Introduction

Machine learning is pervasive!

- purchase/movie recommendations

- spoken languange
    understanding

- autonomous vehicles

Recommended Accessories   View All >

SanDisk 64GB Extreme Pro CompactFlash Memory Card
$67.31
Add to Cart

Canon EF 24-70mm f/2.8L II USM Lens
$1,699.00
Add to Cart

Vello FreeWave Plus Wireless Remote Shutter Release for
$59.95
Add to Cart

Peak Design Everyday Backpack (20L, Charcoal)
$259.95
Add to Cart

U.S. Cellular   11:29 AM   61%

Hey Siri current weather
Tap to Edit >

It appears to be clear right now in McFarland, with a temperature of 1°F.

WEATHER

McFarland
Sunny
Chance of Rain: 20%
High: 1° Low: -25°
1°

12 PM		1
1 PM		1
2 PM		-0
3 PM		-0

amazon alexa

Machine learning involves finding patterns [2] in data

- Automatic identification of structure

- Learn by example

Example: Movie Ratings

	Jake	Jennifer	Julia	Justin
Star Trek	3	9	2	8
The Martian	1	7	1	7
Pride + Prejudice	9	3	5	2
Sense + Sensibility	9	2	6	3
The Empire Strikes Back	2	9	2	?

A matrix is an ordered collection of numbers. [4]

$$R = \begin{bmatrix} 4 & 7 & 2 & 8 \\ 3 & 8 & 3 & 7 \\ 9 & 3 & 5 & 2 \\ 9 & 3 & 6 & 3 \\ 2 & 9 & 2 & 8 \end{bmatrix}$$

rows

columns

A vector is a single row or column

$$r_2 = \begin{bmatrix} 3 & 8 & 3 & 7 \end{bmatrix}$$

$$c_3 = \begin{bmatrix} 2 \\ 3 \\ 5 \\ 6 \\ 2 \end{bmatrix}$$

Matrix methods are the foundation of machine learning.

- Ordered organization → pattern discovery

- Linear algebra → powerful tools

Focus on principles for machine learning, not software or toolboxes