# AI & ML

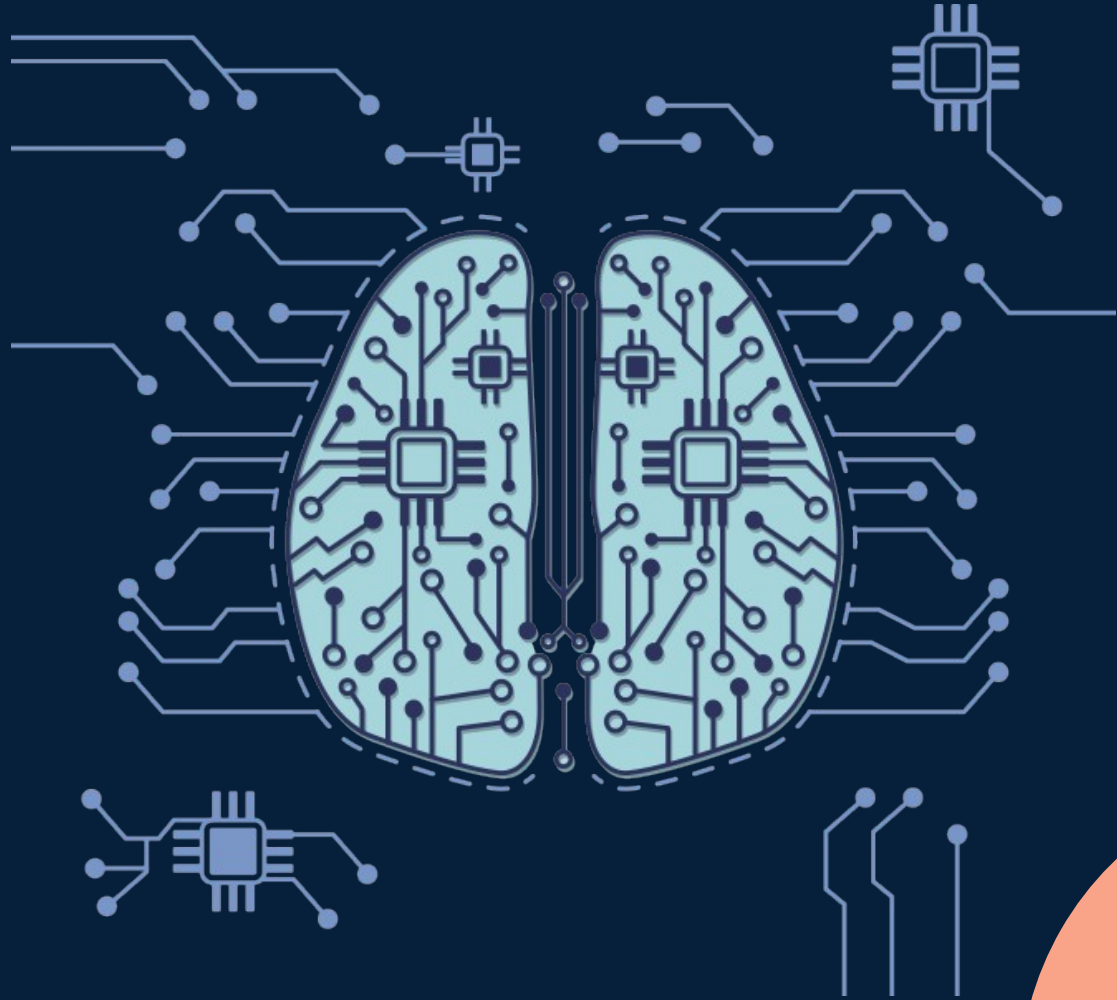# **What is Artificial Intelligence**

## Software that mimics human intelligence
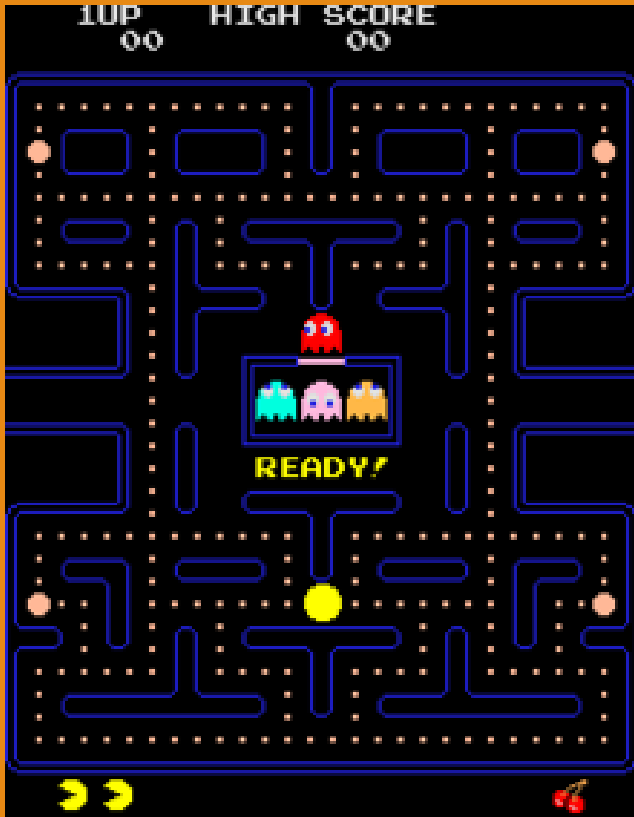


Self-Driving Cars



Games



Translation



Voice Commands

# AI Can Be Simple...

- Pacman (1980)

- Ghosts follows simple rules...

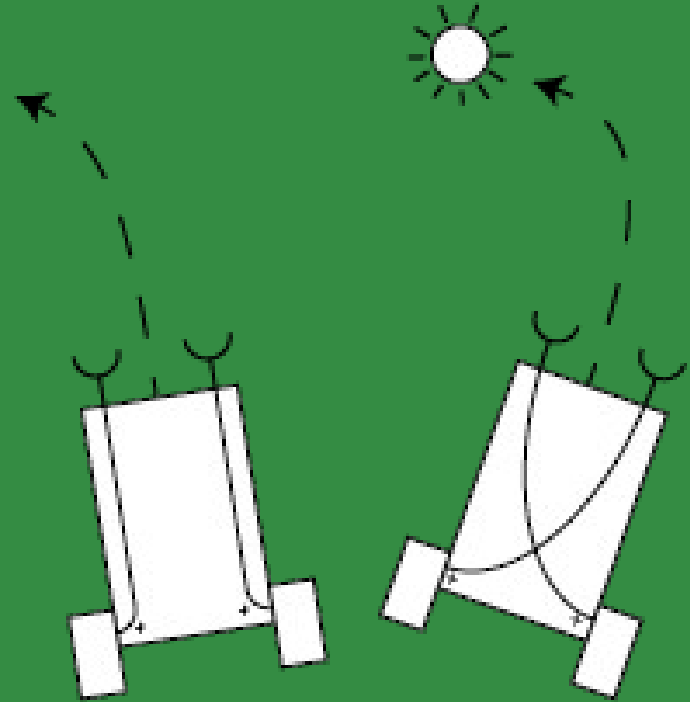- ...but creates seemingly complex behaviors

# AI Can Be Simple...



- Blinky (Red)
  - Direct chase
- Pinky (Pink)
  - Intercept from front
- Inky (Cyan)
  - Work with Red to flank pacman

# Braitenberg vehicle

- Simple AI models

- Moves towards or away from light depending on wiring

- In environments with multiple lights, behavior can be complex, human like, and unpredictable

- Many insect and animal behaviors can be modeled with this...
  - Cockroachs, Lizards, Bats, etc
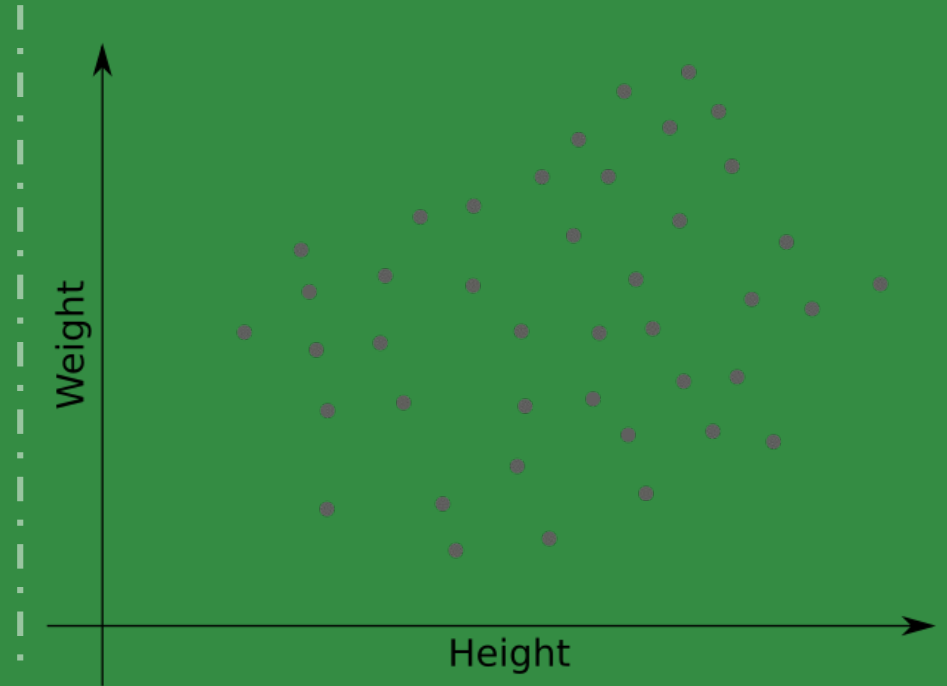
# **Machine Learning**

- Pacman Ghosts and Braitenberg's vehicle are pre-programmed

- These can lead to complex behaviors that even the programmers may not predict...

- ...but they never learn from experience

# **Machine Learning**

- Machine Learning
  - Programs changing the way they carry out tasks by learning from data
- Achieve more complex behaviors than directly programming in behavior
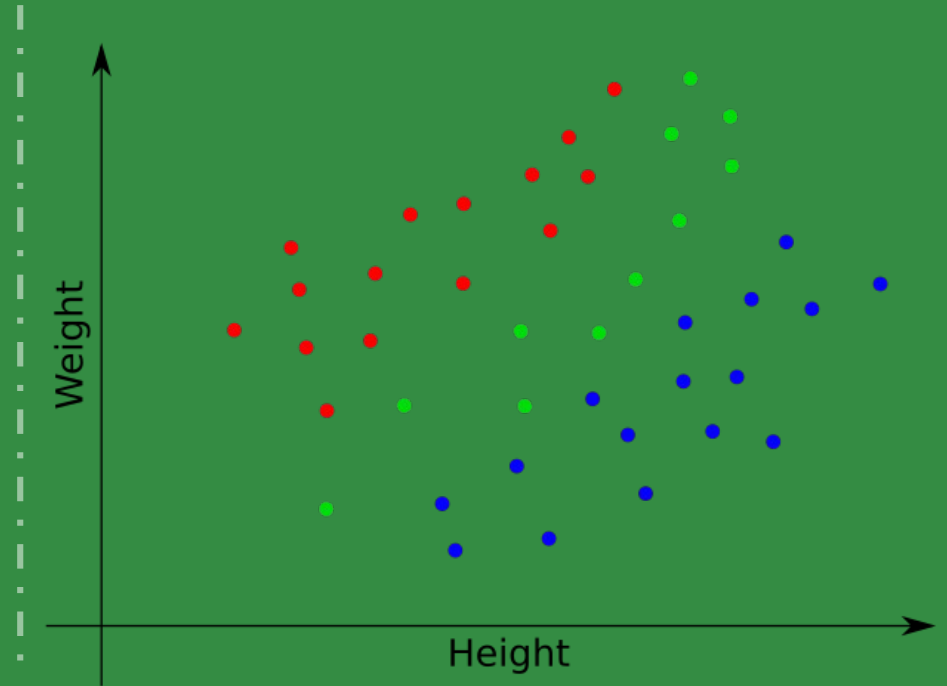- Need to provide training data

# ML is Curve Fitting

- Example:
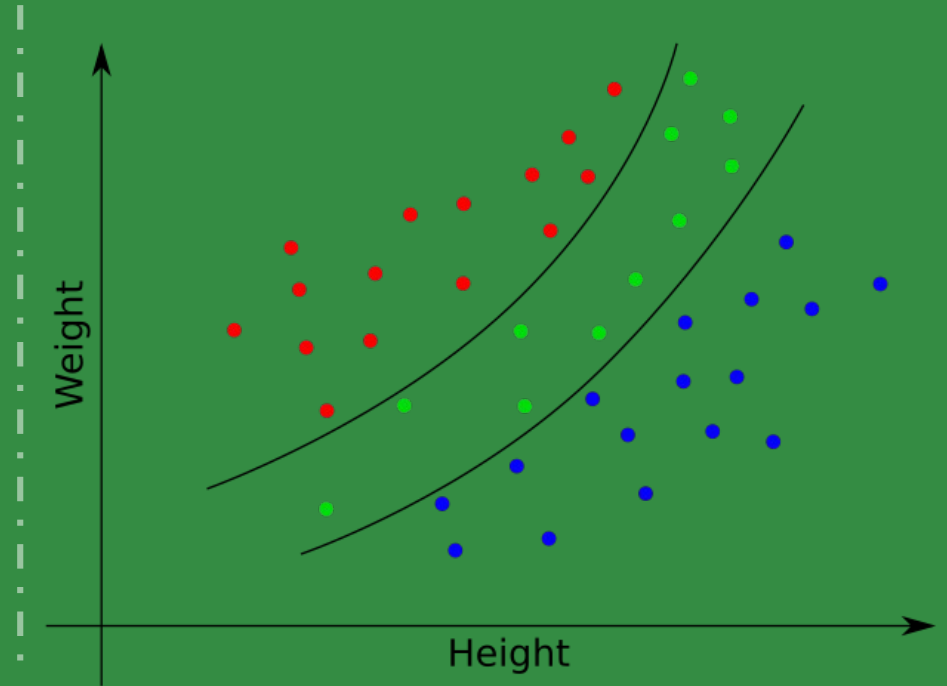  - Train an AI to recognise if someone is over-weight or under-weight based on their weight and height

# ML is Curve Fitting

- ## Step 1
  - Provide training data
  - Eg.
    - Red: Overweight
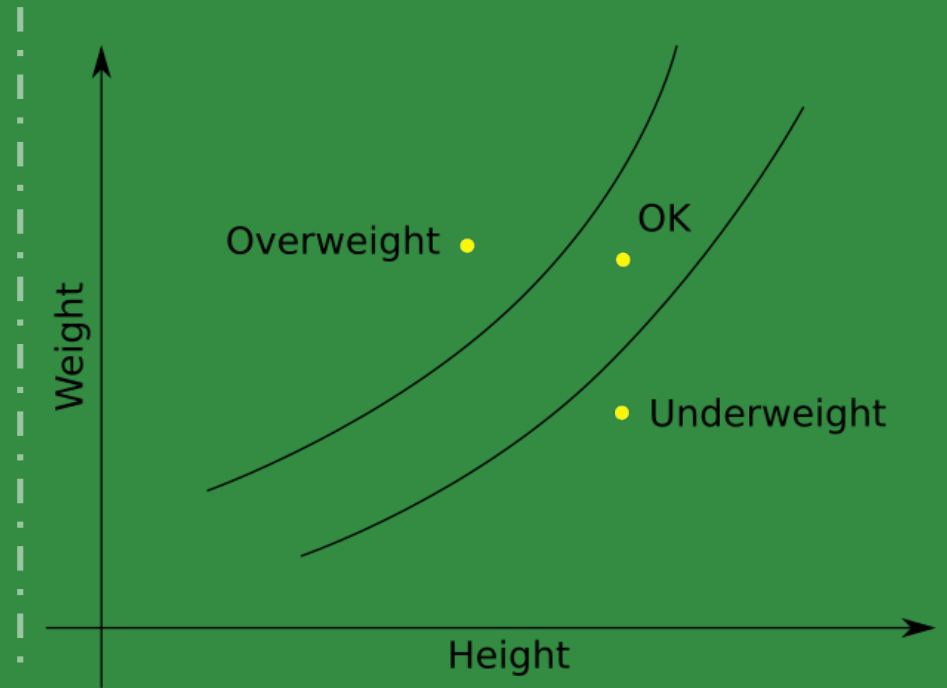    - Green: OK
    - Blue: Underweight

# ML is Curve Fitting

- Step 2
  - AI finds curves that separates each category
  - Uses curve fitting techniques

# ML is Curve Fitting

- Step 3
  - Apply to new data
  - Categorize new data based on whether it is above or below each line

# Machine Learning

- The example given is 2 dimensional (weight, height)…

- …but the technique can be applied to data with hundreds of dimensions (weight, height, gender, age, body fat, genes, etc)…

- …to find other complex relationship (eg. Chances of getting a heart attack)

# State of AI / ML?

- Depending on who you ask, AI / ML today is…

- A) Amazing!

  - Capable of doing many things thought impossible

    - Beat Chess and Go world champions

    - Identify objects in images better than human

    - Hold simple conversations

# **State of AI / ML?**


Chihuahua


"airliner"

- ...OR...
- B) Terrible
  - Just curve fitting
    - Technique invented over 300 years ago
  - No real understanding
    - Sometimes produces ridiculous or illogical results


Race car

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