Artificial Intelligence Syllabus

Mongolian Young Scholars Program 2017

Course Description

An overview of how artificial intelligence is studied, created, and applied around the world. By the end of the course, you will understand the historical context and societal implications of artificial intelligence, how people are solving real-world problems with artificial intelligence, and the road to becoming an artificial intelligence practitioner. We will first introduce the field of computer science and describe life as an undergraduate computer science major (choosing a specialization, finding internships, and optimizing your class schedule). We will then introduce the nontechnical side of artificial intelligence (its history, prevailing philosophies, and ethical conundrums) as well as its technical side (an overview and comparison of statistics, machine learning, deep learning, and artificial intelligence) before exploring the fascinating case study of autonomous vehicles.

Homework will include readings, drafting your college plan, preparing your personal definition of intelligence, explaining your views on various ethical conundrums, solving quantitative problems, and brainstorming approaches to tackling real-world problems with data. The final project is a choice between solving a real-world problem with AI or debating how policymakers should attempt to regulate the impact of AI on society.

Day 1 - Life as a Computer Science Major

Objective:

- To describe what life as a computer science major studying artificial intelligence is like. By the end of the session, students should have a clearer idea of whether they might want to study artificial intelligence as undergraduates.

Homework (due when class starts):

- Draft a life plan for the next three years. Use whatever format makes sense to you.
    - Goal: encourage students to start thinking about what they want out of life and how they can shape their actions over the next couple of years accordingly

Readings (finish before class):

- Life at Stanford (BusinessInsider, 20 pages with pictures - introduces common mentalities and earning potentials Stanford CS people have when searching for jobs)
- The Odyssey Years (New York Times, 2 pages - describes how many people now spend their 20s / what to expect from life after college)

Day 2 - Introduction to Artificial Intelligence

Objective:

- To introduce both the technical and non-technical side of artificial intelligence. By the end of the session, students should be able to digest and hold an intelligent conversation

about news articles, documentaries, and other information related to artificial intelligence.

Homework (due when class starts):

- Define intelligence using as many or as few words as you need. Don't use dictionaries or other references; come up with your own personal definition. Do this before the readings.
    - Goal: encourage students to think about what they mean when they talk about intelligence so they can better recognize what constitutes artificial intelligence

Readings (finish before class):

- Definitions of Intelligence (technical report, 9 pages of content - combines the key aspects of 70+ definitions of intelligence from various fields into one definition)
- Man Made A History of Synthetic Life (Chemical Heritage Foundation, 10 pages of content - an investigation into the origin behind our fear of artificial life)

Day 3 - Solving Problems with Data

Objective:

- To describe the general approach people take when solving real-world problems with data. By the end of the session, students should be equipped to start thinking about how to solve real world problems using these frameworks.

Homework (due when class starts):

- Describe three real-world products that use artificial intelligence that you have heard about, read about, or personally used. Try to come up with examples nobody else will come up with.
    - Goal: encourage students to start thinking about how widely applicable artificial intelligence is to various real world problems

Readings (finish before class):

- The Data That Turned the World Upside Down (Motherboard, 10 pages - one of my favorite examples of the sometimes scary power of data to impact the world; a description of how targeted advertising facilitated Brexit and Trump's election)
- John Snow Cholera (Berkeley Science Review, 4 pages - a short description of one of the earliest examples of using data for good)

Day 4 - Case Study: Optical Character Recognition

Objective:

- To demonstrate, in detail, how specialized artificial intelligence can solve the specific problem of optical character recognition. By the end of the session, students should understand how the general framework presented the previous day is actually applied when solving real-world problems.

Homework (due when class starts):

- Complete the k nearest neighbors worksheet (here)
    - Goal: encourage students to understand how machine learning algorithms actually work

Readings (finish before class):

- CS231N: Image Classification (Stanford, 15 pages - pay particular attention to "Nearest Neighbor Classifier" and "k-Nearest Neighbor Classifier" on pages 4-8 - a technical introduction to image classification and the k-Nearest Neighbors algorithm as taught in an advanced undergraduate course at Stanford; feel free to ignore the code)

Day 5 - Case Study: Autonomous Vehicles

Objective:

- To demonstrate how complex artificial intelligence products and their impact on society can be through the case study of autonomous vehicles. By the end of the session, students should be familiar with many of the nuances related to the invention and adoption of autonomous vehicles.

Homework (due when class starts):

- Imagine you are a policymaker tasked with regulating the ethical decisions related to autonomous vehicles. For the following scenario, choose the option you would enforce and explain why that option is better than all the others. (prompt)
    - Goal: encourage students to wrestle with some of the serious ethical decisions AI will prompt over the next couple of years

Readings (finish before class):

- Auto Safety Case Study (Stanford Business School, 12 pages - overviews the history of auto safety and introduces the current industry goals, unresolved issues, and probable societal implications of autonomous cars)
- SAE International Levels of Driving Automation (1 page - describes the different levels of autonomy in autonomous cars)

Final Project

Choose between:

1. A small technical project to solve a real-world problem with AI
2. A public debate about how policymakers should regulate the impact of AI on society

Exact details are to be determined.

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