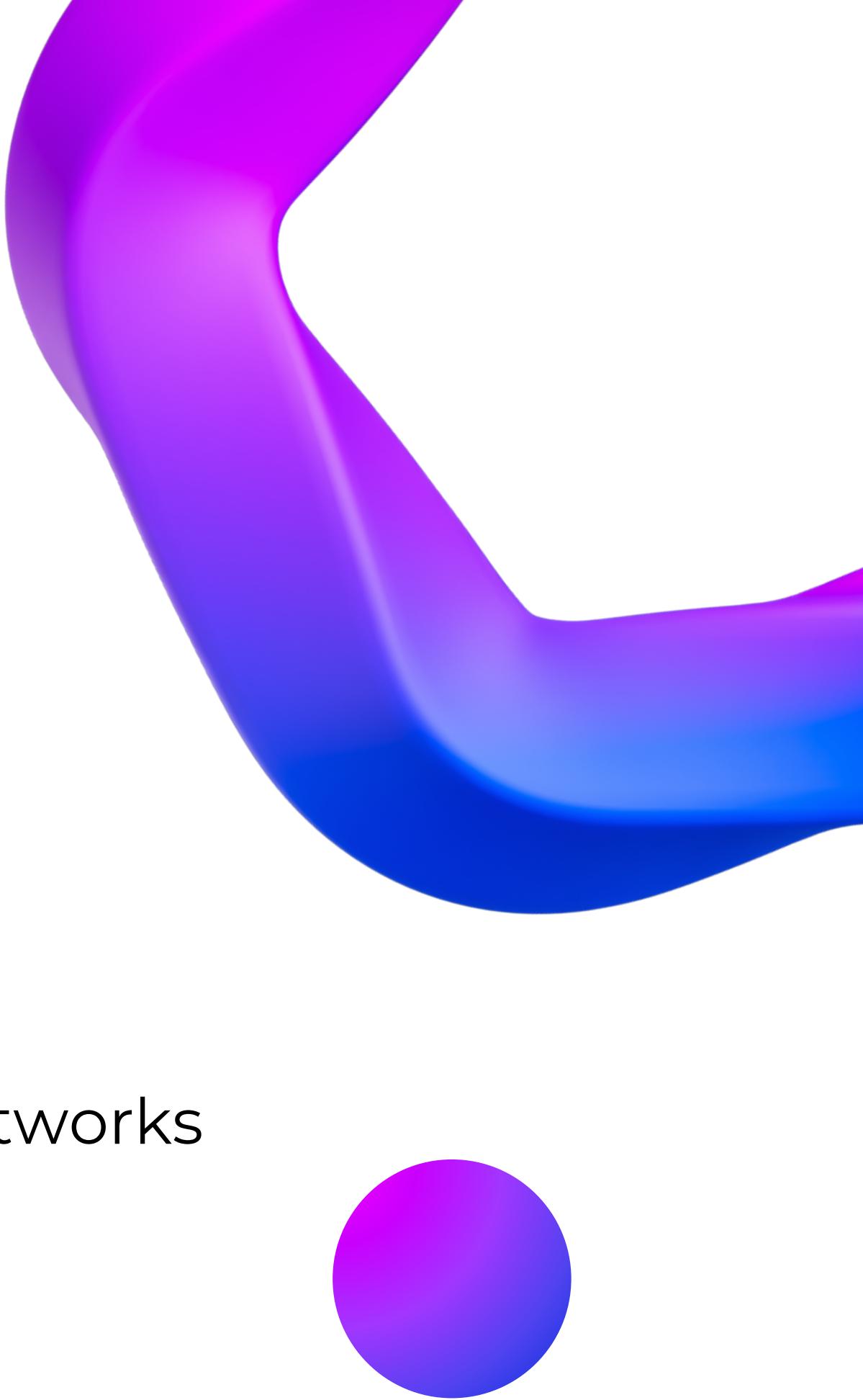
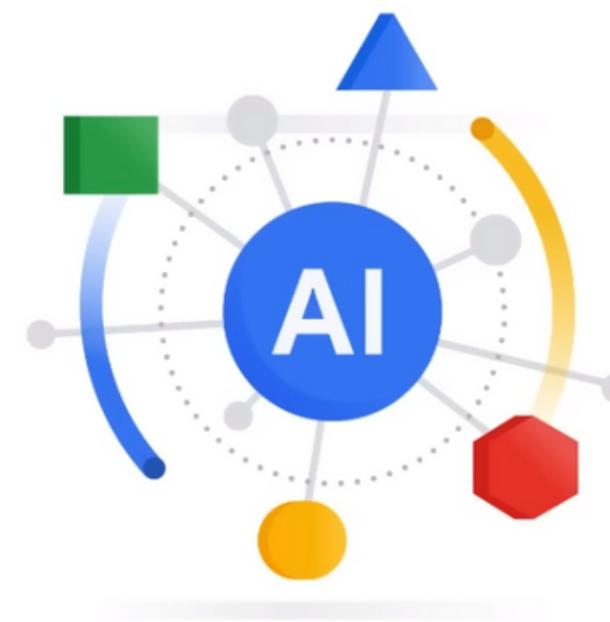


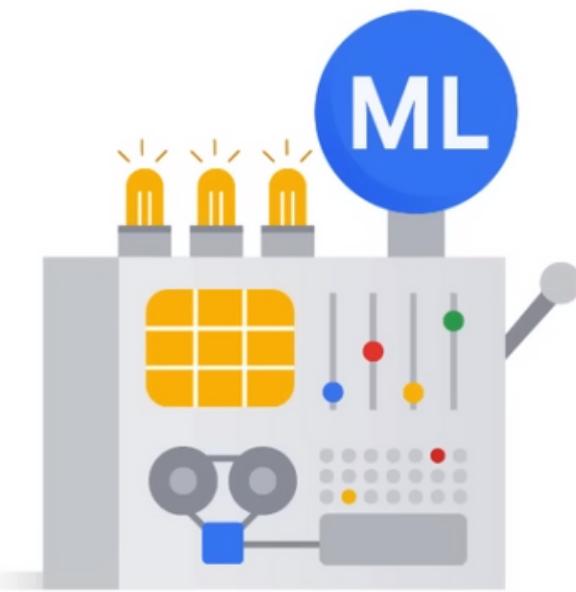
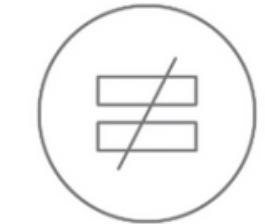
Introduction to Deep Learning

Exploring Computer Vision, Neural Networks





Artificial Intelligence

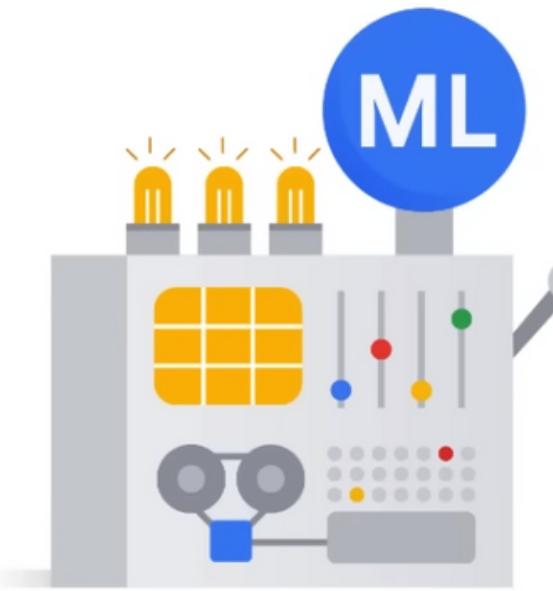
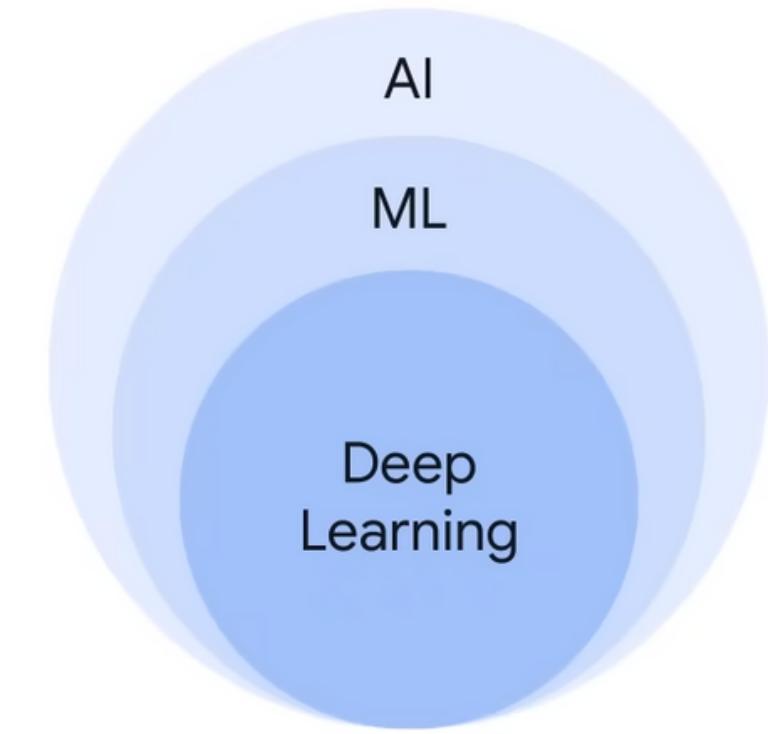


Machine Learning



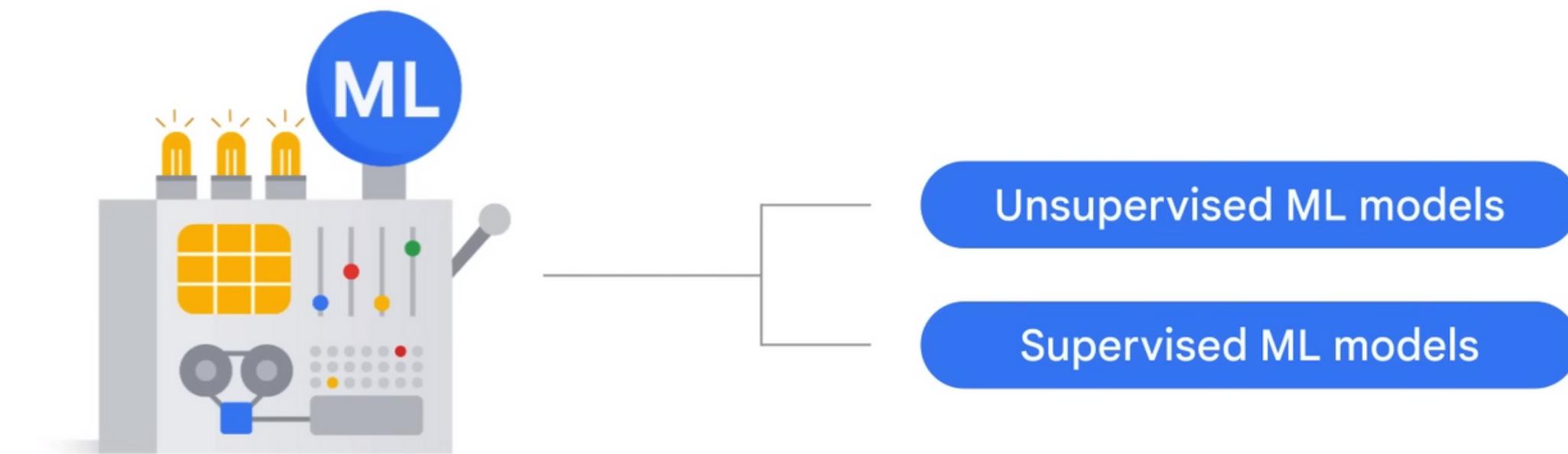
Artificial Intelligence

is a discipline



Machine Learning

is a subfield



**Supervised learning
implies the data is
already labeled**

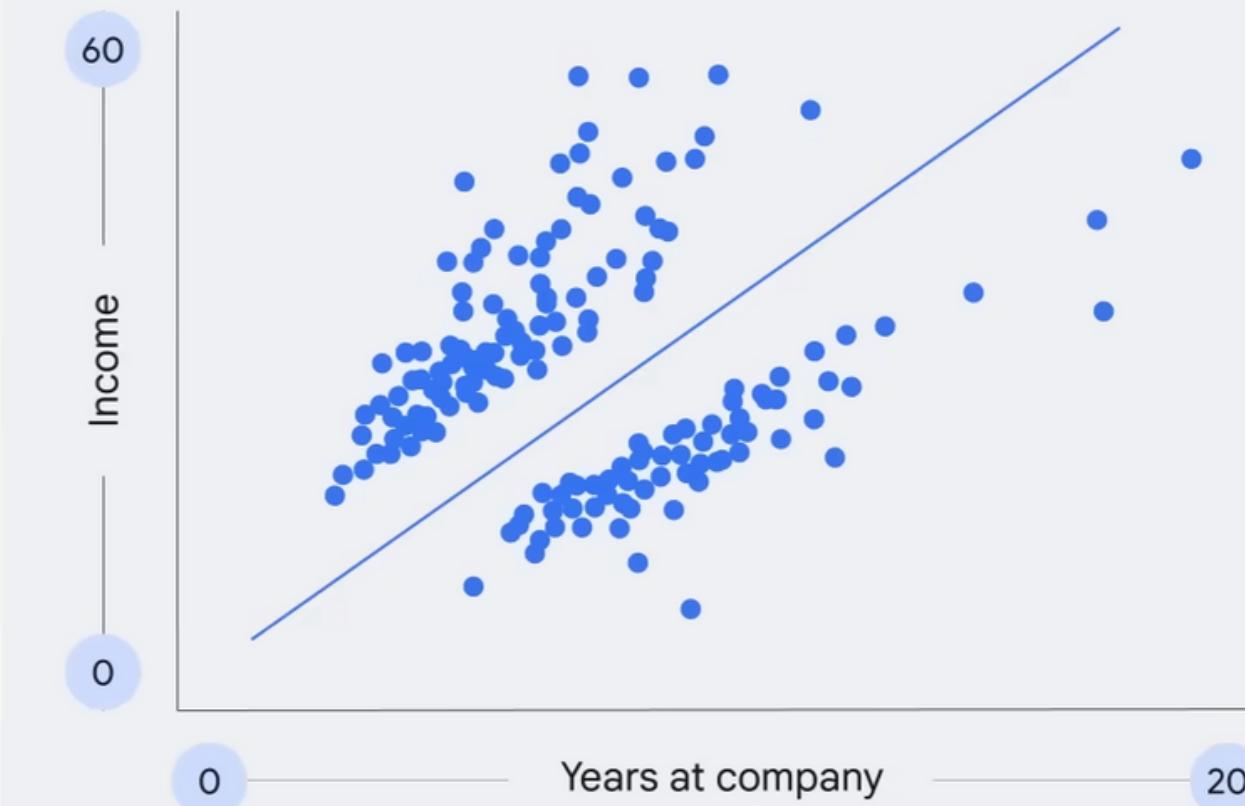
In supervised learning we are learning from past examples to predict future values.



Unsupervised learning implies the data is **not labeled**

Unsupervised problems are all about looking at the raw data, and seeing if it naturally falls into groups

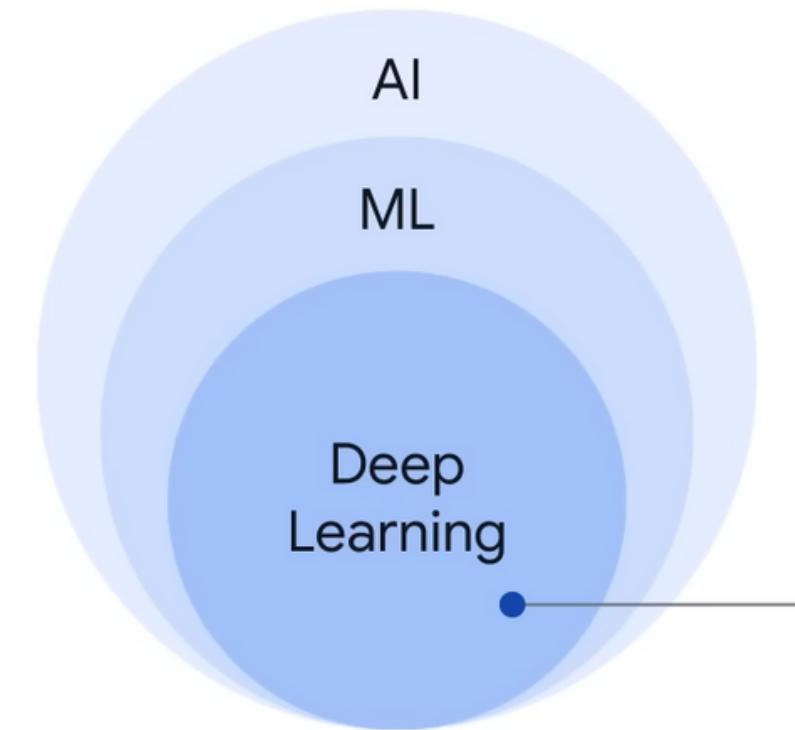
Income vs Job tenure



Example Model: Clustering

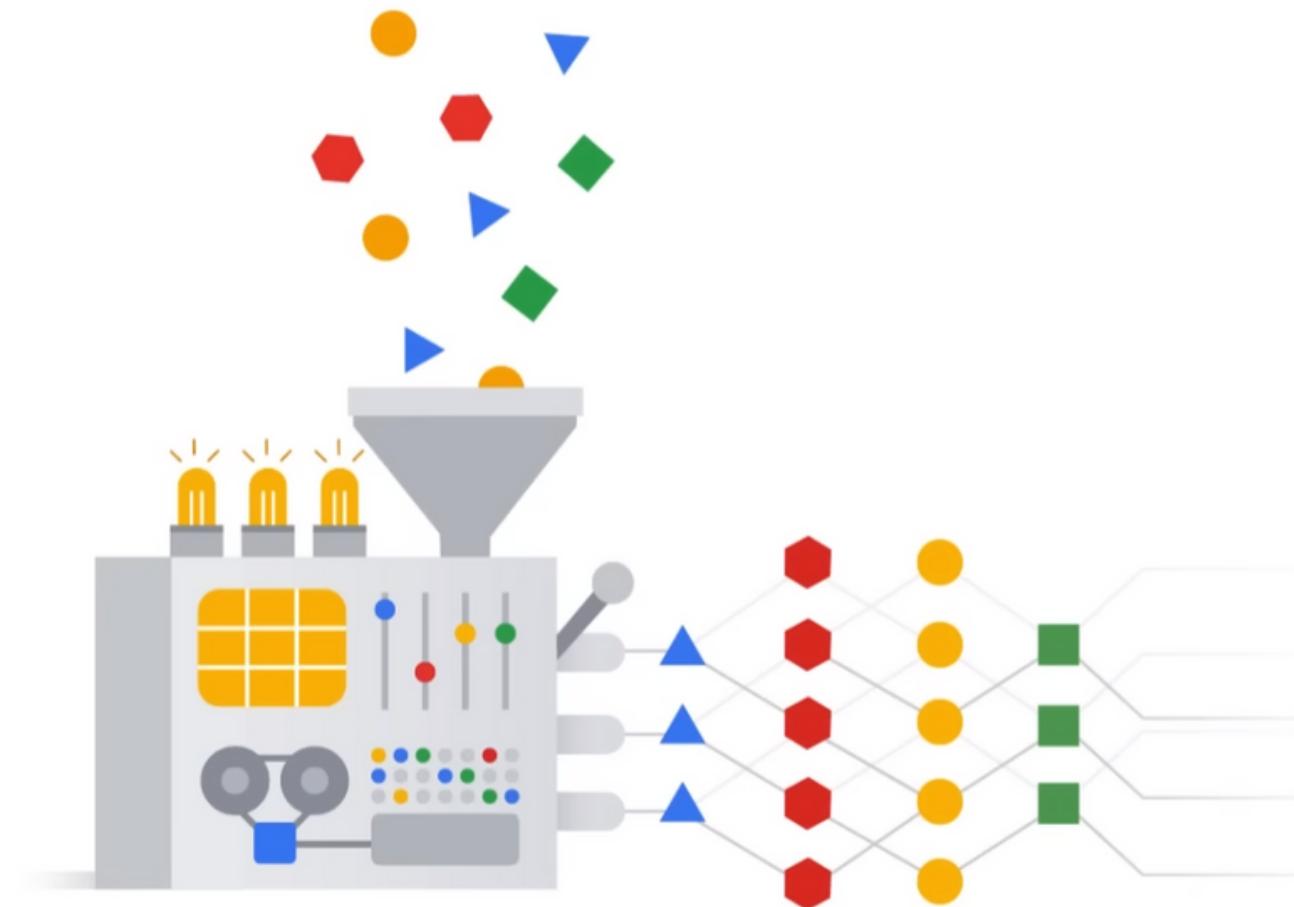
Is this employee on the “fast-track” or not?

**Deep learning is
a subset of ML**



- Machine Learning
- Supervised learning
- Unsupervised learning
- Reinforcement learning
- Deep learning**

Deep learning uses Artificial Neural Networks - allowing them to **process more complex patterns** than traditional machine learning.

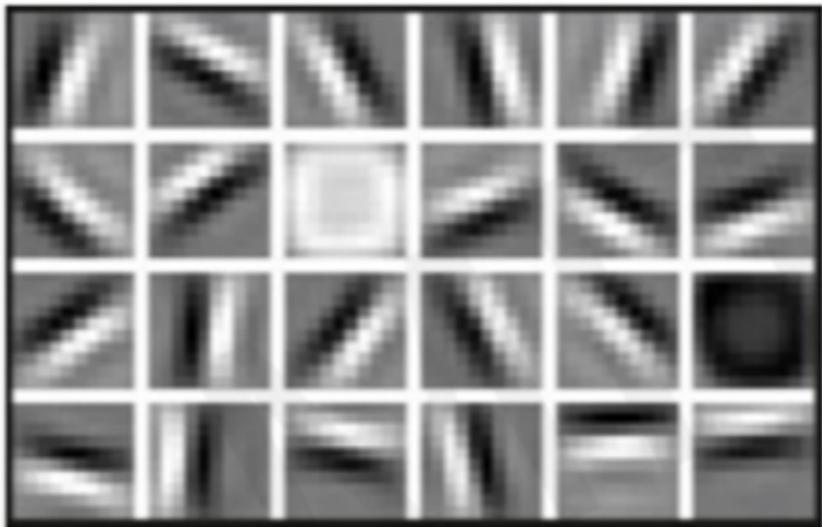


Why Deep Learning?

Hand engineered features are time consuming, brittle, and not scalable in practice

Can we learn the **underlying features** directly from data?

Low Level Features



Lines & Edges

Mid Level Features



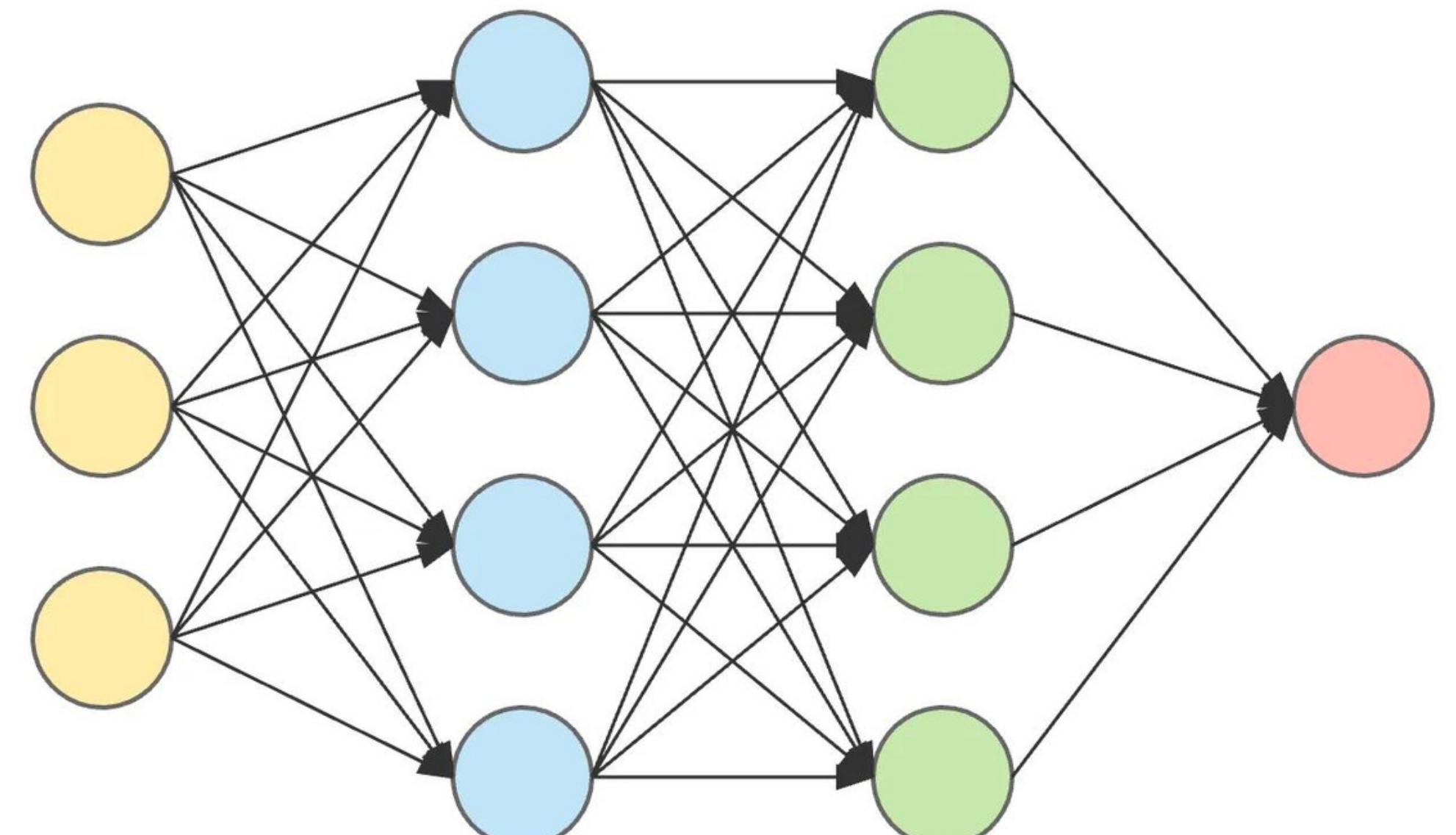
Eyes & Nose & Ears

High Level Features



Facial Structure

Neural Network



input layer

hidden layer 1

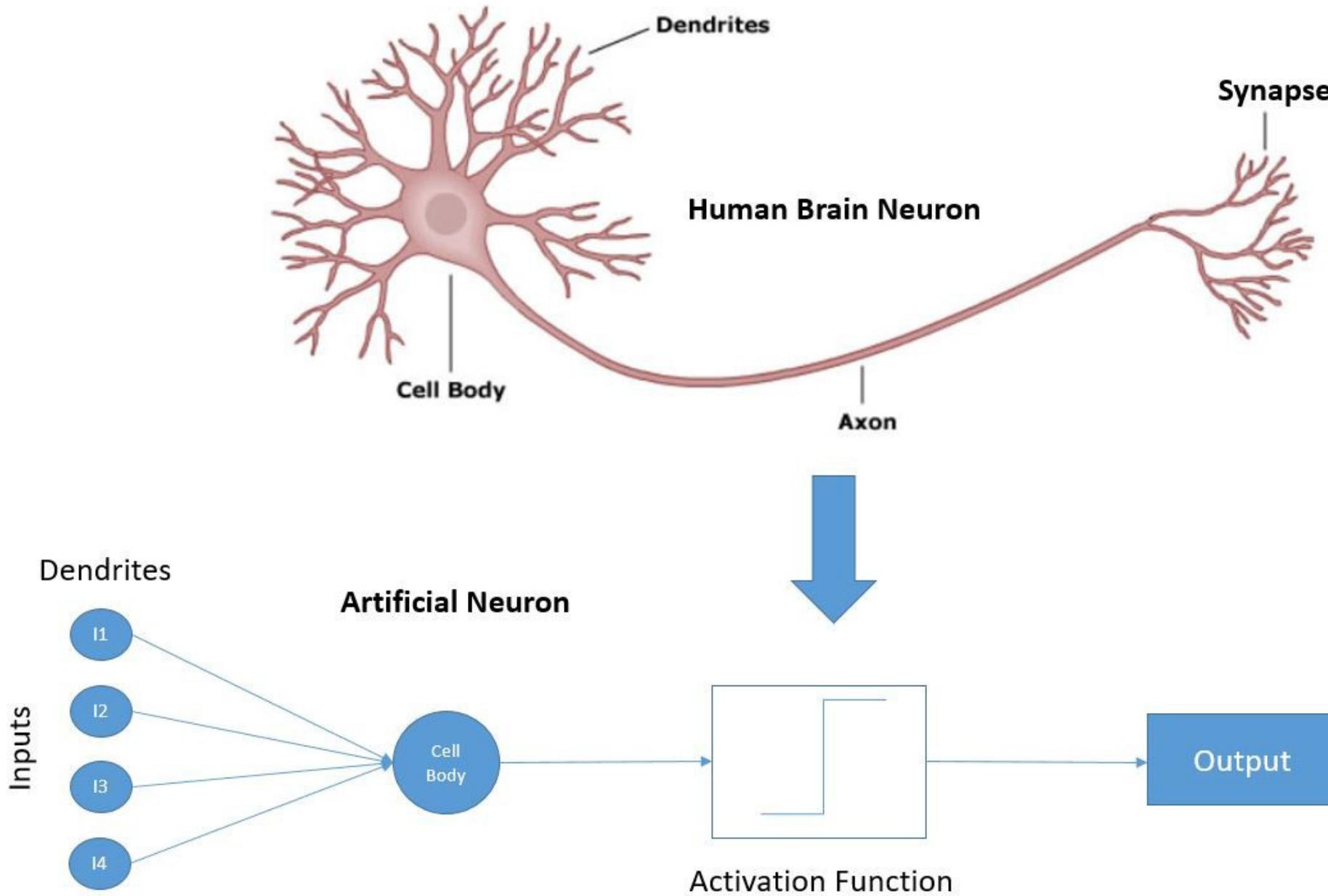
hidden layer 2

output layer

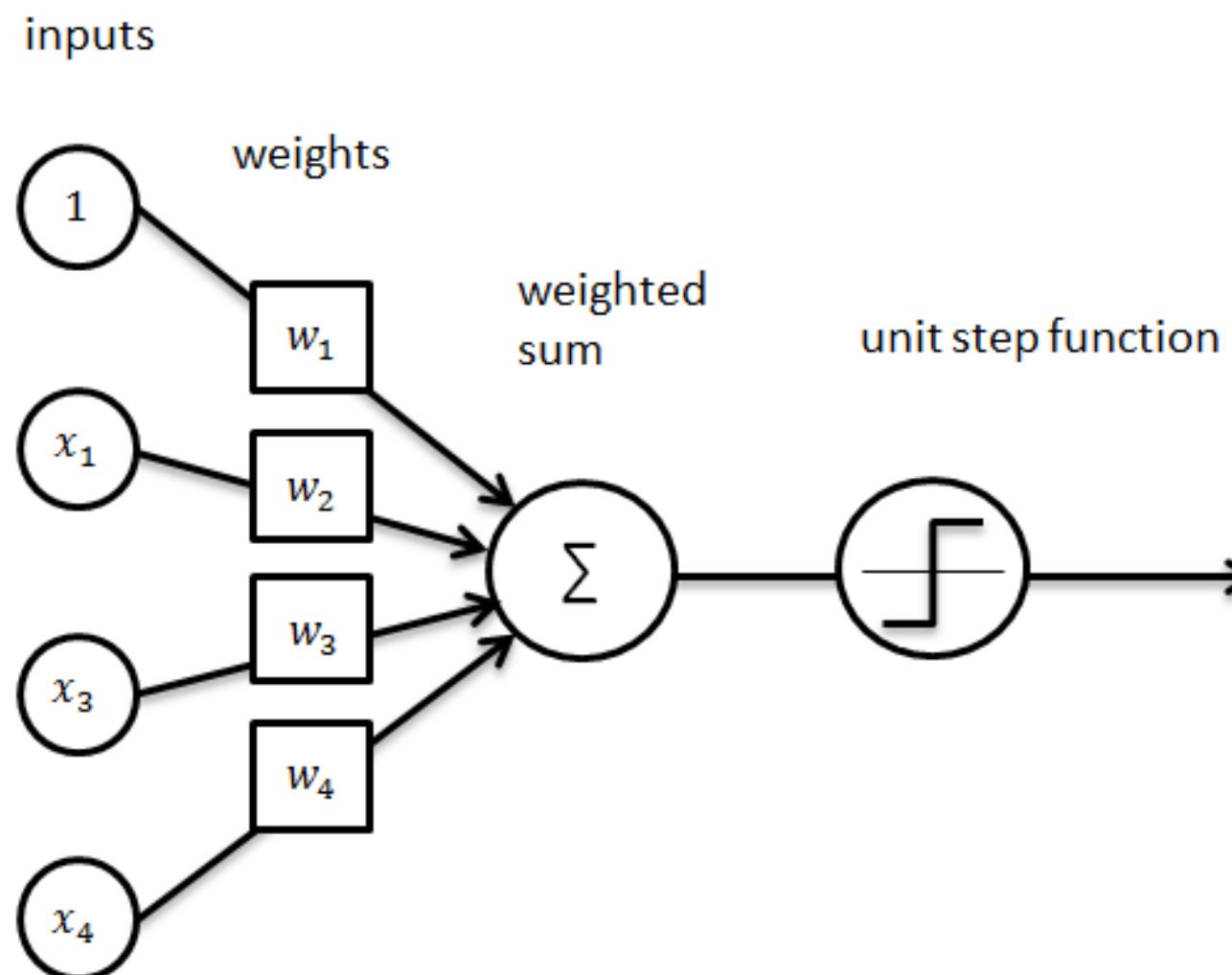
Neural Network

- **Input layer** – initial data for the neural network
- **Hidden layers** – intermediate layer between input and output layer and place where all the computation is done.
- **Output layer** – produce the result for given inputs.

Neural Network



Basic Working of NN

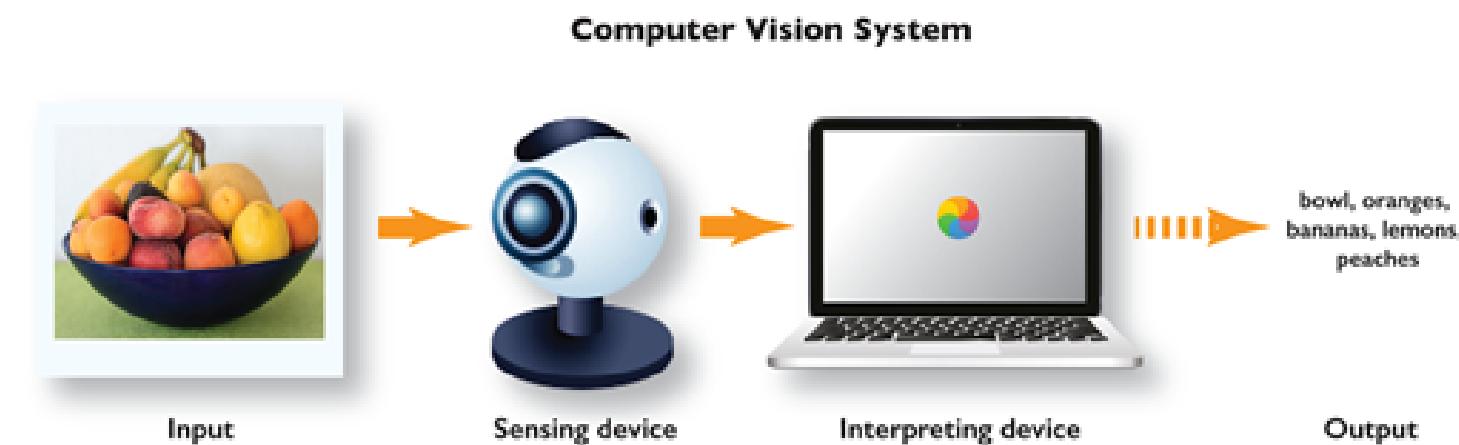
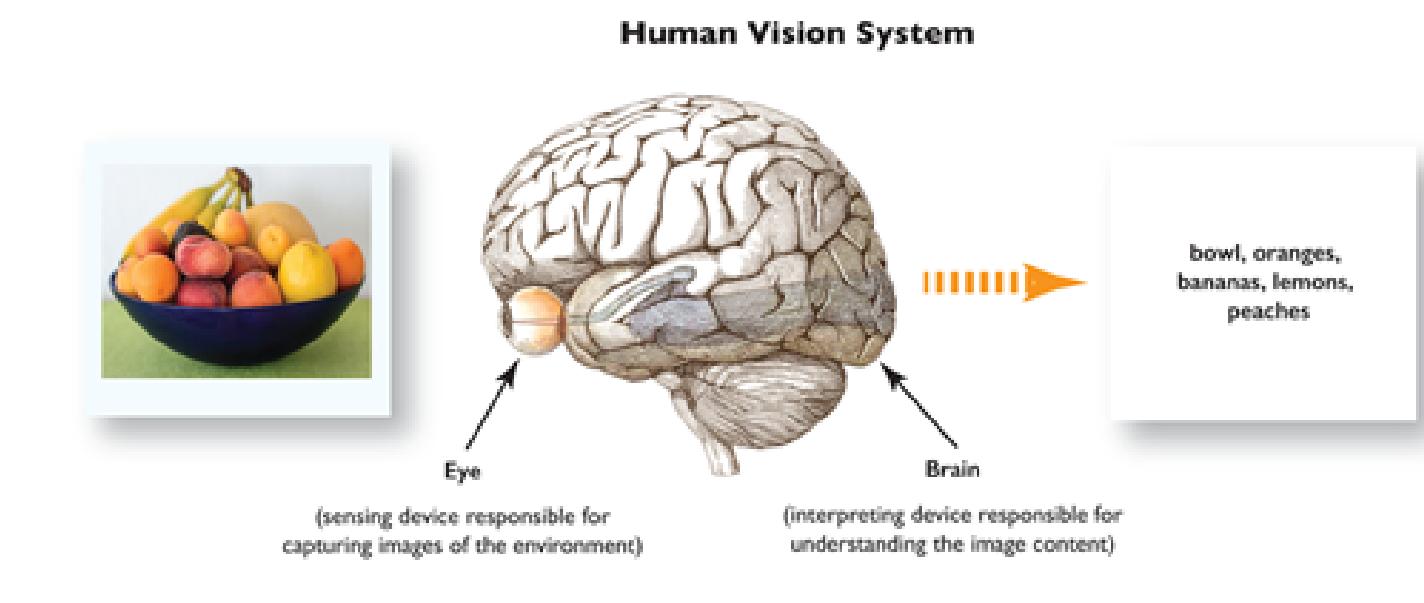


- Receive n-inputs
- Multiplies each input by its weight
- Applies activation function to the sum of results
- outputs the result

Activation Functions

- Controls when unit is active or inactive
- Threshold function outputs **1** when input is **positive** and **0 otherwise**
- Types
 - Sigmoid
 - Relu
 - Tan H
 - Leaky ReLU

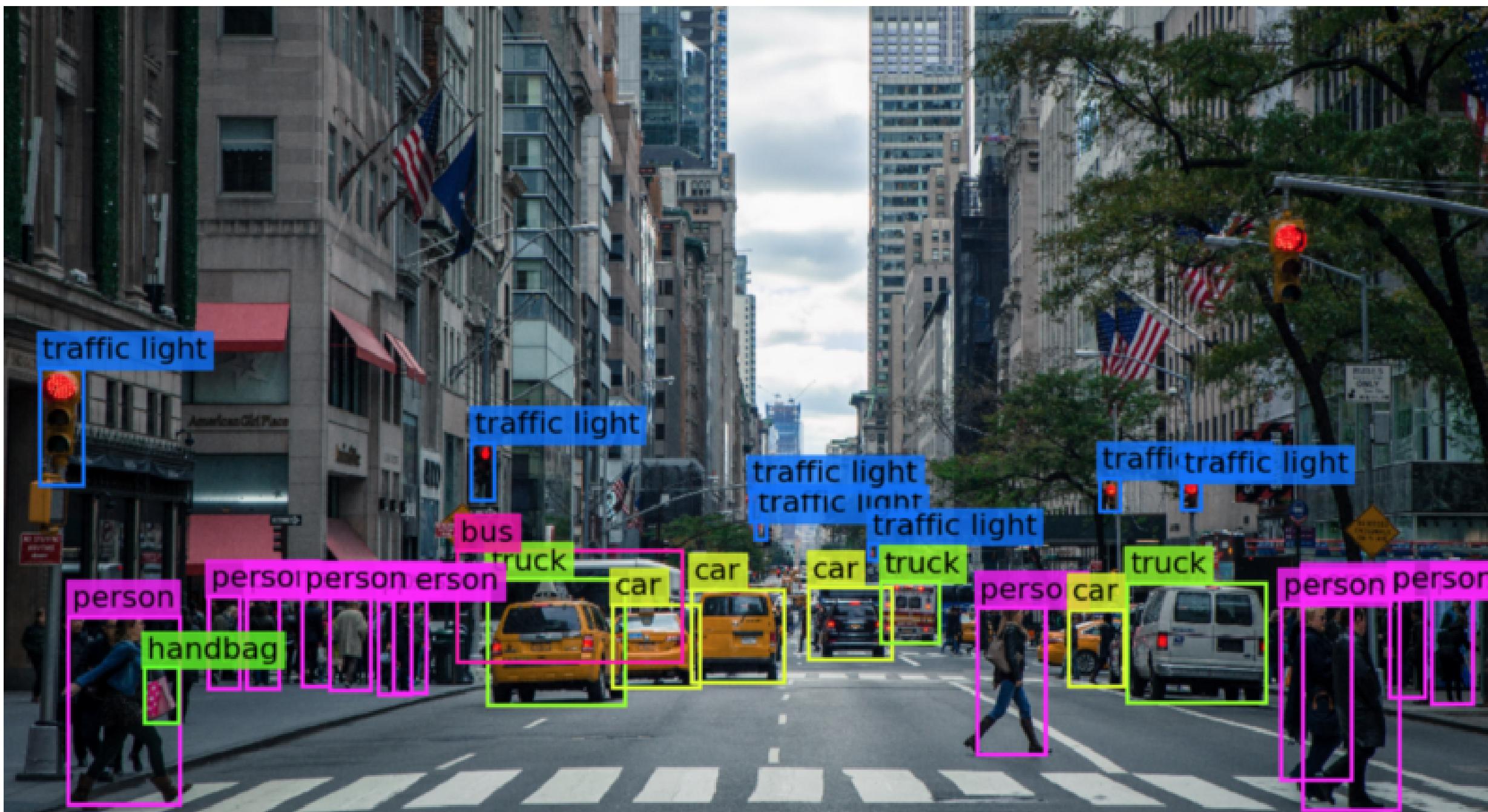
Computer vision



Computer vision

- Subfield of AI focused on visual data
- Enable machines to **see** and interpret the visual world
- Key Tasks: Image classification, object detection, scene understanding
- Neural networks, like CNNs, are central for feature extraction
- Powered by Deep Learning for complex pattern extraction

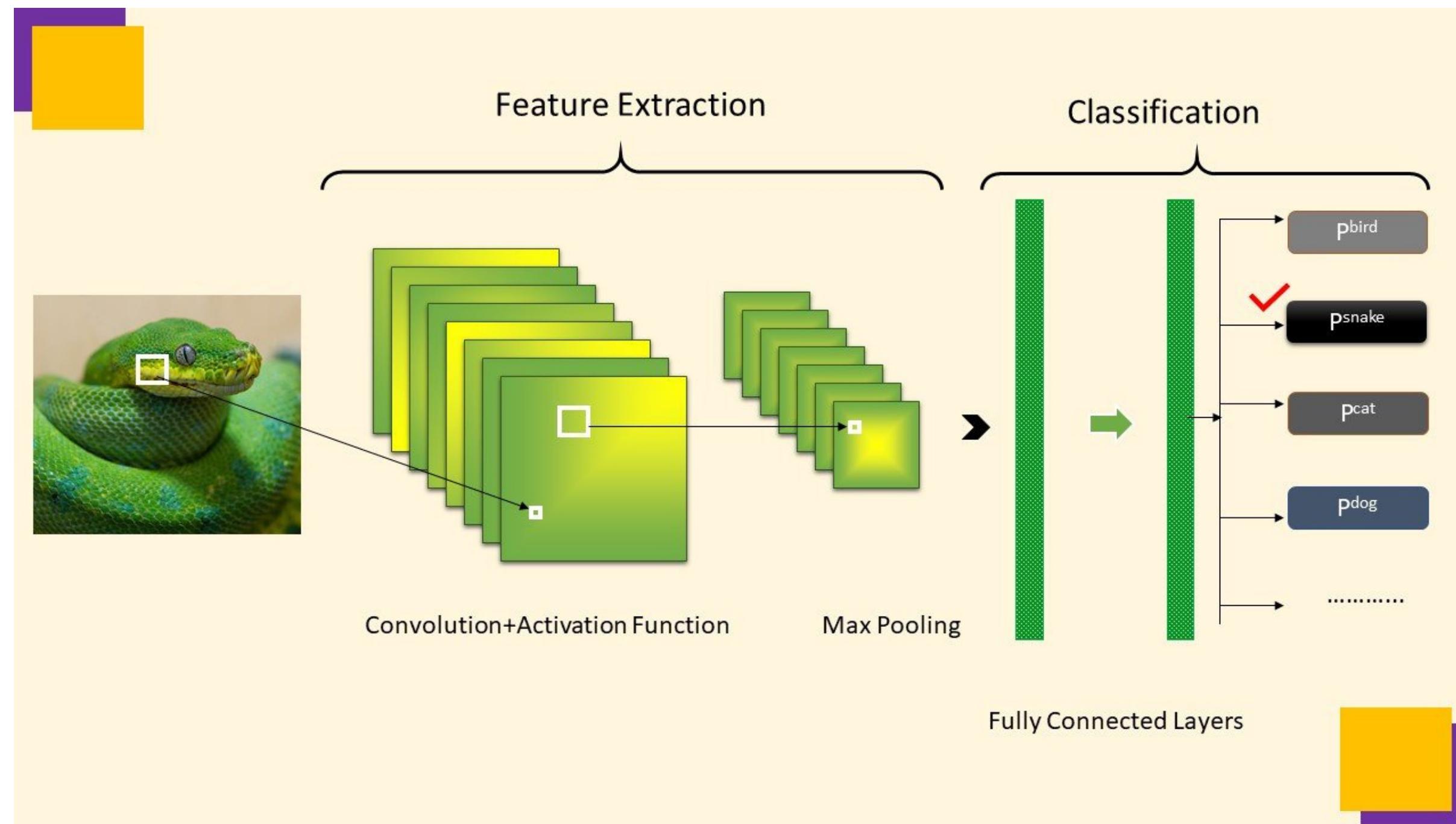
Computer vision

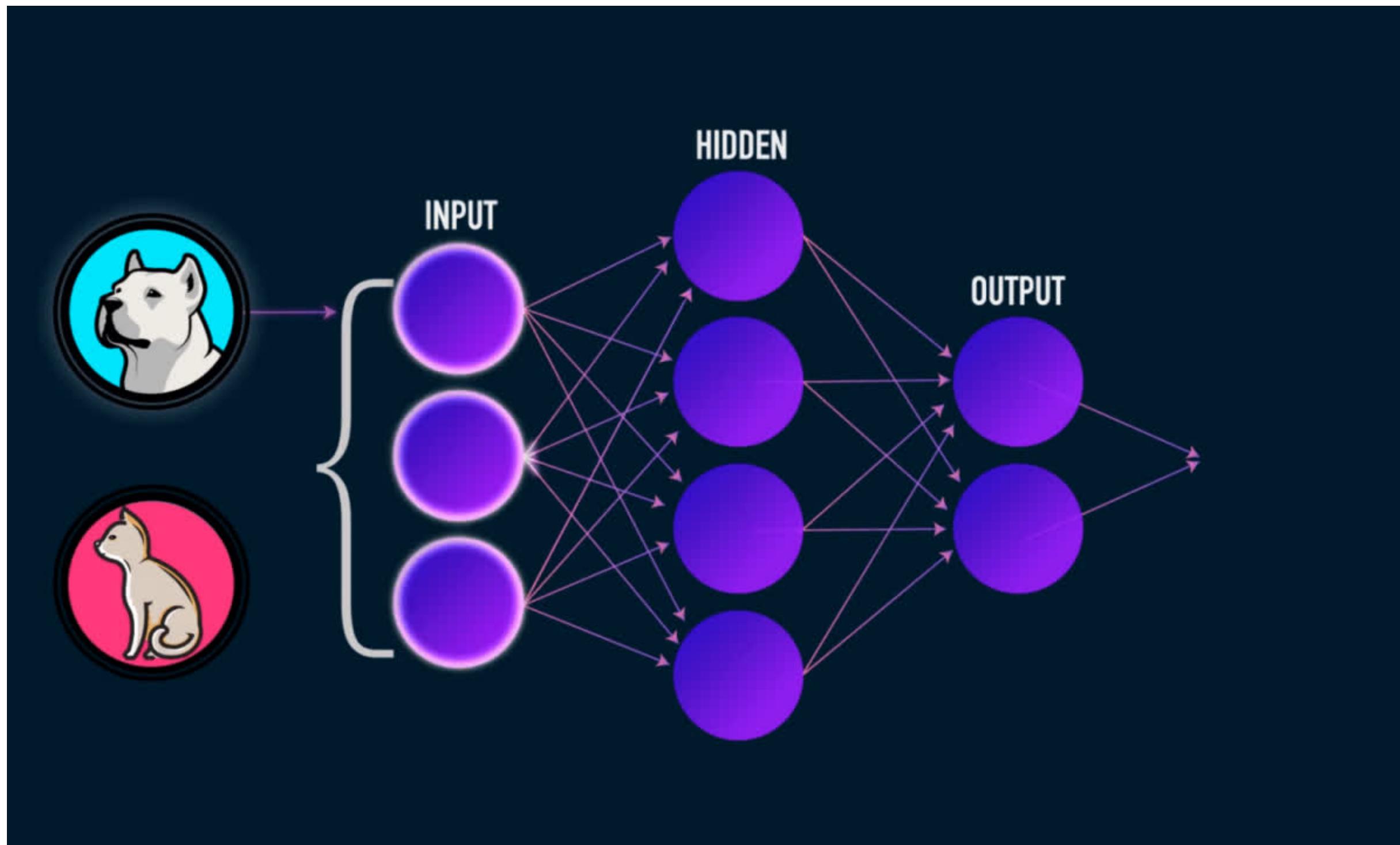


Convolutional Neural Network (CNN)

- **Image Processing:** CNNs are great at understanding images and computer vision tasks
- **Spotting Patterns:** They find patterns like edges and textures(**Convolutional Layers**)
- **Downsizing:** They make things smaller to save time(**Pooling Layers**)
- **Making Sense:** CNNs can figure out what's in pictures
- **Transfer Learning:** They can learn from other smart models

Convolutional Neural Network (CNN)

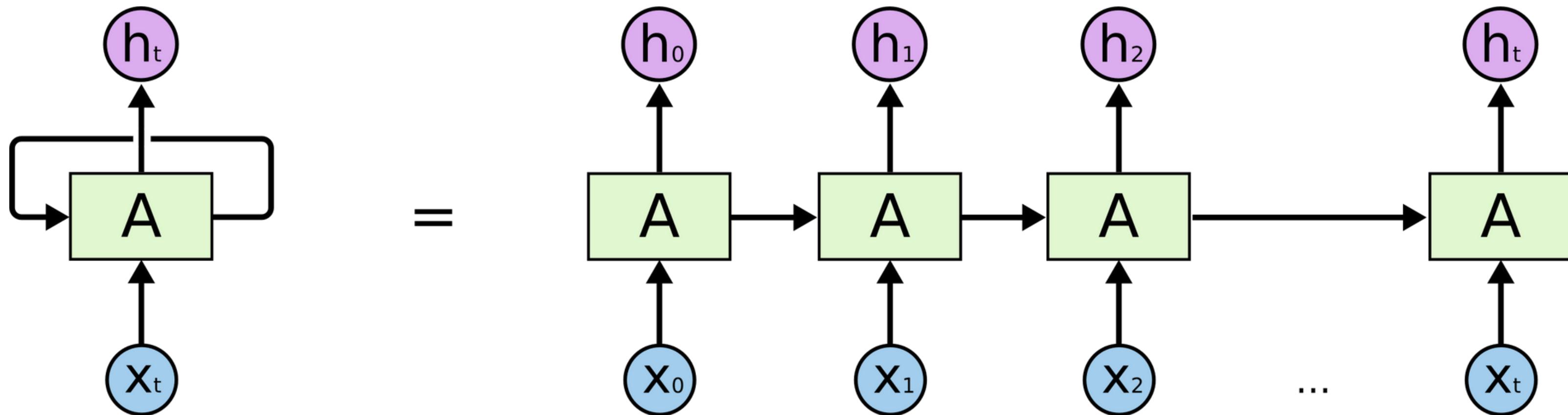




Recurrent Neural Network (RNN)

- **Sequential Data:** RNNs are for dealing with things in order, like sentences or time series.
- **Remembering:** They use memory cells to remember past information and context while processing sequences
- **Time-Step Computation:** RNNs work on one piece of data at a time, moving forward
- **Variable Length:** They're okay with data of different lengths, like sentences of varying words
- **Shortcomings:** RNNs struggle to remember far-back information in long sequences.

Recurrent Neural Network (RNN)



Applications

- **Self-Driving Cars**
 - Deep learning powers autonomous vehicles, enabling them to perceive their environment and make driving decisions
- **Driver Assistance Systems**
 - Features like adaptive cruise control and lane-keeping are powered by deep learning.
- **Machine Translation**
 - Services like Google Translate use deep learning to translate languages.
- **Chatbots**
 - Virtual assistants like Siri and Alexa
- **AI Camera**
 - Detect helmets ,seat belts ,number plates

Applications

- **Snap chat/Instagram filters**
 - Different overlay filter by detecting face landmarks
- **Face App**
 - Uses input image and modifies into different age , gender , color
- **Facebook**
 - Auto tag option is done by recognizing faces in the uploaded images
- **Netflix Recommendations**
 - uses deep learning algorithms to personalize content recommendations
- **DeepFake Technology**
 - AI can manipulate or superimpose a person's face onto someone else's in a video



Thank You...