Syllabus

Artificial intelligence (AI), envisioned over 70 years ago, is achieving significant successes almost on a weekly basis. These rapid advances are made possible by machine learning, a type of AI that enables computers to learn new capabilities without traditional programming. In addition to chatbots and self-driving cars, this course will explore medical advances made possible through AI, as well as concerns for civil liberties and public discourse posed by uncontrolled technology.

Learning Objectives:

- Appreciate the promise of artificial intelligence.
- Develop a general understanding of how artificial intelligence works.
- Create awareness of some perils associated with artificial intelligence.

Class Format: The online format will include a combination of presentation charts and YouTube videos. The course is intended for nontechnical attendees.

Week 1 - Can Machines Think?

In 1950, Alan Turing, the father of computer science and artificial intelligence (AI), wrote an essay that posed the question: “Can machines think?” Rather than trying to define what is meant by “thinking,” Turing proposed a test, which he called the imitation game, whereby a computer might answer questions in a way that was indistinguishable from human responses. This week will address the origins of AI and the two main categories: rule-based systems and machine learning.

Week 2 - The Games We Play

AI systems are now beating us at our own games. Initially AI was applied to board games that were believed to require human intelligence. Then, an AI system won a two-game match against Jeopardy! champions. AI systems have learned to win at card games, and are now being used to play computer games. This week will cover how AI is used to win at these games:

- Checkers
- Chess
- Go
- Jeopardy!
- Poker
- Starcraft

Week 3 - Mark My Words

Week 3 covers how AI systems enable computers to communicate with people using written language. This week explores how natural language processing evolved from rule-based systems to statistical models to neural networks. The topics are:

- Understanding Written Languages
- Translating Documents
- Generating Text
- Analyzing Sentiments

Week 4 - You Talkin' to Me?

This week builds on the language capabilities to read and write text discussed in Week 3 and adds the ability of AI software to communicate with people using spoken words. These topics will be covered:

- Synthesizing Speech
- Recognizing Spoken Words
- Analyzing Vocal Sentiments
- Recreating Emotional Intent
- Identifying Specific Speakers

- Simulating Speaker Voices
- Composing Original Songs

Week 5 - A Picture Is Worth 1000 Words

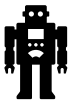
Week 5 examines how computers using AI software are able to recognize images and scenes. Although creating art is generally assumed to be a uniquely human capability, AI systems can now generate photorealistic images. This week delves into more detail about how neural networks work on the following:

- Reading Handwriting
- Identifying Objects
- Describing Scenes
- Creating 3D Images
- Generating Photorealistic Pictures

Week 6 - Here's Looking at You

Beyond identifying objects, facial recognition software can distinguish between individuals. Facial recognition and the ability to create fake videos of people are two of the more controversial uses of AI. This week will address:

- Detecting Faces
- Recognizing Faces
- Identifying Facial Expressions
- Generating Photorealistic Faces
- Creating Fake Videos



Week 7 - Danger, Will Robinson!

Contrary to what is seen in the movies, AI and robotics are two different disciplines that often do not intersect. However, rather than using traditional methods to program robots, AI approaches are beginning to help robots learn specific skills, including learning to: speak, see, grasp, walk, fly, and play games.

Week 8 - Law and Order

AI systems are being used by police departments to help stop crimes, within law offices to assist attorneys, and in courtrooms to advise judges. The use of AI in the following areas will be examined:

- Positioning Patrol Officers
- Surveilling for Street Crimes
- Detecting White Collar Crimes
- Pursuing Suspects
- Solving Crimes
- Assisting Lawyers
- Recommending Bail and Sentences

Week 9 - Medical Miracles

In 1995, the Food and Drug Administration (FDA) approved the first medical test based on AI. Now, over 500 medical tests and devices using AI have been approved by the FDA. This week will explore AI in:

- Medical Research
- Drug Discovery
- Medical Imaging Analysis
- Diagnostics
- DNA Analysis

Week 10 - Take Me Home, Jeeves

The Society of Automotive Engineers has defined six levels for autonomous vehicles, and the race is on between existing manufacturers and new startups to reach the top tier of self-driving vehicles. These leaders in the field will be presented:

- Tesla Full Self-Driving Beta
- Honda Traffic Jam Pilot System
- Mercedes Benz Drive Pilot
- GM Cruise Taxis
- Zoox Shuttles
- Gatik Short-Haul Trucks
- Aurora Long-Haul Trucks

Week 11 - Is There an Analog?

The digital computers we know today convert information into a series of ones and zeroes. However, long before digital computers, analog devices, which use continuous values rather than just ones or zeroes, were used for computing. Because the neurons in the brain use analog signals, AI systems meant to emulate the brain may begin to use analog computers. These topics will be discussed:

- The Difference Between Analog and Digital
- Brief History of Analog Computing
- Brief History of Digital Computing
- Parallel Processing
- Building an Artificial Brain