Building ML Models

Week 1: Introductions, Onboarding, Intro to ML

Overview

- Introductions/Icebreakers
- Intro to ML
- Intro to Math
- Code a Perceptron

Administrivia

Administrivia

- Join the Slack channel if you haven’t already
  - We post slides, links, and send announcements there
- Attendance policy: must attend every other session

Introductions

Isaac Heitmann

Major: Data Science

Year: Senior

Hometown: Andover, MA

Fun facts:

- I have a Pokemon card collection (potentially $$$$) that I can't find
- I'm a transfer student from UMass Amherst

Kevin Calopisis

Major: Data Science (Eng)

Year: 3rd (and final)

Hometown: Seoul, South Korea, but I moved to Michigan at 1 y/o

Fun Facts:

- I can solve a Rubik's Cube in under 15 seconds
- I'm fairly fast at typing

15 seconds	30 seconds	10 words
173	158	209
100%	97%	100%

Icebreaker

- Count off by 5s...
- Get in your groups
- **First group where one person gets all names right...**

Intro to Machine Learning

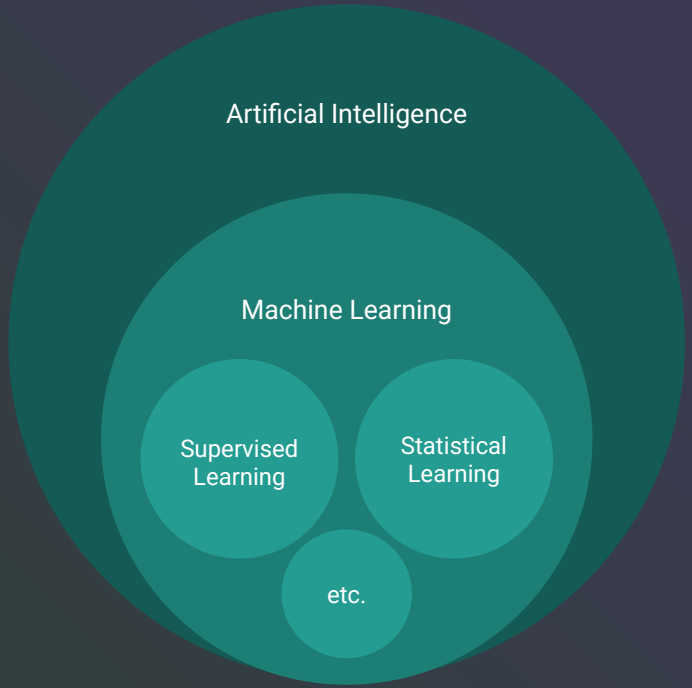
What is Machine Learning vs Artificial Intelligence?

Artificial Intelligence

- A general term to describe machines performing intelligent, or human like tasks
- Contains all forms of statistical learning

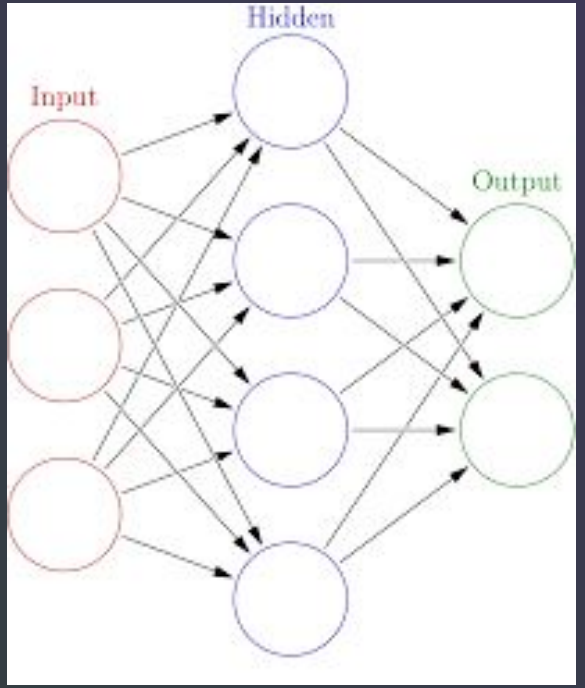
Machine Learning

- A specific type of artificial intelligence where machines learn to classify or predict based of data
- Data driven, robust, low complexity



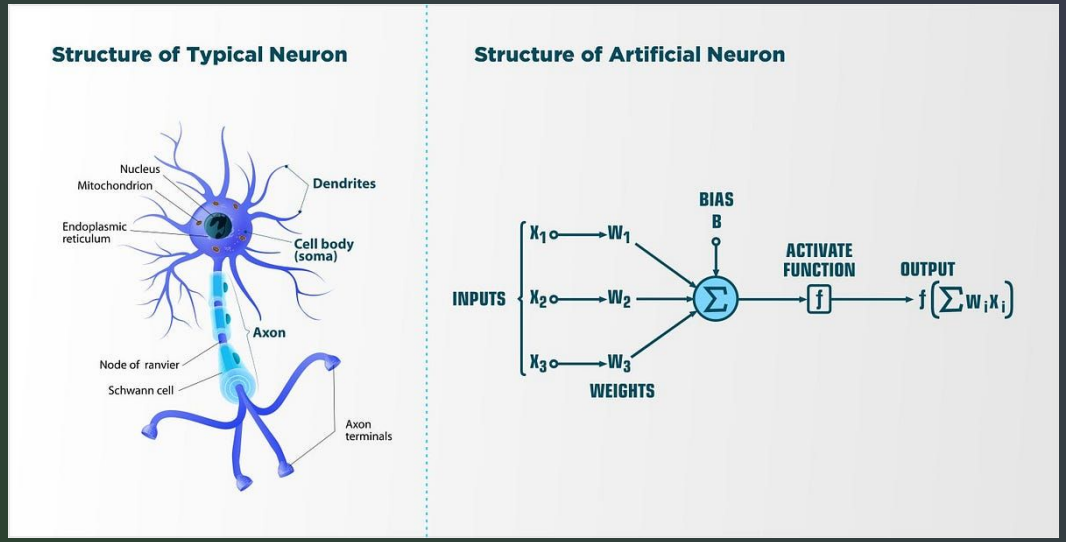
Neural Networks

- Ubiquitous ML model type
- Well-suited to tasks involving **complex patterns**
  - Natural language processing (NLP)
  - Computer vision (CV)
  - Financial forecasting and fraud detection
- Seems complex, but the design is quite human.



The Brain and Neural Networks

- Inspiration for ANNs: **The Brain**



- Key idea: **Learning** happens upon **repeated recognition**
- Similarly, ANNs **improve weights** (multiply inputs) to improve accuracy

How the Perceptron Works

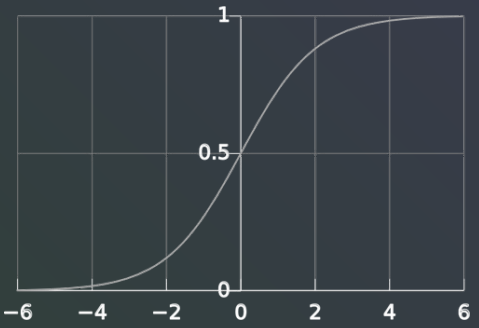
- Based on a human neuron
- Some positive integer *n* inputs $x_1, x_2, \ldots, x_n$
- A weight for each input $w_1, w_2, \ldots, w_n$
- One output
- Weighted sum of inputs is taken
- Activation function applied to weighted sum to push all values between a manageable range

$$\bar{x} = \sum_{i=0}^{n} x_i w_i$$

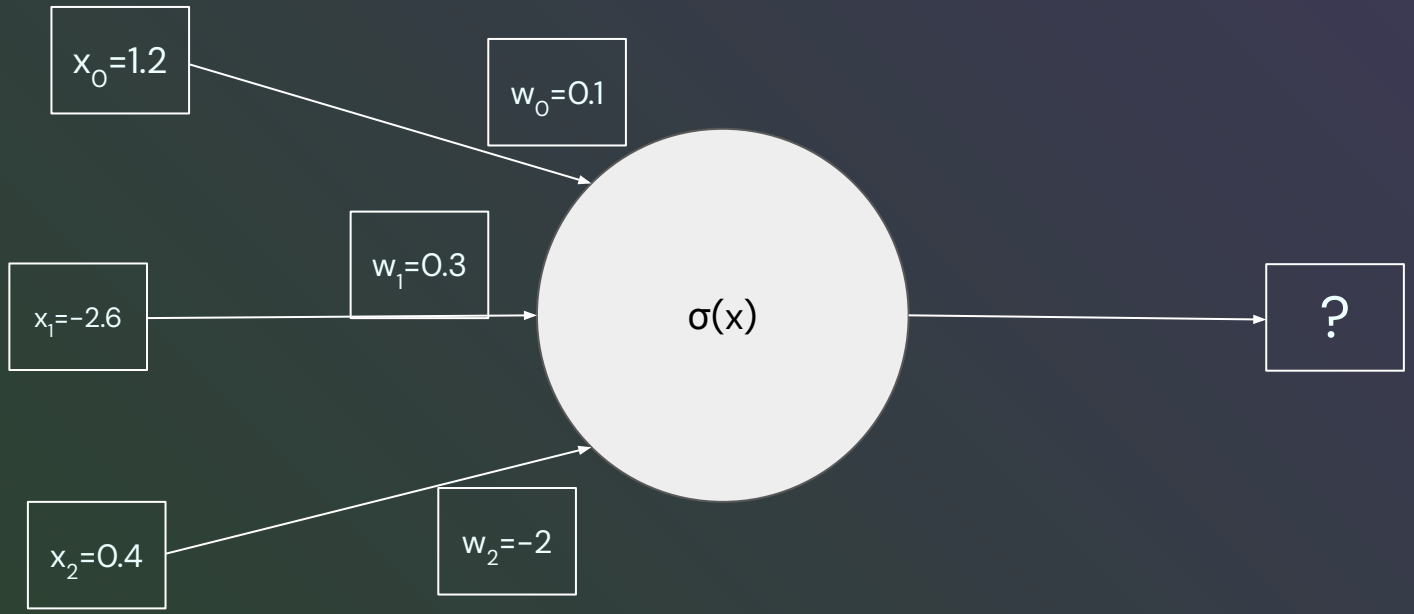
Weighted Sum Formula

$$\sigma(x) = \frac{1}{1 + e^{-x}}$$

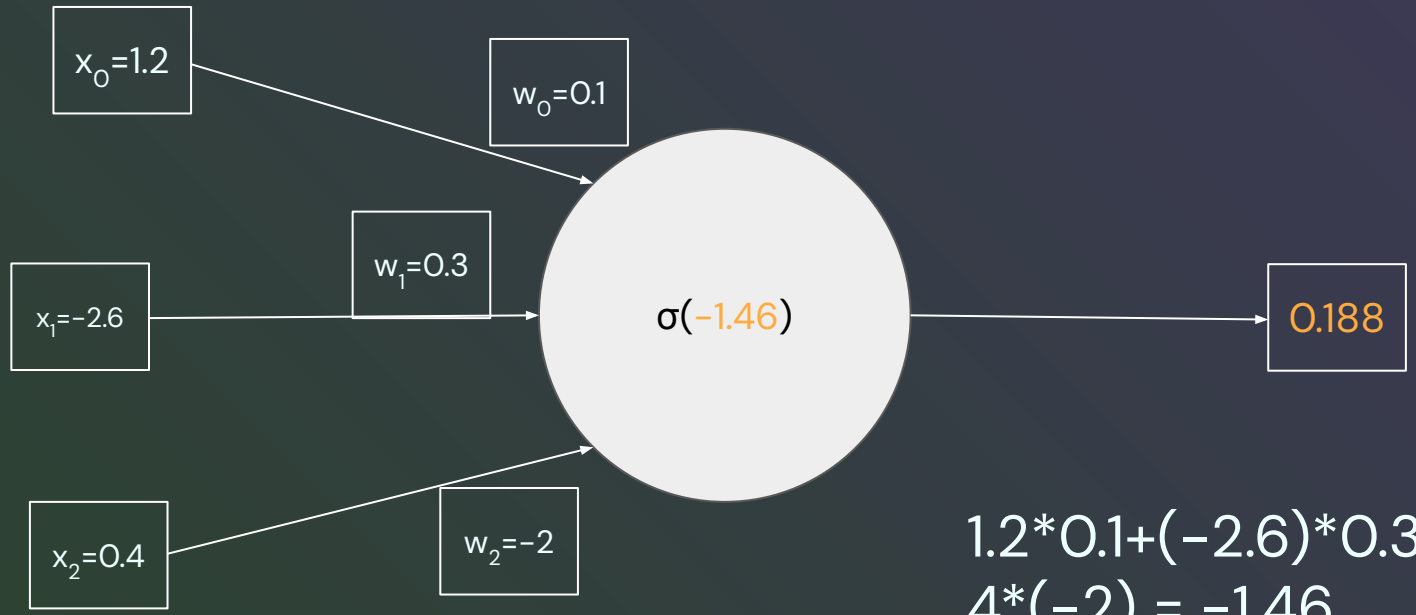
Sigmoid Activation Function



Example Problem



Example Problem: Solution



1.2*0.1+(−2.6)*0.3+0.
4*(−2) = −1.46
1/(1+e^(1.46)) = 0.188

Let’s Code It!

Code Links:

- Github
  - Download the Jupyter Notebook
  - Use either Colab or VS Code to edit the notebook