1 Introduction

This course will introduce students to foundations of AI as it is commonly found in social and applied contexts. Topics include social network analysis, forecasting, matching, recommendation systems, autonomous driving, and security.

2 Course Materials and Prerequisites

The prerequisite for this course is CSE 247 or equivalent. Additionally, homework assignments will involve python programming, so previous experience with python is strongly recommended.

This class has no required textbooks. However, the following optional books may be helpful:

Lawrence Burns and Christopher Shulgan. Autonomy: The Quest to Build the Driverless CarAnd How It Will Reshape Our World.

3 Grading

Homeworks (4): 40%
Exams (2): 40%
Pop Quizzes: 10%
Class participation: 10%

3.1 Details

Homeworks: There will be 4 homework assignments. Homeworks will involve python programming, and occasionally also conceptual/analytical problems. All homeworks must be submitted online through the course management system! All analytic solutions must be done in LaTeX and submitted as pdf files.

Class participation: Students will be expected to regularly attend class and actively participate.
**Pop Quizzes:** There will be about 10 pop quizzes given in the first 10 minutes of randomly chosen lectures. These quizzes will draw on assigned reading for this lecture, as well as material covered in past lectures.

**Exams:** There will be two exams in the course, each accounting for 20% of the final grade. The first will be in early October, while the second at the end of November or early December. There will be no final exam.

## 4 Course Schedule

### Week 1 (8/27): Introduction and Overview
1. Course logistics
2. AI 100 year study: 2016 report ([https://ai100.stanford.edu/2016-report](https://ai100.stanford.edu/2016-report))
3. AI in society: course overview

### I. Social Networks (Weeks 1-4)

#### Week 1 (8/29): Social Networks in the Media; Basics
- HIV prevention
- Disease spread on networks
- Social media platforms

#### Week 2 (9/3, 9/5): Networks and Network Analysis
- Networks “in the wild”; concepts (degree, degree distribution, clustering, diameter)
- Bipartite networks
- Generative models of networks

#### Week 3 (9/10, 9/12): Network Analysis and Diffusion
- Link prediction
- Community detection
- Diffusion models
- Influence maximization and blocking
- **Homework 1 (Social Networks) DUE 9/24**

#### Week 4 (9/17, 9/19): Applications and Ethical Issues
- Back to applications (HIV prevention, disease spread, marketing)
- Recommendations (link prediction, etc) and equity of influence
- Fake news and election control
- Privacy and adversarial network analysis
II. Predictions and Decisions (Weeks 5-6)

Week 5 (9/24): Media Coverage
- Predictive policing
- Criminal justice
- Fairness

Week 5 (9/26): Predictions and Machine Learning
- Basics of machine learning
- Temporal predictions and survival analysis
- Geospatial analysis

Week 6 (10/1, 10/3): Decisions, Evaluation, and Fairness
- (10/1): Invited Talk (Pauline Kim): Law and Algorithmic Affirmative Action
- Predictions and decisions
- Evaluation measures
- Fairness

III. Matching and Resource Allocation (Weeks 7-8)

Week 7 (10/8): Media Coverage and Applications
- Residency matching
- Kidney exchange
- Homelessness support
- School choice

Week 7 (10/10): Matching and Allocation Problems
- Optimization problems for matching and allocation
- Algorithmic approaches
- Incentives

Week 8 (10/15, 10/17): Applications and Ethical Considerations
- (10/15): Fall Break (NO CLASS)
- Homework 2 (Matching and Forecasting) DUE 10/17
- 10/17: Applications and ethical issues
Week 9 (10/22): Exam 1 (social networks, predictions, fairness, matching)

Week 9 (10/24): Invited Talk

(10/24): Invited talk: Sanmay Das

IV. Recommendation Systems (Weeks 10-11)

Week 10 (10/29): Media Coverage
- Netflix prize
- YouTube recommendations and radicalization
- Homework 3 (Decision support and equity) DUE 11/5

Week 10-11 (10/31, 11/5): Recommendation Systems Technology
- Data mining and machine learning
- Matrix completion and decomposition
- Ethical considerations
- Recommendations and fake news

V. Autonomous Driving (Weeks 11-12)

Week 11 (11/7): AD in the Media and Think Tanks
- Media promises and concerns
- Media coverage of crashes (Tesla, Uber)
- The take from the think tanks

Week 12 (11/12, 11/14): AD Technologies
- Perception (vision, lidar), deep learning
- Localization and mapping
- Navigation and path planning
- Vulnerabilities and security
- End-to-end learning to drive

VI. AI and Security (Week 13)

Week 13 (11/19, 11/21): Media and Technology
- Security and AI in the media
- Adversarial machine learning
- Game theory and security
VII. Generative Models and Deep Fakes (Week 14)

Week 14 (11/26, 11/28): Media and Technology

- Generative models in applications and media
- Deep Fakes: generation and detection; the arms race
- Homework 4 (Recommendation systems; adversarial ML) DUE 11/28
- (11/28): NO CLASS (Thanksgiving Break)

Week 15 (12/3): Exam 2

Week 15 (12/5): Exam 2 discussion; Wrapup