CS 115: COMPUTING FOR THE SOCIO-TECHNO WEB

ARTIFICIAL INTELLIGENCE, MACHINE LEARNING...
Today

Terminology: algorithms, artificial intelligence, machine learning

How does AI work?

Algorithmic Bias

Training data and human computation
ALGORITHMS

What is an algorithm?
- A set of instructions
- A list of rules
- A recipe
- Uses relational operators !, &&, || and loops

What are some examples of algorithms that you interact with in your day to day?
ARTIFICIAL INTELLIGENCE
WHAT IS AI?

The science of making machines that:

Think like people
Act like people
Think rationally
Act rationally
THE TURING TEST

- Turing, “Computing machinery and intelligence,” 1950
- Can machines think? → Can we tell if a conversation is by a machine and not a human?
- Operational test for intelligent behavior: aka the Imitation Game
Mostly about engineering domain-specific solutions rather than creating general theories.

A set of “tools” for representing information and using them to solve specific tasks.

- Neural networks, hidden Markov models, Bayesian networks, heuristic search, logic, …

There’s no magic. It’s representation, probability, and algorithms
“My personal challenge for 2016 is to build a simple AI to run my home and help me with my work. You can think of it kind of like Jarvis in Iron Man. I’ll start teaching it to understand my voice to control everything in our home … I’ll teach it to let friends in by looking at their faces when they ring the doorbell … I’ll teach it to let me know if anything is going on in Max’s room that I need to check on …”

– Mark Zuckerberg, Facebook
JARVIS

Jarvis Server
(Processes requests; Builds model of the world)

Home Systems
- Crestron
- Lights
- Thermostat
- Doors
- Sonos
- Spotify
- Cameras
- Toaster
- T-Shirt Cannon (??)

AI Systems
- Language Processing
- Speech Recognition
- Face Recognition

User Interfaces
- Messenger Bot
- iOS Voice App
- Door Camera
HUMANS ARE STILL BETTER THAN COMPUTERS AT:

- General intelligence (adaptability)
- Creativity
- Common-sense knowledge or understanding of the world.
It’s representation, probability, and algorithms.
PERCEPTRON: BASIC ML ALGORITHM

Get lots of images depicting cats and dogs

Label the images with the correct category

Find a separator that can determine if an image depicts a dog or a cat
MACHINE LEARNING

It’s representation, probability, and algorithms.
If(legs=4) and if(ears=pointy) and if(whiskers=yes) and if(tail=yes) and if(expression=supercilious), then(cat=yes).
DEEP LEARNING NLP
The Five Largest Industrial Corporations

2017

1. Apple $801B
2. Alphabet $680B
3. Microsoft $540B
4. Amazon $476B
5. Facebook $409B

And Baidu!!
Leading AI research companies today

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   - $801B
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And Baidu!!
Description: Machine learning is the science of teaching computers how to learn from observations. It is ubiquitous in our interactions with society, showing up in face recognition, web search, targeted advertising, speech processing, genetic analysis, and even Facebook’s selection of posts to display. It is currently at the forefront of research in artificial intelligence, and has been making rapid strides given the vast availability of data today. This course is a broad introduction to the field, covering the theoretical ideas behind widely used algorithms like support vector machines, neural networks, graphical models, decision trees, and many more. We will also study practical applications of these algorithms to problems in vision, speech, language, biology, and the social sciences.

Prerequisite(s): CS 230 and either MATH 206 or MATH 220 or MATH 225

Instructors: Brian Tjaden
APPLICATIONS:

- Scheduling, e.g. airline routing, military
- Route planning, e.g. Google maps
- Medical diagnosis
- Web search engines
- Spam classifiers
- Automated help desks
- Fraud detection
- Product recommendations
- … Lots more!
ALGORITHMIC BIAS

https://www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms/discussion
TRAINING DATA

• Human Computation (Luis Von Ahn):
  • Simple tasks (sometimes games) that only humans can perform to input training data for an algorithm.
  • Ex: Read books, find objects in an image…

• Digital Footprints:
  • Collect information from the Social Web to make predictions.
HUMAN COMPUTATION
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