated by the papers
- think about new ways to improve the work
Homework

Lightweight Python notebook to help practice using NLP methods

**One week** to finish the homework once it is released

No collaboration will be permitted
Logistics and Other Information

Course Contacts:

**Webpage:** materials and announcements

**Ed discussion:** discussion forum

**Other personal issues:** email cs224c-staff@lists.stanford.edu *(faster reply)*

Computing Resources:

Experiments can take up to hours, even with efficient computation
Stay tuned for credit emails!
Academic Integrity

This class abides by the Honor Code
We take academic integrity **seriously**

You are encouraged to discuss readings/project with your classmates; however, what you hand in should be your own work

- Okay to use open-source software, however, do acknowledge
- Copying/reusing code is not allowed; strict action will be taken if similarities are found
- Copying content from other published work (without citing it) is considered plagiarism
Late Policy

Reading responses are due the day (23:59pm PT) before the class.

Presentations need to be sent to the instructor or TAs one day before the class meeting (not required, by strongly encouraged)

6 late days to use in total
Course Materials

Readings are available on the course website.
Readings are subject to change, so always double check

No official text books

Lecture slides will be made available on the course website
Expectation and Prerequisites

Prerequisites

CS 106B or equivalent is strictly required; Programming background
Basics in machine learning and data science
Passion for topics on Social NLP 😊

Expectation

High-quality course project
Read research papers from different research fields and venues (e.g., ACL, EMNLP, NAACL, CSCW, SIGCHI, Science, etc.)
Books to Check Out (Optional)

An Introduction to Statistical Learning by James, Witten, Hastie, and Tibshirani
Bit by Bit: Social Research in the Digital Age by Sagalnik
Networks, Crowds, and Markets by Easley and Kleinberg
Six Degrees by Duncan Watts
On Individuality and Social Forms by Georg Simmel
Writing for Social Scientists by Howard Becker
Natural Language Processing with Python by Steven Bird, Ewan Klein, and Edward Lope
Preference Intake Form for CS224C

https://shorturl.at/ako13

Share us your preferences by Apr 7th, 2024
Introduction to
Computational Social Science
"A field is emerging that leverages the capacity to collect and analyze data at a scale that may reveal patterns of individual and group behaviors"
The Cross-Disciplinary Flavor of CSS

Cross-disciplinary research and application field with theoretical and methodological aspects in computational and social sciences.

Related fields:
- NLP/ML/CV, Data science
- Communication
- Human computer interaction
- Sociological, psychological, economics
- Political science, social science
Online Interaction Generates Big Unstructured Text Data

Volume
2 Wikipedia revisions per second

Velocity

Variety
Tweets, articles, slangs, news, etc
Online Interaction in Text Format Grows Exponentially

between human and human

between human and machines
(e.g., ChatGPT)
Opportunities: Data & Social Phenomena

Data
- Speech data is expensive; social media data is a good proxy
- Personal conversations
- Socially grounded data
- Evolution of new words and slang

Social phenomena
- Hate speech, fake news, misinformation, online counseling ..
Opportunities and Benefits

1. Provide information about social relationships (e.g., emails)
2. Analyze how group interactions predict individual behaviors

Coordination of the user (as speaker) and, respectively, towards the user (as target) in the months before and after status change occurs.

Opportunities and Benefits

1. Provide information about social relationships (e.g., emails)
2. Analyze how group interactions predict individual behaviors
3. **Understand how the structures of society change evolve over time**
Democrats and Republicans More Ideologically Divided than in the Past

Distribution of Democrats and Republicans on a 10-item scale of political values

1994

Consistently liberal

Consistently conservative

Source: 2014 Political Polarization in the American Public
Notes: Ideological consistency based on a scale of 10 political values questions (see Appendix A). The blue area in this chart represents the ideological distribution of Democrats; the red area of Republicans. The overlap of these two distributions is shaded purple. Republicans include Republican-leaning independents; Democrats include Democratic-leaning independents (see Appendix B).

PEW RESEARCH CENTER

https://www.pewresearch.org/politics/2017/10/05/1-partisan-divides-over-political-values-widen/

Opportunities and Benefits

1. Provide information about social relationships (e.g., emails)
2. Analyze how group interactions predict individual behaviors
3. Understand how the structures, network of society change evolve over time
4. **Large-scale tracing of people’s movements and physical proximities**

Opportunities and Benefits

1. Provide information about social relationships (e.g., emails)
2. Analyze how group interactions predict individual behaviors
3. Understand how the structures, network of society change evolve over time
4. Large-scale tracing of people’s movements and physical proximities
5. **Offer channels for understanding what people say and how they connect**
6. **Understand the impact of users’ digital activities on everything from their moods, political ideology, to their health**
The colors reflect political orientation, red for conservative, and blue for liberal. Orange links go from liberal to conservative, and purple ones from conservative to liberal. The size of each blog reflects the number of other blogs that link to it.

"Being A Voter" Vs "Voting"

(Bryan Et Al., 2011)

Image: https://commons.wikimedia.org/wiki/File:Police_body_cam.png
Opportunities and Benefits

1. Provide information about social relationships (e.g., emails)
2. Analyze how group interactions predict our power and performance
3. Understand how the structures, network of society change evolve over time
4. Large-scale tracing of people’s movements and physical proximities
5. Offer channels for understanding what people say and how they connect
6. Understand the impact of users’ digital activities on everything from their moods, political ideology, to their health

7. **Analyze how technology affects the society as a whole**
Can we really detect fake news?

Kim And Kanye Silence Divorce Rumors With Family Photo. Kanye took to Twitter on Tuesday to share a photo of his family, simply writing, “Happy Holidays.” In the picture, seemingly taken at Kris Jenner’s annual Christmas Eve party, Kim and a newly blond Kanye pose with their children, North, 3, and Saint, 1. After Kanye’s hospitalization, reports that there was trouble in paradise with Kim started brewing. But E! News shut down the speculation with a family source denying the rumors and telling the site, “It’s been a very hard couple of months.”

Kim Kardashian Reportedly Cheating With Marquette King as She Gears up for Divorce From Kanye West. Kim Kardashian is ready to file for divorce from Kanye West but has she REALLY been cheating on him with Oakland Raiders punter Marquette King? The NFL star seemingly took to Twitter to address rumors that they’ve been getting close amid Kanye’s mental breakdown, which were originally started by sports blogger Terez Owens. While he doesn’t appear to confirm or deny an affair, her reps said there is “no truth whatsoever” to the reports and labeled the situation "fabricated."

Bots and Social Media

Commercial Activity
Social Media Bots facilitate company-to-customer relations, including selling of products or services.

Counterterrorism and Terrorism
Social Media Bots allow for faster searching and detection of online activity by using foreign language search terms.

Entertainment
Social Media Bots are used on social media specifically to find, add, or create, the illusion of online fame or popularity.

Harassment
Social Media Bots can be used to overwhelm the user's account to the point of deactivation.

Hate Speech
Social Media Bots can propagate hate speech on social media platforms, making the subject matter appear to gain mainstream popularity.

Information Operations
The intentional spread of propaganda to sway public opinion, limit free speech, and manipulate democratic processes and elections.

Notifications
Social Media Bots provide automated watching capabilities to capture breaking news, ideas, or events.

Social and Civic Engagement
Social Media Bots post to encourage and heighten civic engagement and participation.

Search for #Besiegen

Found #più caramele al cioccolato al latte

Search for #Besiegen

Social Beats Top/All

MusicMojo@TopTunes
#LoveXYZ’sNewSong!

Sam@Mazin’O@SnapTune
#LoveXYZ’sNewSong!

SRit@suertibot
#Greatreporths!

JLee@jantrebots
#Greatreporths!

JSmith@osmilbot
#Greatreporths!

Your account has been deactivated due to high volume usage.

ParadeVolunteerNow/All

DCFunHelp@VolDCPSbot
#Volunteer Day of Service@ParadeSE!

JaneS@Helpinghandsmom
Thanks signing up now!

LLMs meet Human Behaviors

AI as human surrogates
- Act as human

AI as AI
- Act as itself

AI for social science

Researchers

AI for Social Science and Social Science of AI: A Survey

Generative Agents: Interactive Simulacra of Human Behavior
Opportunities and Benefits

1. Provide information about social relationships (e.g., emails)
2. Analyze how group interactions predict our power and performance
3. Understand how the structures, network of society change evolve over time
4. Large-scale tracing of people’s movements and physical proximities
5. Offer channels for understanding what people say and how they connect
6. Understand the impact of users’ digital activities on everything from their moods, political ideology, to their health
7. Analyze how technology affects the society as a whole
8. **Build interventions to facilitate better social interactions**
Chat interventions can improve online political conversations

Argyle, Lisa P., Christopher A. Bail, Ethan C. Busby, Joshua R. Gubler, Thomas Howe, Christopher Rytting, Taylor Sorensen, and David Wingate. "Leveraging AI for democratic discourse: Chat interventions can improve online political conversations at scale." Proceedings of the National Academy of Sciences 120, no. 41 (2023)
Human–AI collaboration enables more empathic conversations

Computational Social Science in a nutshell

Data → Algorithm → Problem → Theory → Knowledge → Impact
Risks

1. The potential risk to individuals and corporations in the sharing of personal data by private companies
2. Robust models of collaboration and data sharing between industry and academia
3. Potential risks of de-anonymization
4. Ethical concerns & Institutional Review Boards

Ethics in CSS

IRB is a floor not a ceiling
Put yourself in everyone else’s shoes
Think of research ethics as continuous not discrete
Always
  Design ethically thoughtful research
  Explain your decisions to others

Credit to Matthew Salganik @ Princeton
Challenges You See in CSS?

Large amount of noisy data, but limited supervisions
AI-generated content on the rise
Sometimes subjective and hard to obtain “consensus”
  Why do we even optimize “consensus”? 
Context is the key, but often missing
“Ad-hoc” phenomena vs. generalizable knowledge
…
Data Access

Without access to social media platform data, we risk being left in the dark

Significance:

Social media data are essential for studying human behaviour and understanding potential systemic risks. Social media platforms have, however, begun to remove access to these data. In response, other countries and regions have implemented legislation that compels platforms to provide researchers with data access. In South Africa, we have lagged behind the Global North when it comes to using platform data in our research and, given the recent access restrictions, we risk being left behind. In this Commentary, I call attention to this critical issue and initiate a conversation about access to social media data in South Africa.
Challenge Summary

1. The complexity of the theoretical issues confronting social science
2. The difficulty in obtaining the relevant observational data
3. The difficulty of manipulating large scale social organizationals experimentally
4. The complexity and difficulty in computationally, scientifically and rigorously modeling such problems and data
What’s Next?

Sign up for Presentation!
Sign up for Ed discussion!