

CS229: Machine Learning

AI is the new electricity



Electricity transformed countless industries: transportation, manufacturing, healthcare, communications and more.

AI will bring about an equally big transformation.

Introduction

Who we are

Instructors



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Balogun



Jake Silberg



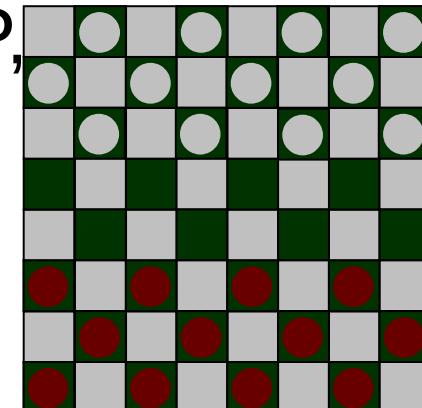
Ha Tran

Goal

Machine Learning introduction

Machine Learning definition

- Arthur Samuel (1959). Machine Learning:
Field of study that gives computers the ability
to learn without being explicitly programmed.
- Tom Mitchell (1998) Well-posed Learning
Problem: A computer program is said to *learn*
from experience E with respect to some task
T and some performance measure P, if its
performance on T, as measured by P,
improves with experience E.



Supervised Learning

Neural Network-Based Autonomous Driving

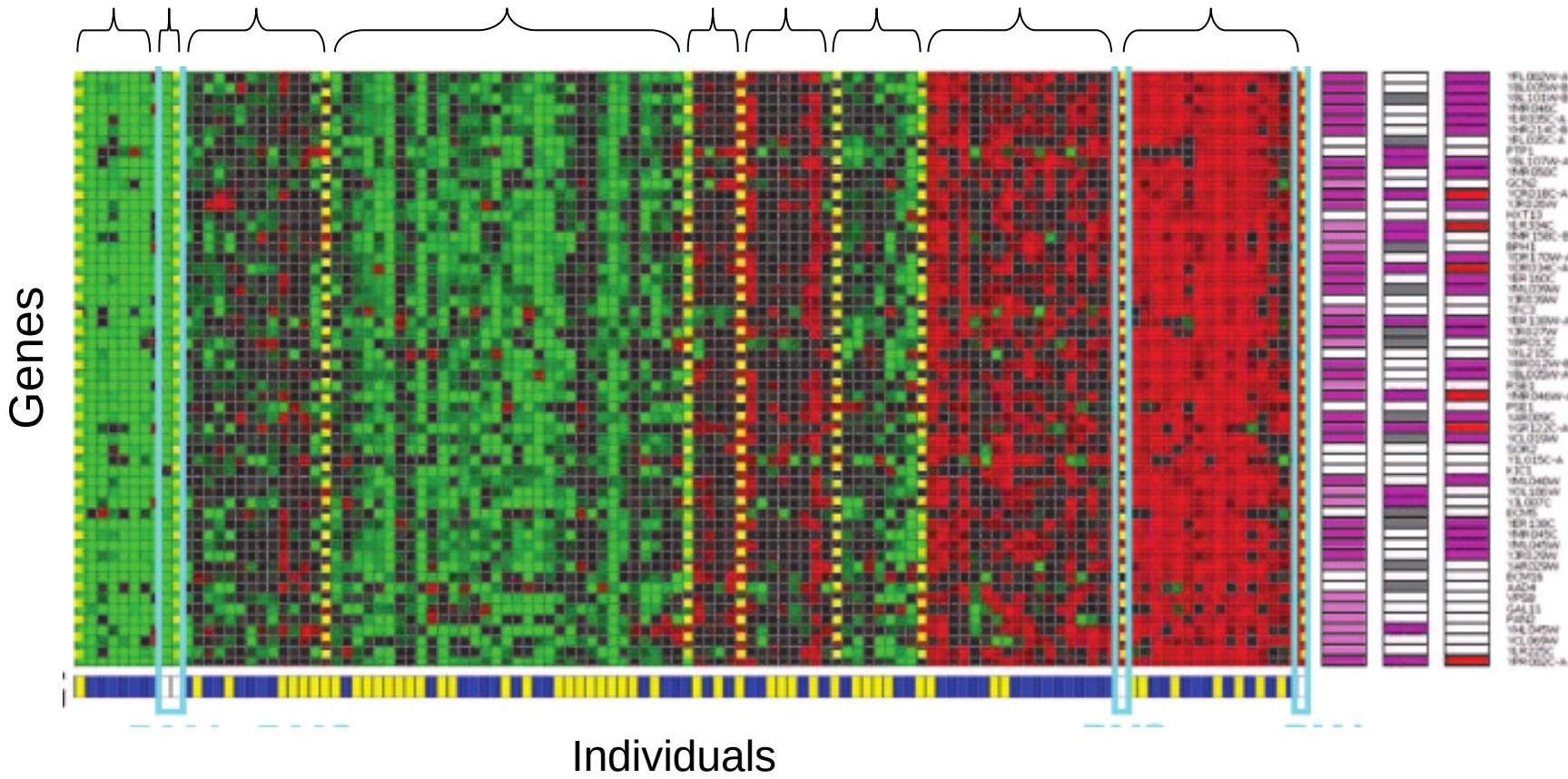
23 November 1992

[Video courtesy Dean Pomerleau.]

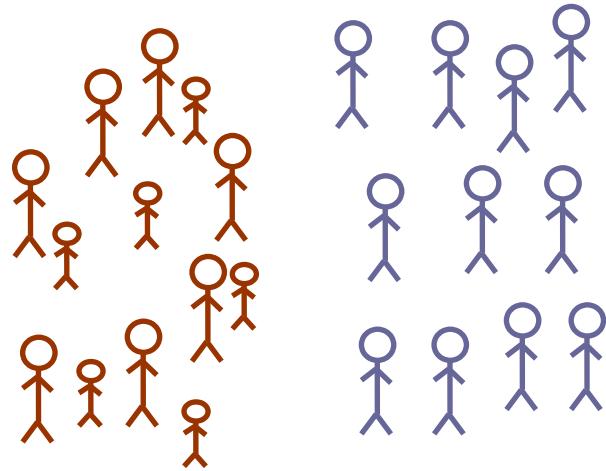
Deep Learning (Neural Networks)

Practical ML advice

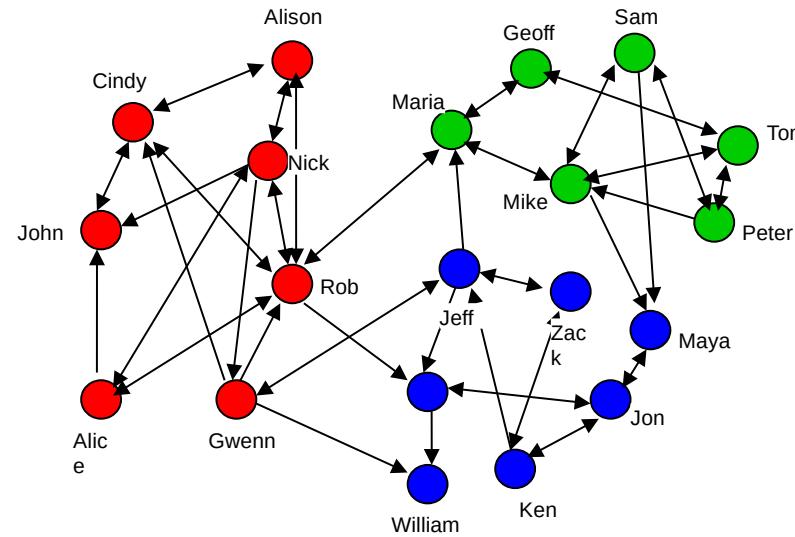
Unsupervised Learning



[Image credit: Su-In Lee]



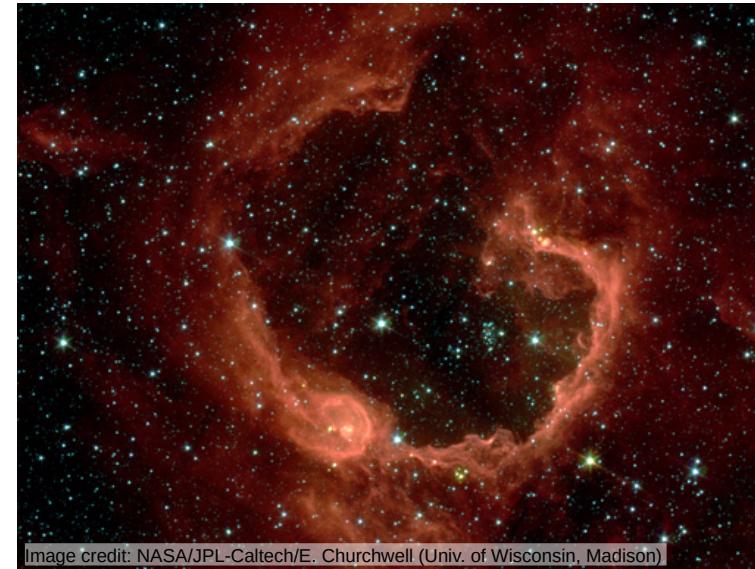
Market segmentation



Social network analysis

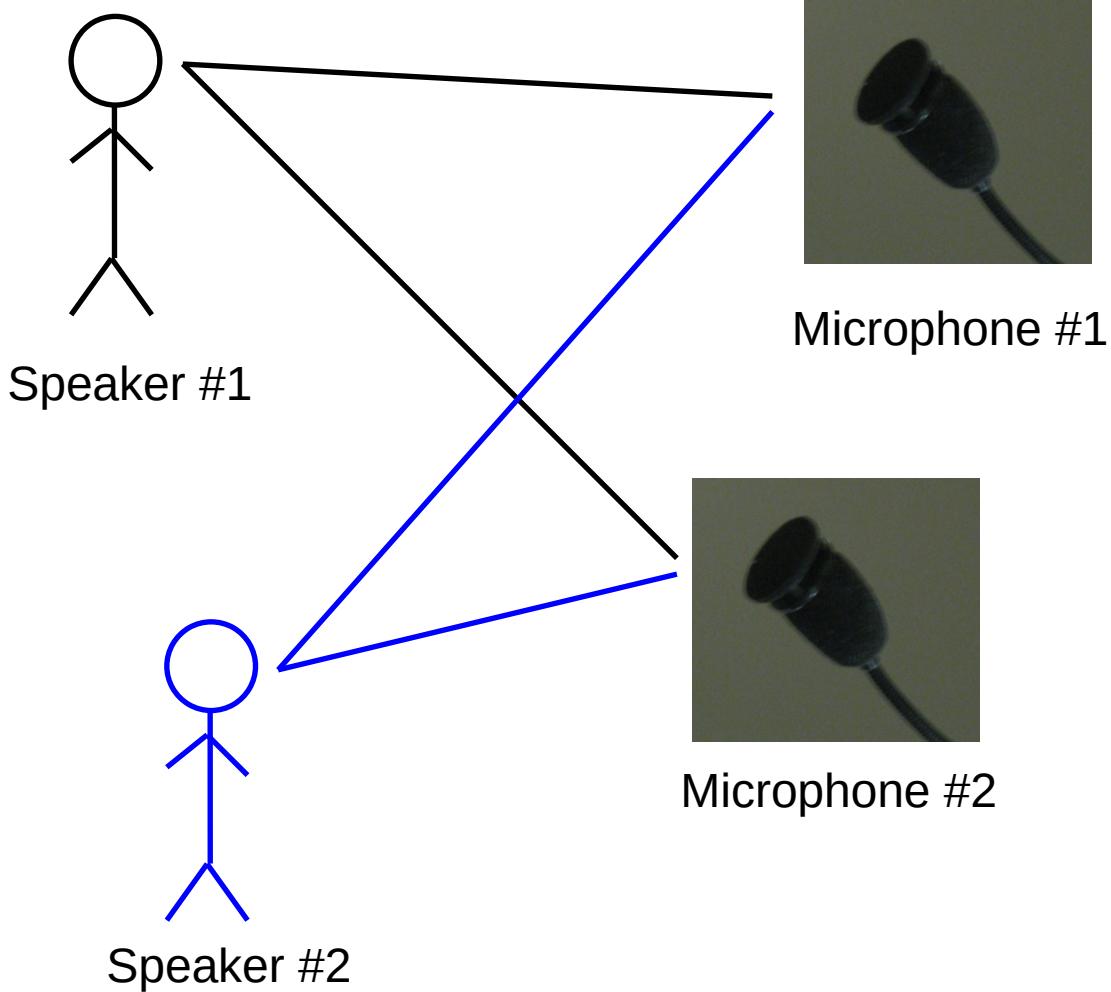


Organize computing clusters



Astronomical data analysis

Cocktail party problem



Microphone #1: 

Output #1: 

Microphone #2: 

Output #2: 

Microphone #1: 

Output #1: 

Microphone #2: 

Output #2: 

[Audio clips courtesy of Te-Won Lee.]

ICA algorithm

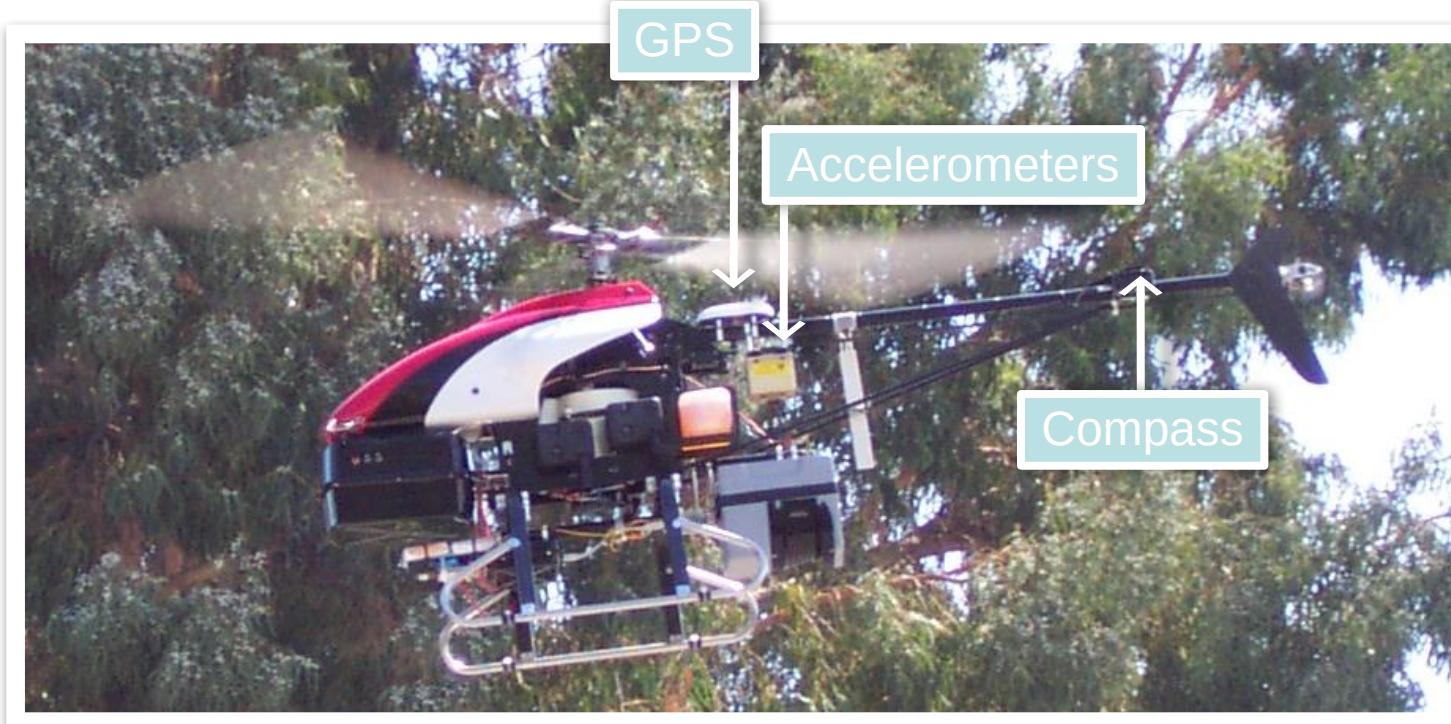
```
[W,s,v] = svd((repmat(sum(x.*x,1),size(x,1),1).*x)*x');
```

[Source: Sam Roweis, Yair Weiss & Eero Simoncelli]

Reinforcement Learning



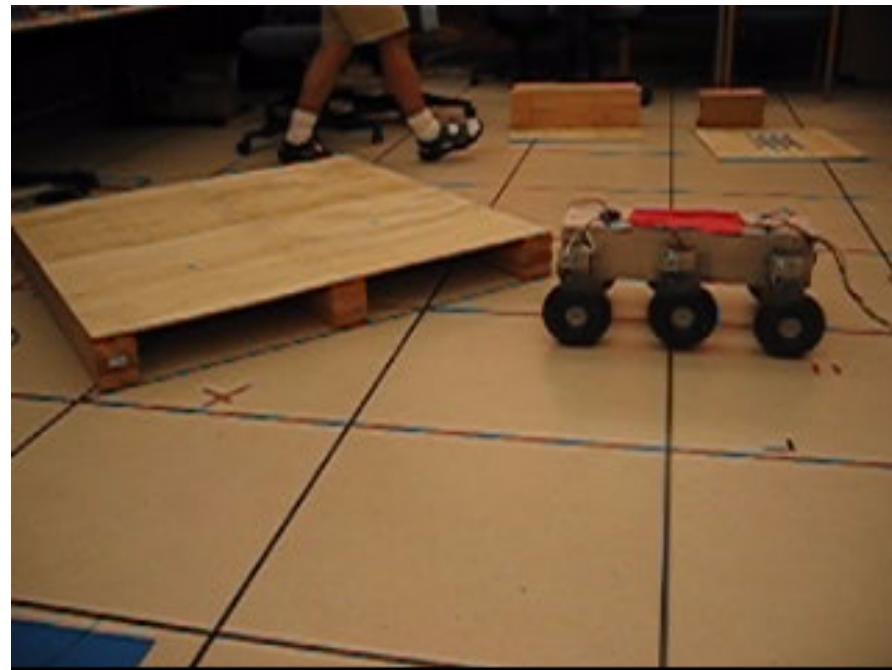
Stanford autonomous helicopter







[Credit: Zico Kolter]



[Pieter Abbeel, Zico Kolter, Jeff Michels, Ashutosh Saxena, Yirong Shen, TongKe Xue]

Logistics

The world's unusual circumstances

- Please reach out if you need help.
- At Stanford and in CS229, we as a community are stronger than any one individual. Please empathize with others and help others where you can.

Prerequisites:

- Knowledge of basic computer science principles and skills, at a level sufficient to write a reasonably non-trivial computer program in Python/numpy. (CS106A or CS106B, CS106X.)
- Familiarity with probability theory. (CS 109, MATH151, or STATS 116)
- Familiarity with multivariable calculus and linear algebra (relevant classes include, but not limited to MATH 51, MATH 104, MATH 113, CS 205, CME 100.)

Work required:

- 4 homeworks (written + programming)
 - Midterm
 - Open-ended final project (teamwork)
 - Poster Session
-
- PS1 due: October 12
 - PS2 due: October 26
 - Midterm: November 3
 - PS3 due: November 9
 - PS4 due: November 30
 - Final project reports due: December 9
 - Poster Session: December 14 (3:30-6:30 pm)

Honor Code

- We encourage study groups.
- We take Honor Code violations very seriously and pursue each case with Stanford's Office of Community Standards
- Please see course logistics for exact definitions.

Project

- Open-ended
- Teams of 1-3. (4 only in special cases)

Friday TA Lectures

- In-depth presentation of materials. Some worked problems.
- Optional attendance; recordings available.

Ed is the class' official forum

- Please use Ed for all written communications.
- When asking questions, please make public if non-confidential.
- Jump in and help answer others' posts too!
- For confidential communications, write a private post.

Ed is preferred over email and the Canvas messaging system.

Ed is highly preferred over the class email.

CS229 vs. CS230 vs. CS129



Your to dos:

- Check out Ed.
- Good place to look for study group and/or project partners.
- Take care of yourself and your loved ones!
And let us know if we can help in any way.