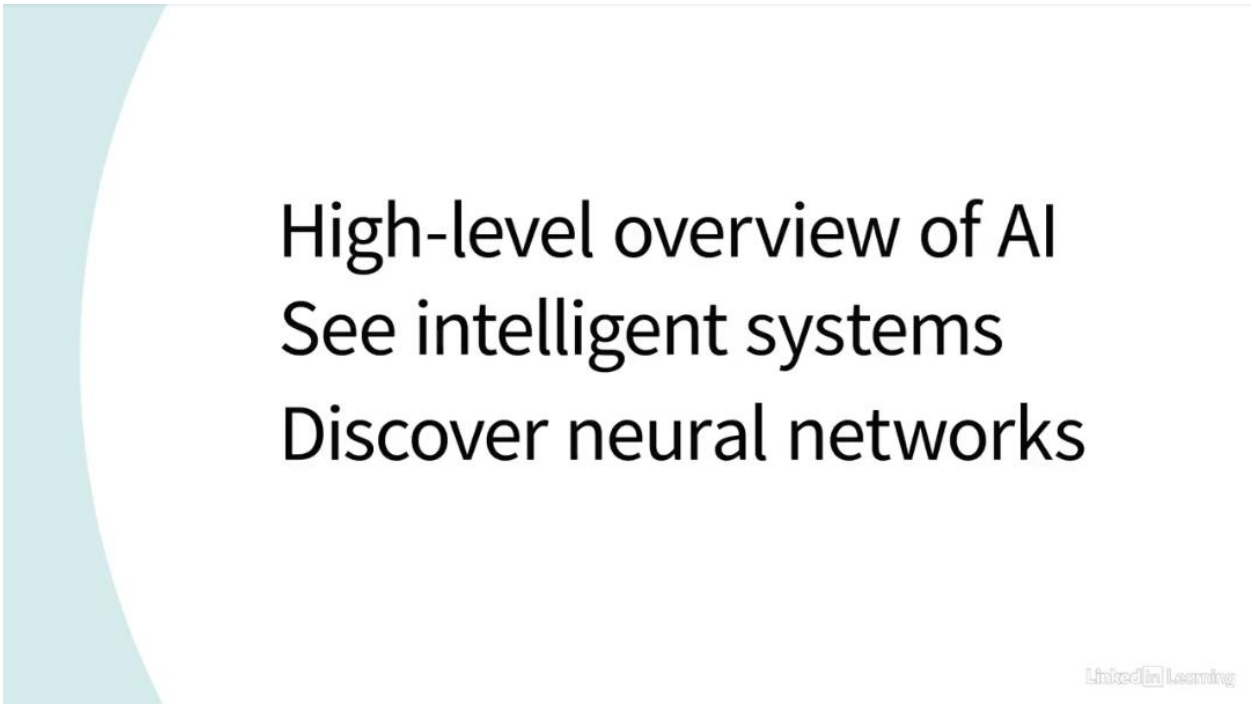
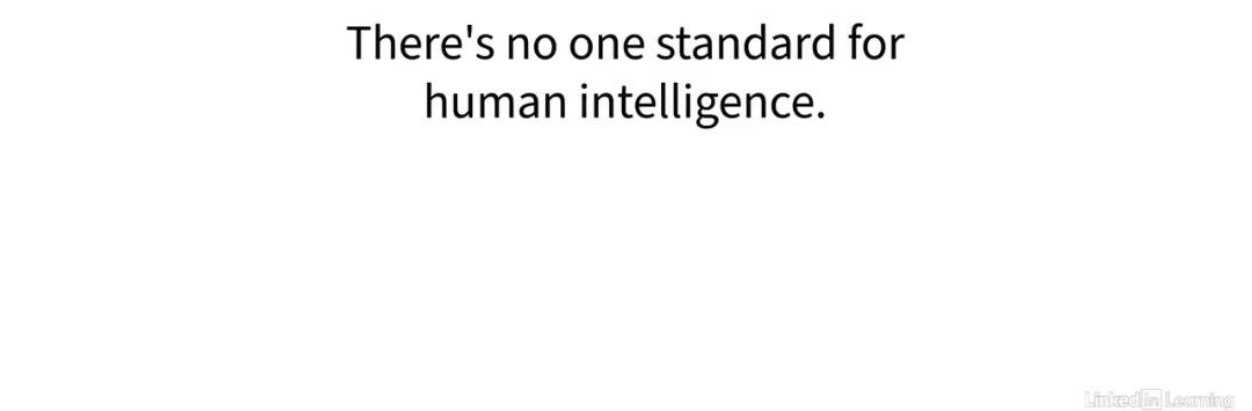
INTRODUCTION TO ARTIFICIAL INTELLIGENCE

INTRODUCTION

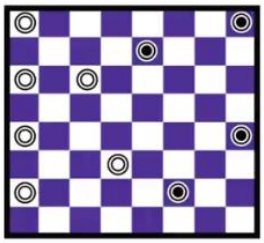


1. WHAT IS ARTIFICIAL INTELLIGENCE?

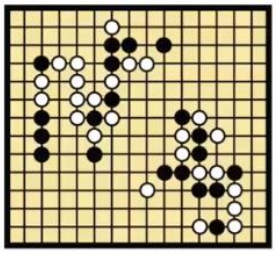
DEFINE GENERAL INTELLIGENCE



Early systems outperform humans.



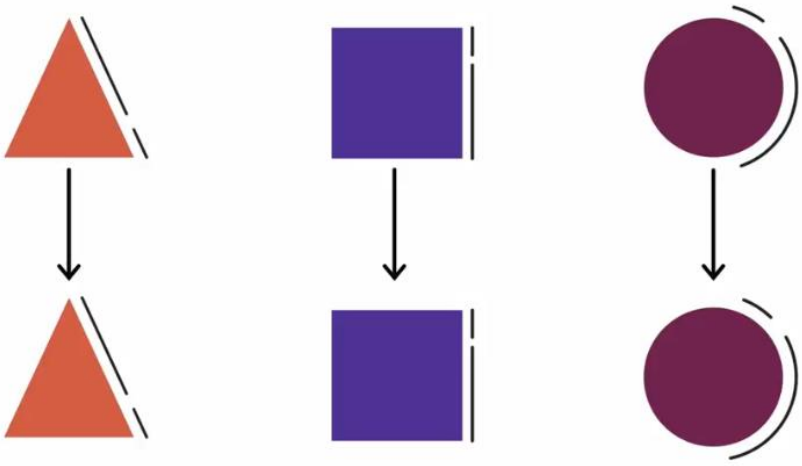
Systems start to seem more intelligent.



Artificial Intelligence

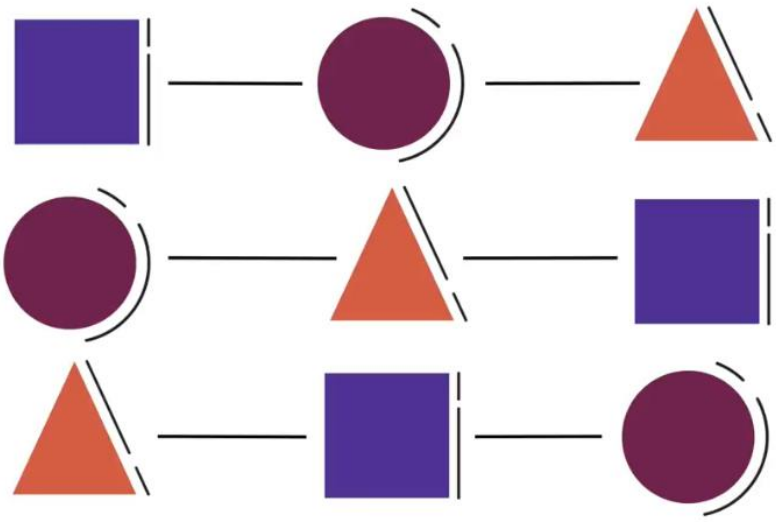
A system that shows behavior that could be interpreted as human intelligence

Rules and pattern matching

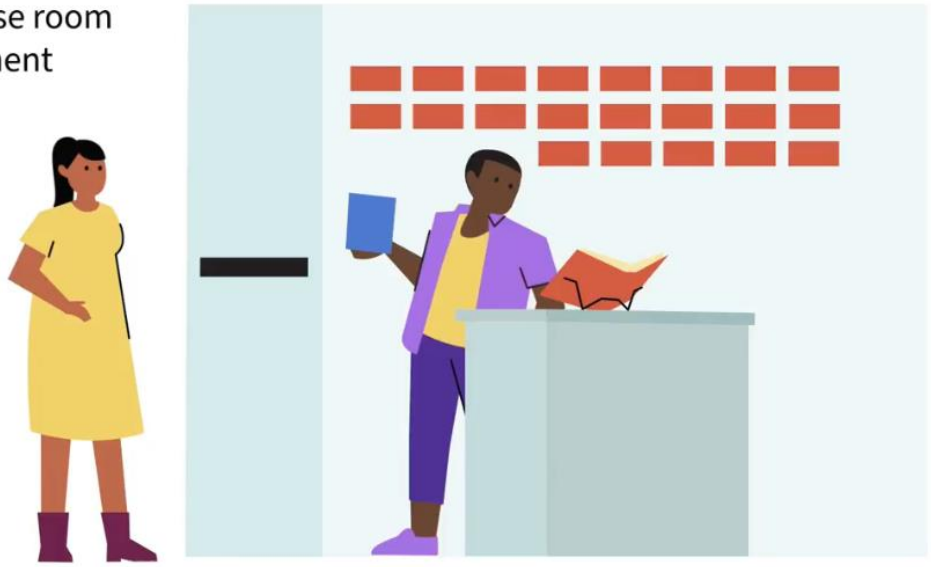


THE GENERAL PROBLEM SOLVER

Physical symbol system hypothesis



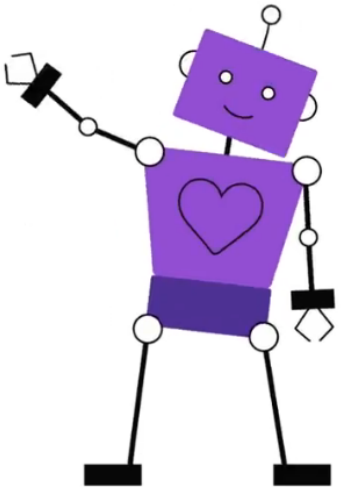
Chinese room argument



STRONG VS. WEAK AI

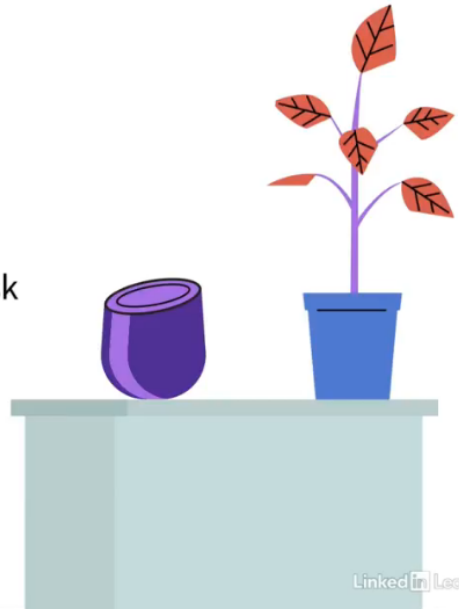
Strong AI

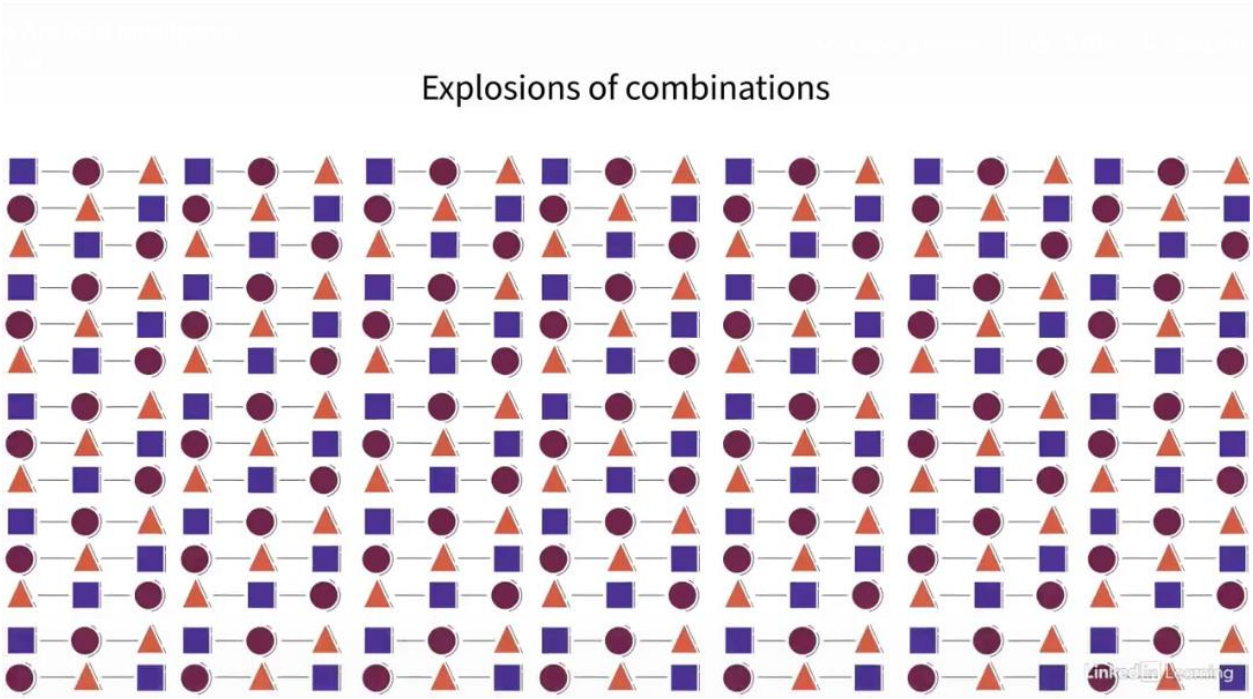
Machine displays all person-like behavior



Weak AI

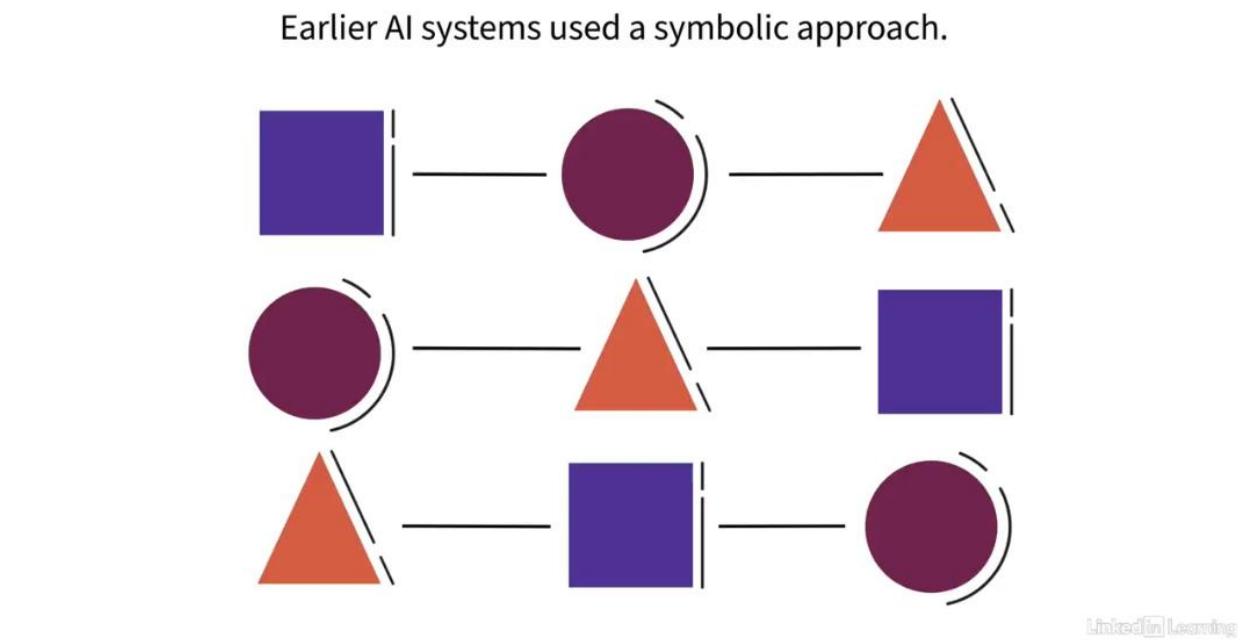
AI that's confined to a very narrow task



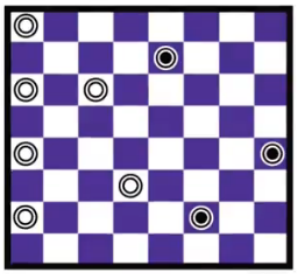


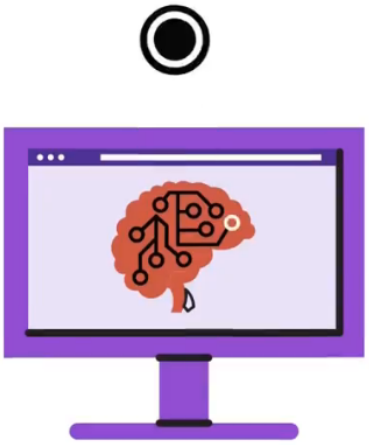
2. THE RISE OF MACHINE LEARNING

MACHINE LEARNING



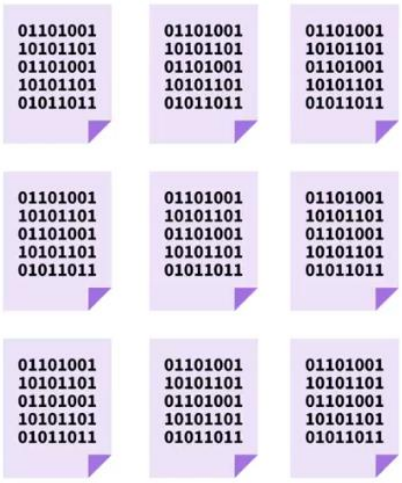
Program a system to become intelligent through observation.

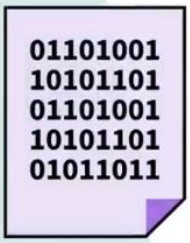




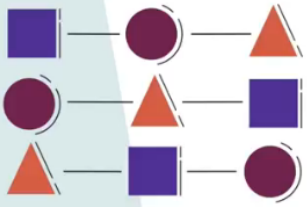
Not that much digital data in the 1950s

Huge increase in digital data in the 1990s





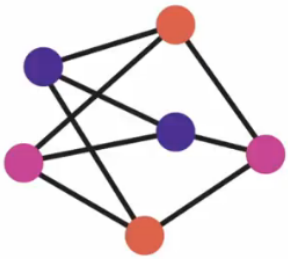
By learning through data, machines could continue to grow with more data.



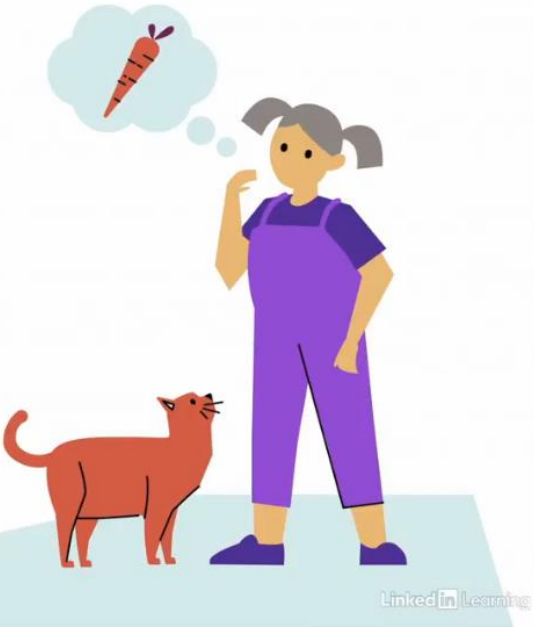
Machine learning systems are still just identifying patterns.

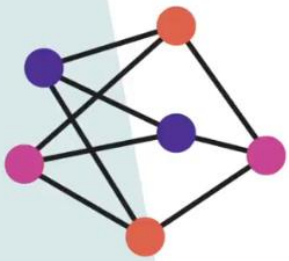
Artificial Neural Network

AI system that mimics the structure of the human brain

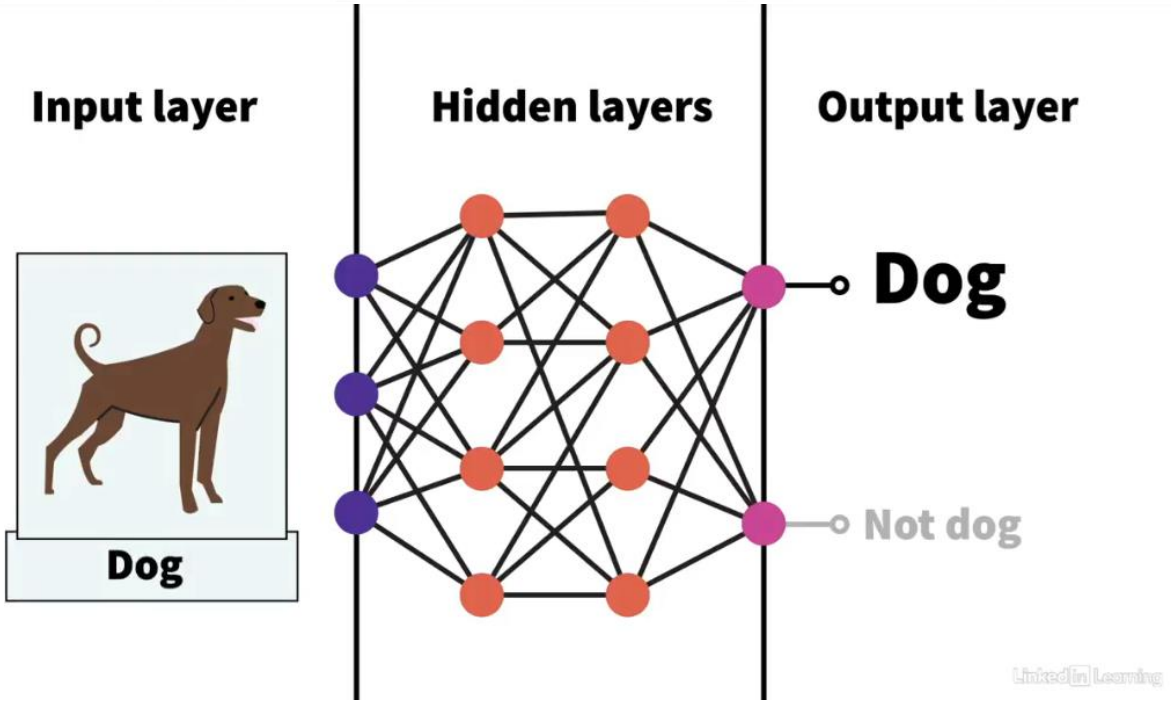


- Fur?
- Bigger than a house?
- Alive?
- Make noise?



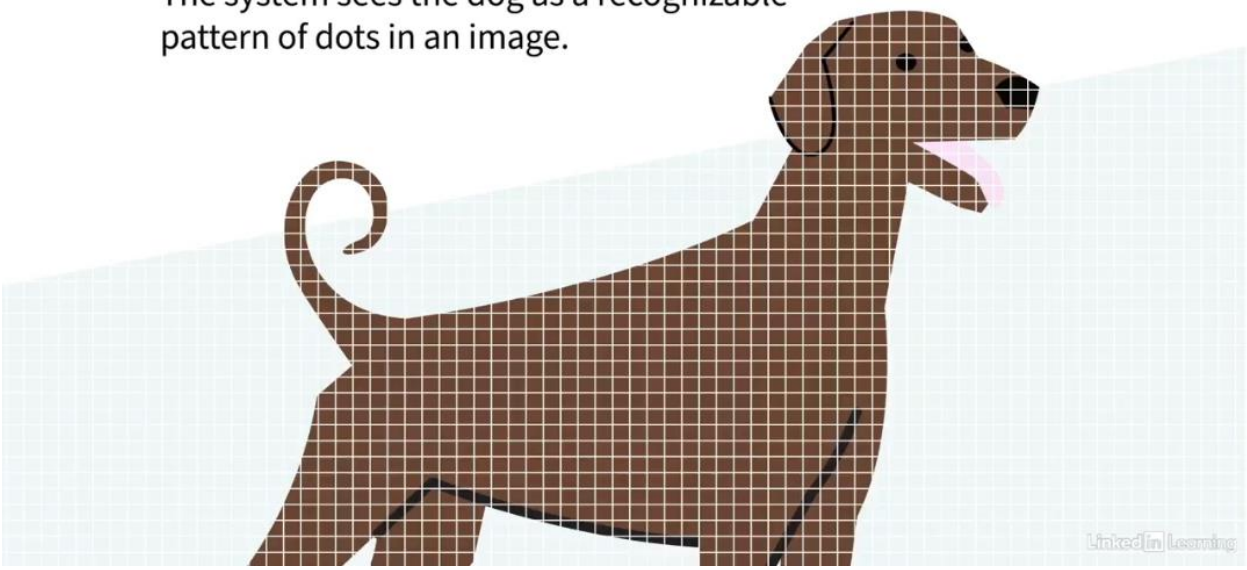


The artificial neural network uses hundreds (or millions) of numerical dials.



Training the neural network

The system sees the dog as a recognizable pattern of dots in an image.



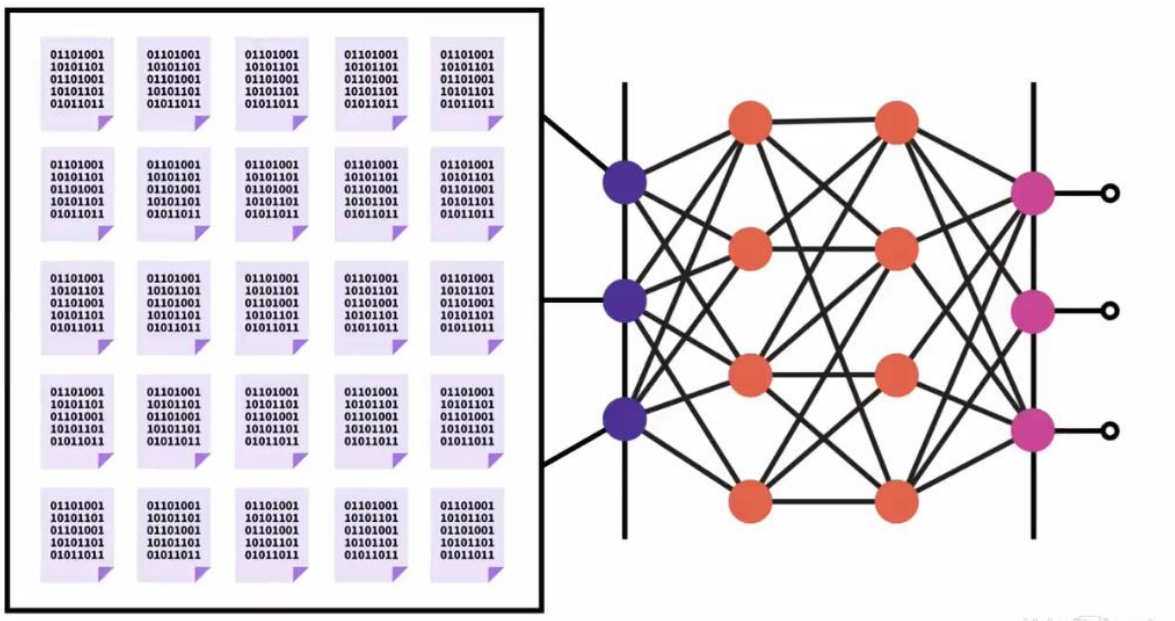
- Neural networks are machine learning systems
- Network needs access to huge amounts of data

3. COMMON AI SYSTEMS

SEARCHING FOR PATTERNS IN DATA

Machine learning systems
feed on **data** to **learn** new things.

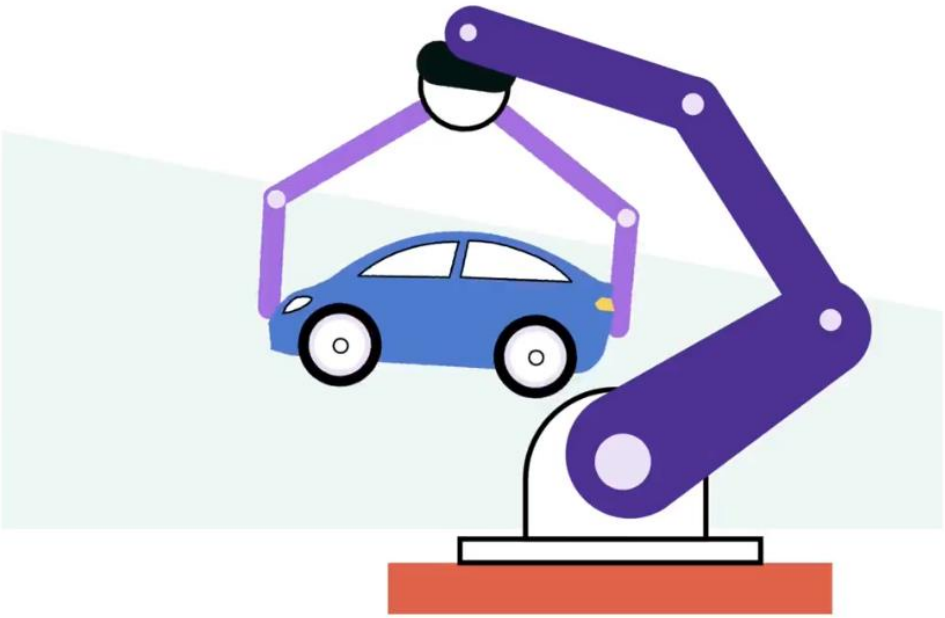
- Customer interests
- Industry trends
- New products
- Improve features



The network might be sensing things that humans are unable to perceive.

This can be a problem with industries such as insurance and healthcare.

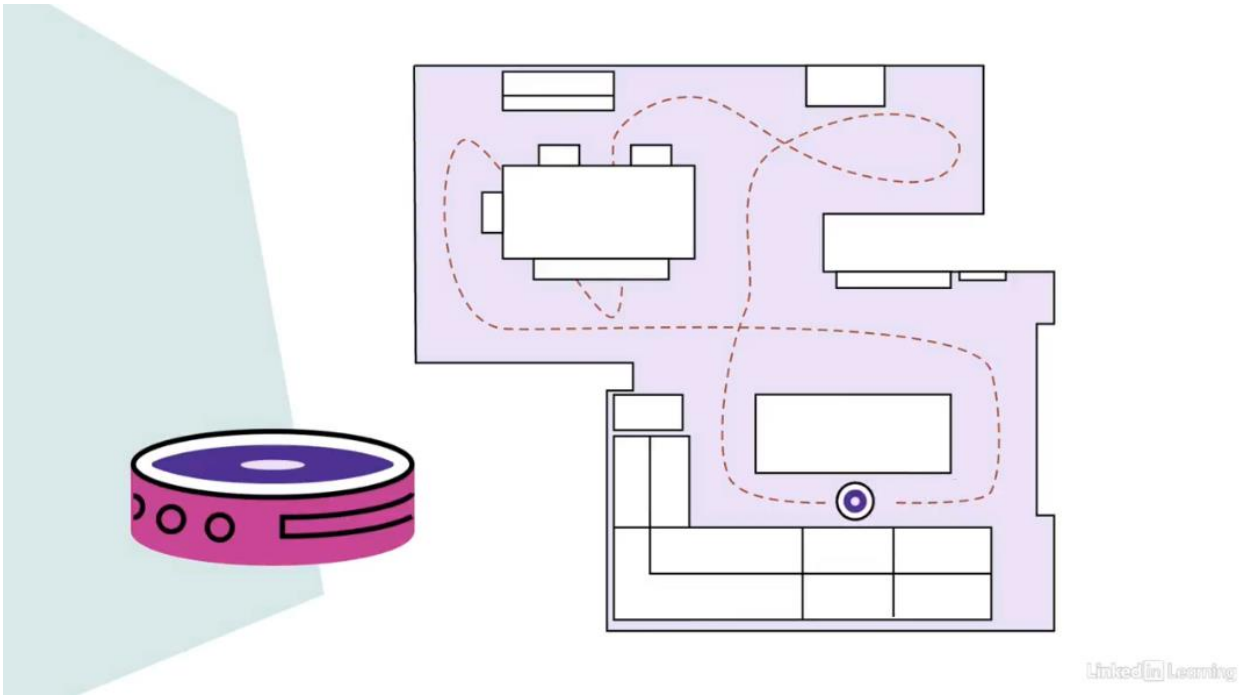
ROBOTICS



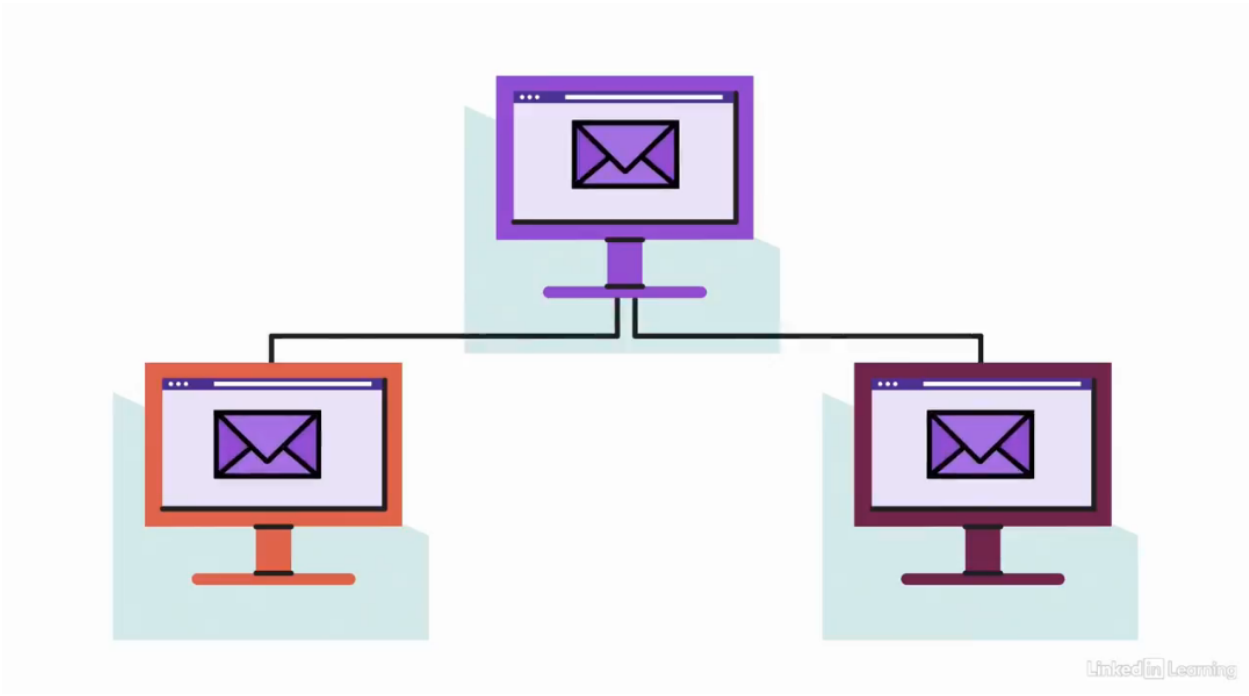
Robotics combined with machine learning gives us many more options.

Self-driving vehicles

Training the network

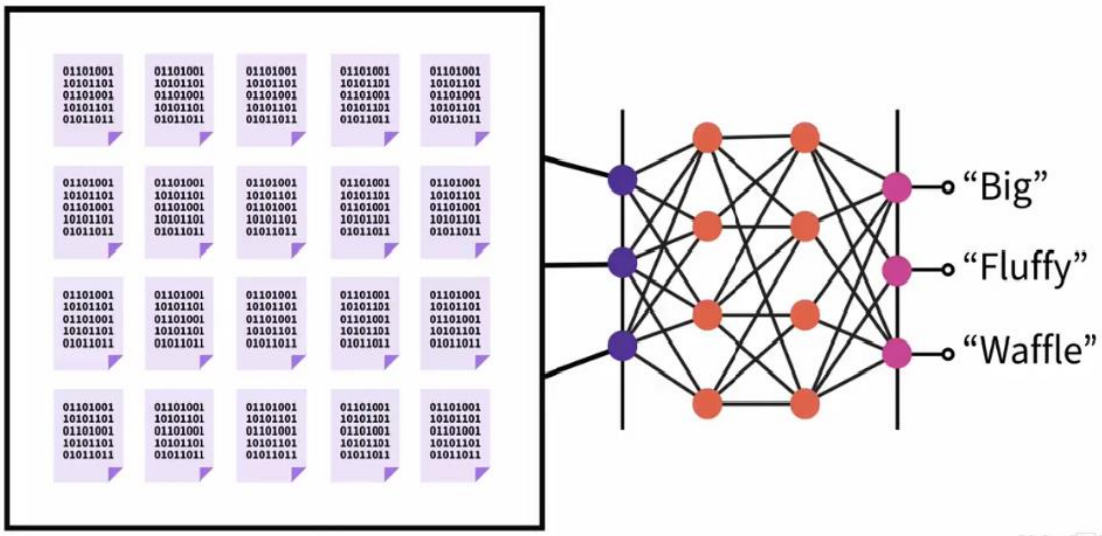


NATURAL LANGUAGE PROCESSING



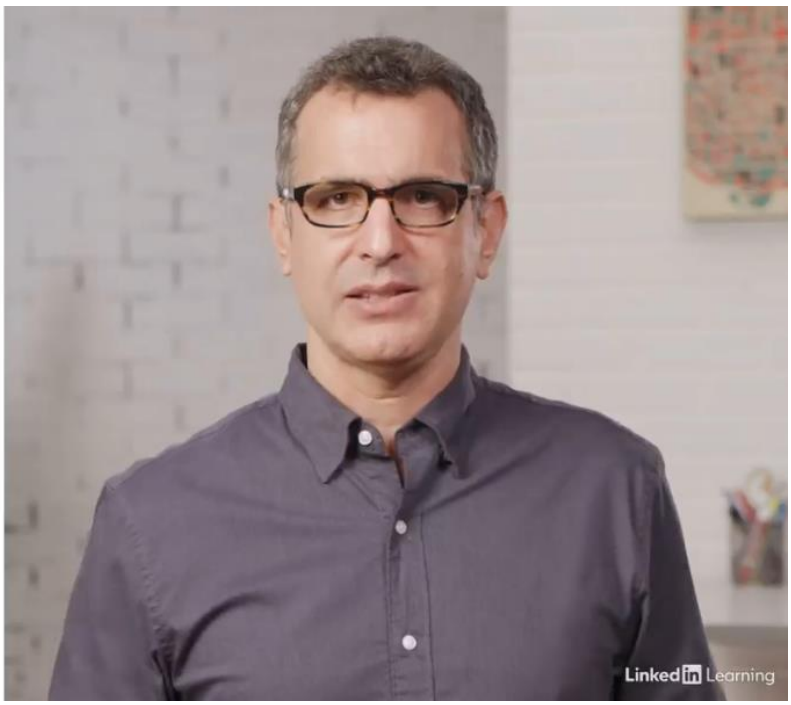
Natural language processing

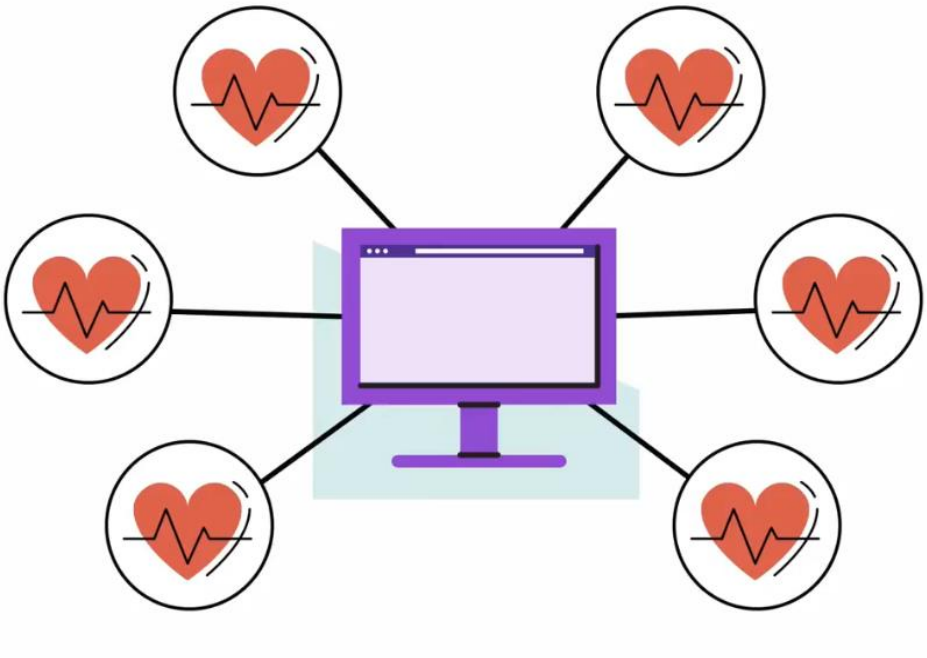
Natural Language Processing



Natural Language Processing

Internet of
Things (IoT)





4. LEARN FROM DATA

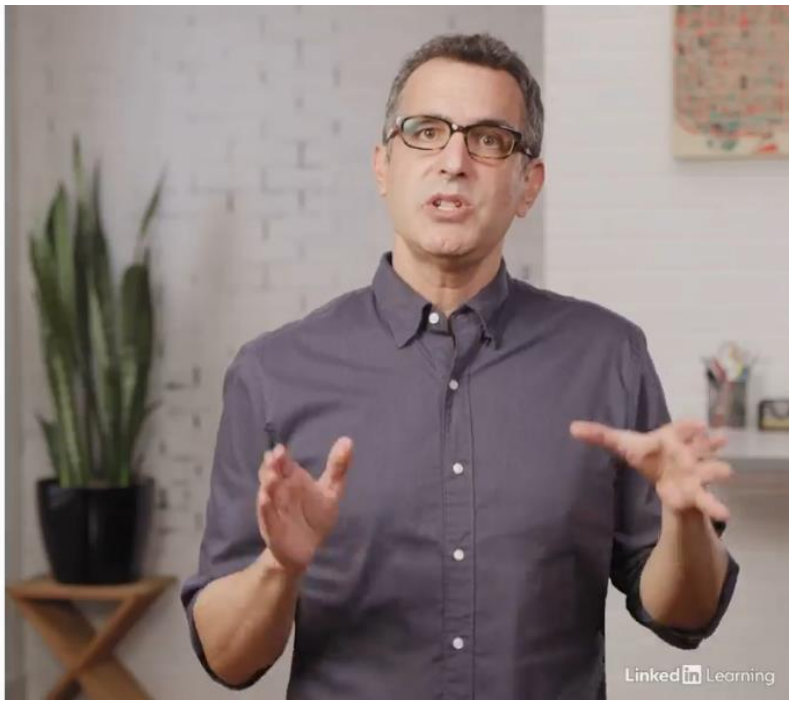
LABELED AND UNLABELED DATA

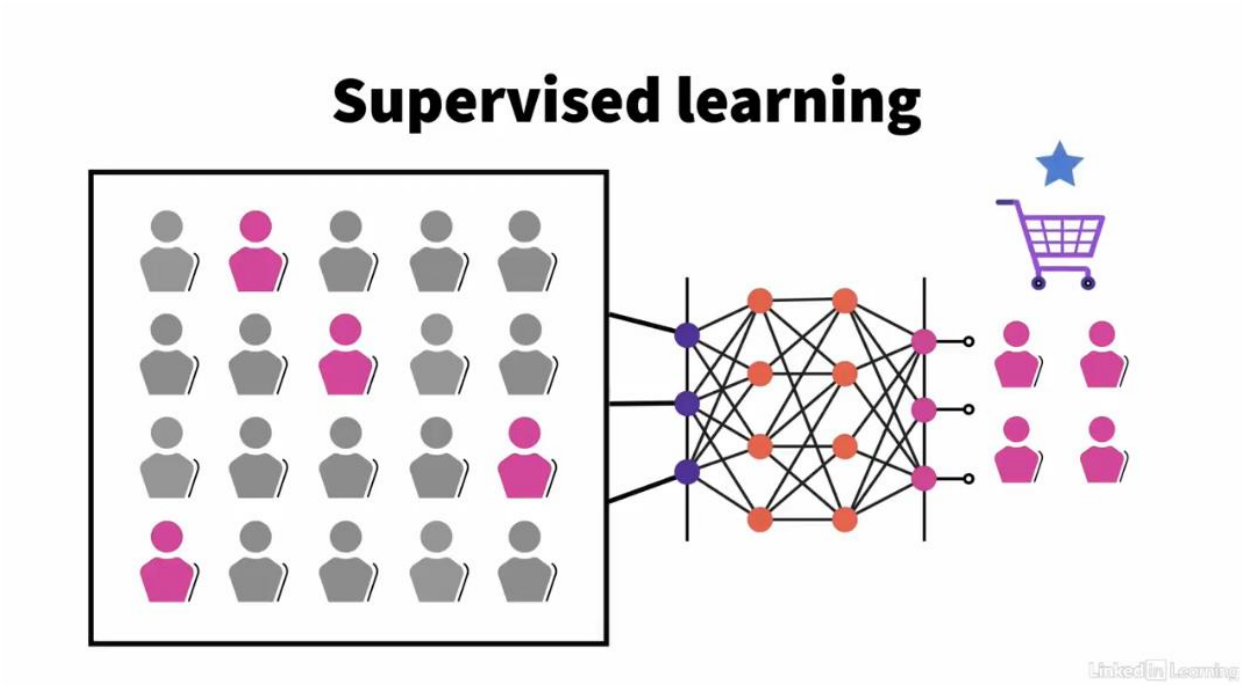
Teaching how to play chess

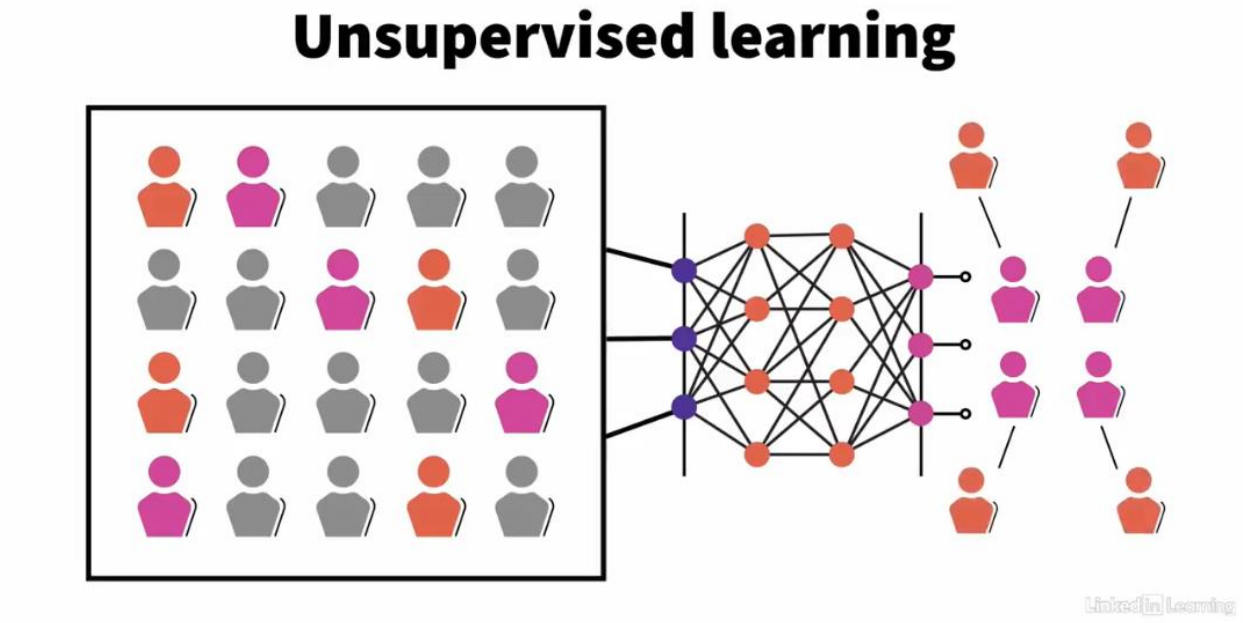
Observing how to play chess

- Supervised learning

- Supervised learning
- Unsupervised learning





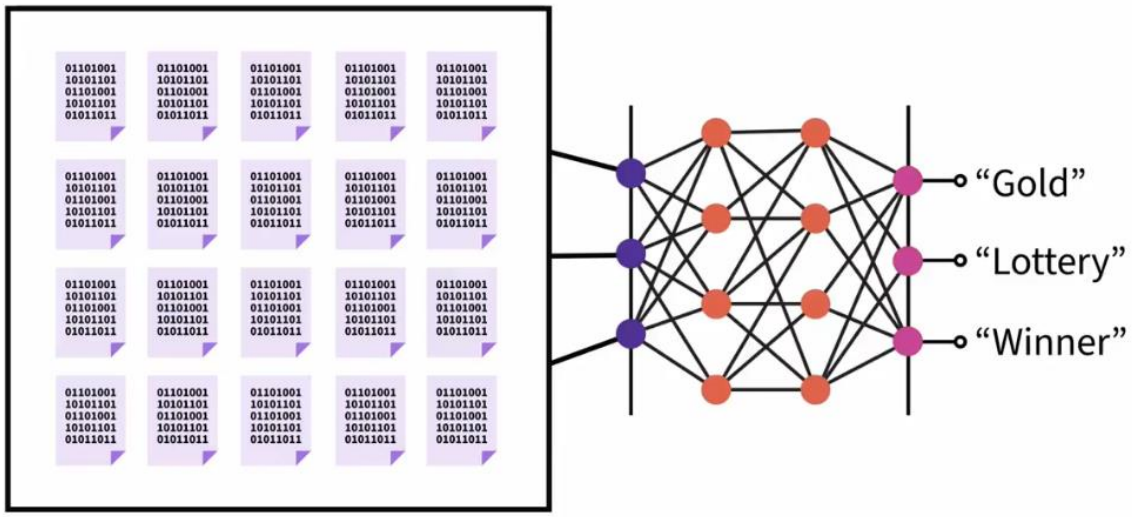


MASSIVE DATASETS

"Gold"

"Lottery"

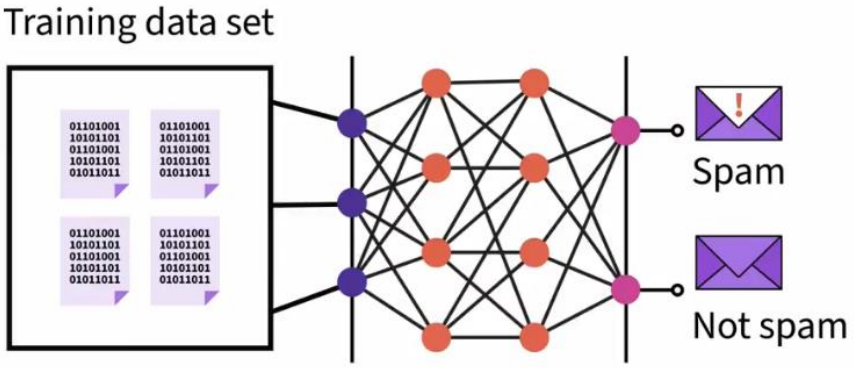
"Winner"

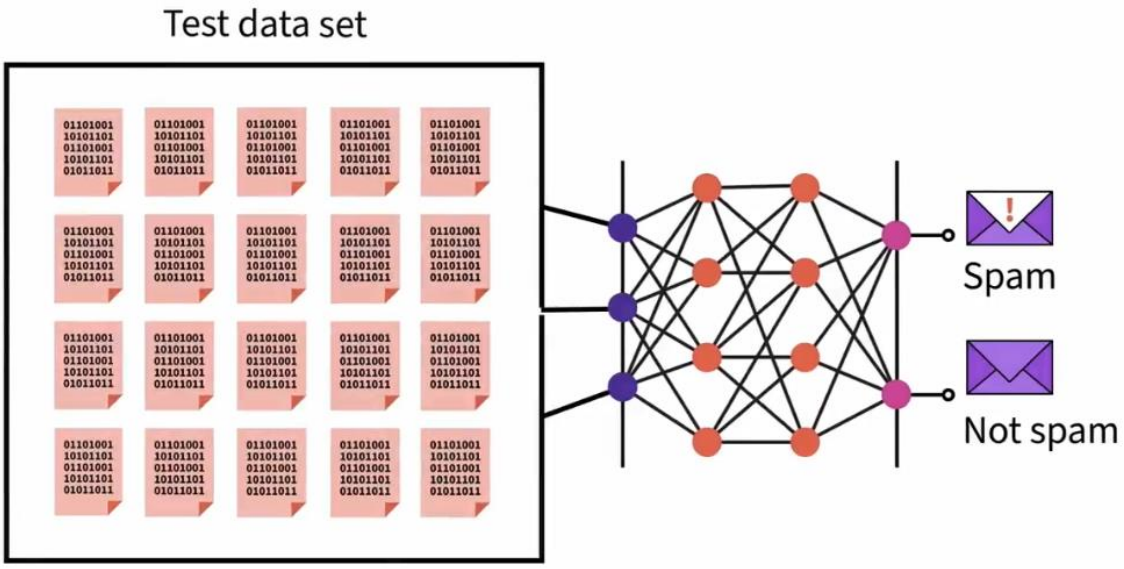


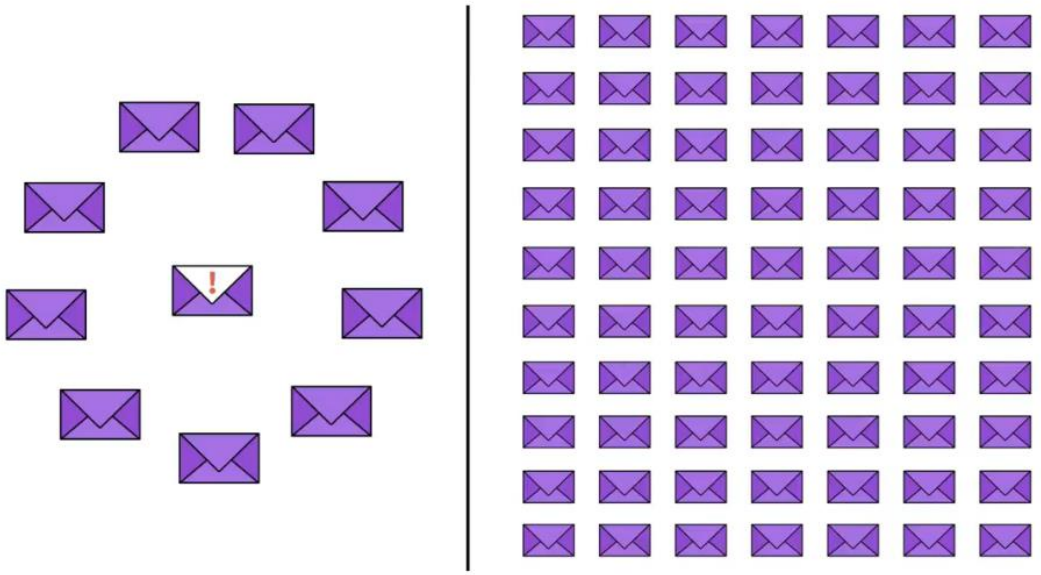
- Training data set
- Test data set

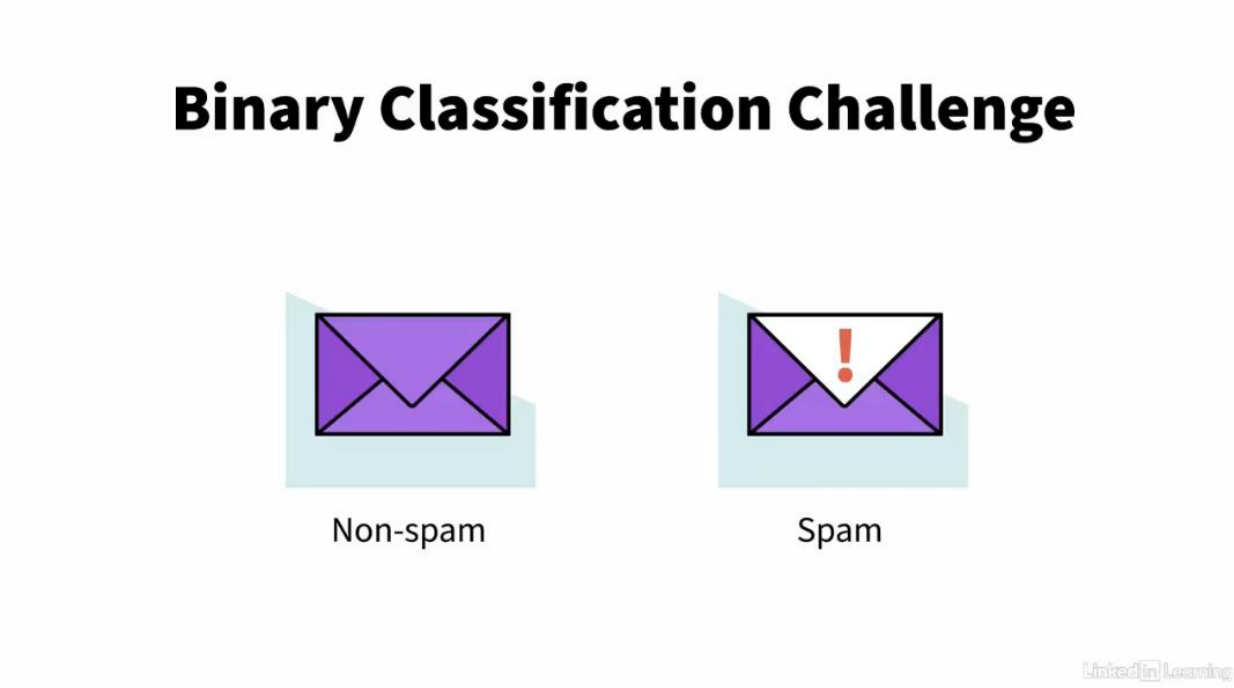
Training Data Set

A smaller chunk of data that the machine uses to learn


Training data set
Spam
Not spam


Test data set
Spam
Not spam





5. IDENTIFY PATTERNS

CLASSIFY DATA

Classifying Data

Binary classification

All binary classification
uses **supervised learning**.

Binary Classification

Binary Classification Challenge

Not spam

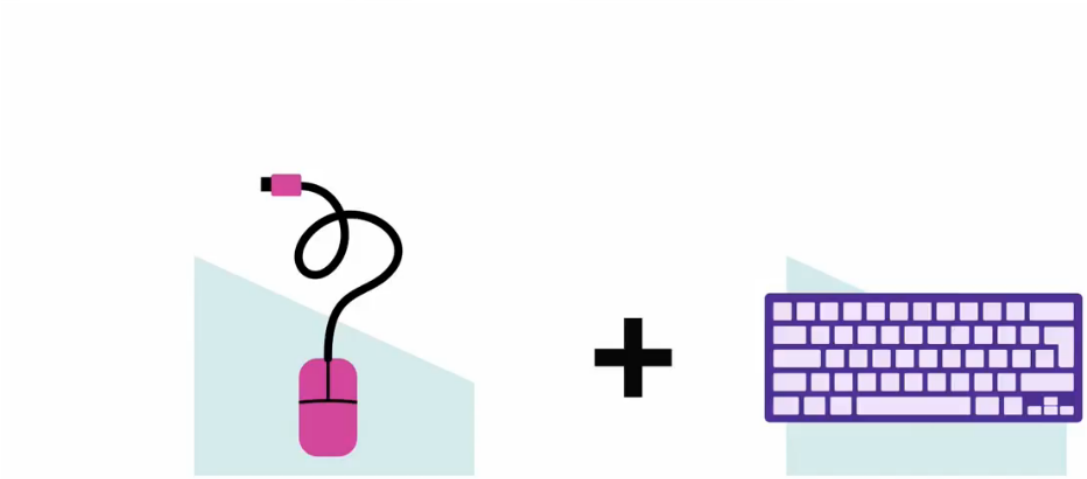
Spam

- Booking data
- Fraudulent transactions
- Spam

CLUSTER DATA

Data Clusters

AI system's use of unsupervised learning to create its own groups of data



Supervised learning = Classifying

Unsupervised learning = Clustering

Classify

- Chocolate
- Peanut butter
- Mints
- Gummies

Classify

- Chocolate
- Peanut butter
- Mints
- Gummies

Cluster

- Unknown candy

Cluster

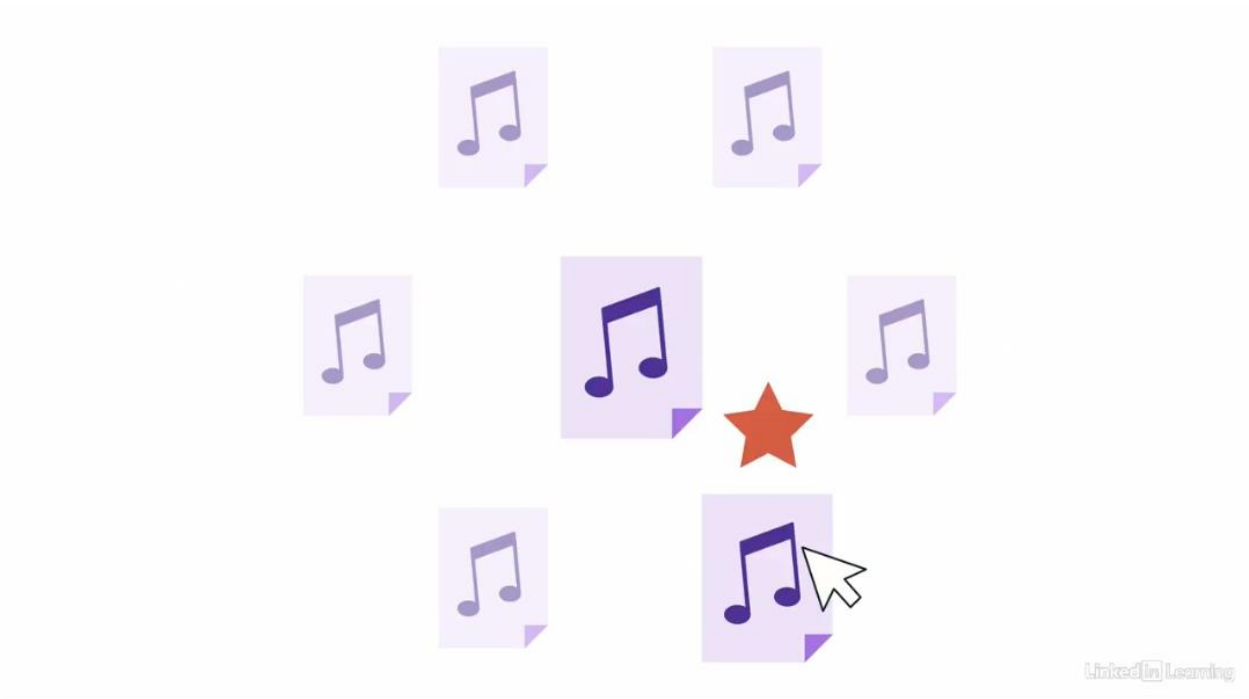
- Candy size
- Candy color

The biggest advantage of clustering is there's a lot more unlabeled data.

REINFORCEMENT LEARNING

Reinforcement Learning

Machine learning algorithms that use rewards as a way to give the system incentive to find new patterns

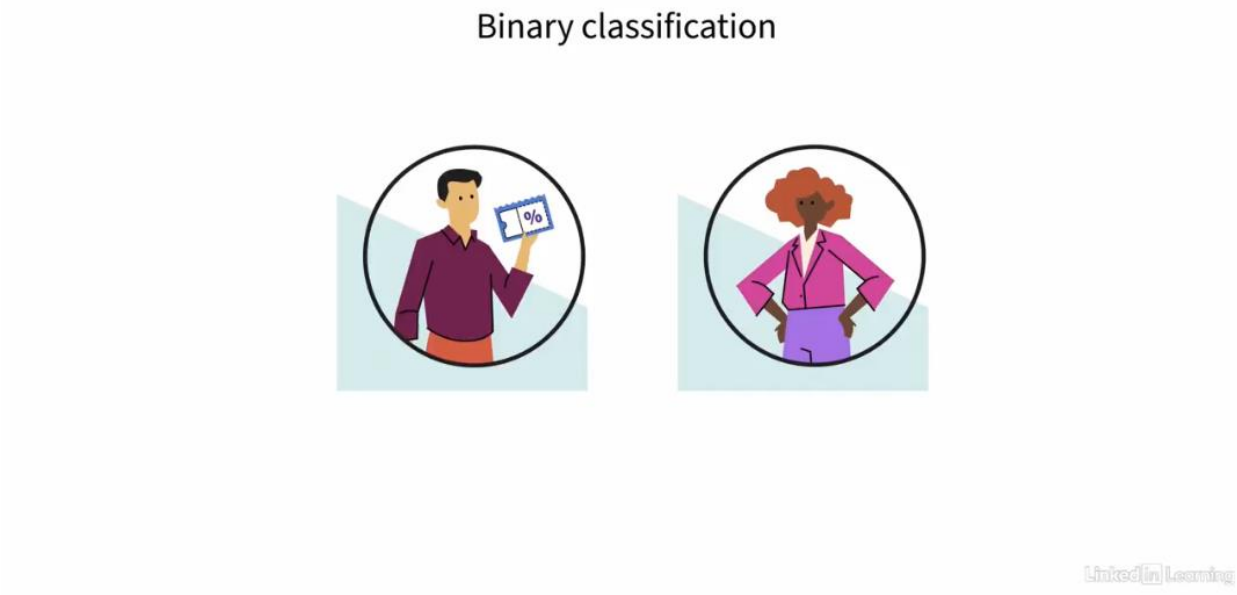


Q-Learning

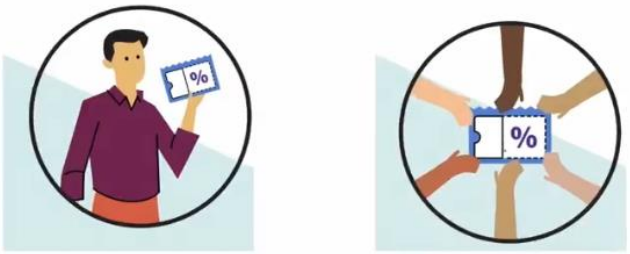
Reinforcement learning that will find the best course of action, given the current state of the agent

6. MACHINE LEARNING ALGORITHMS

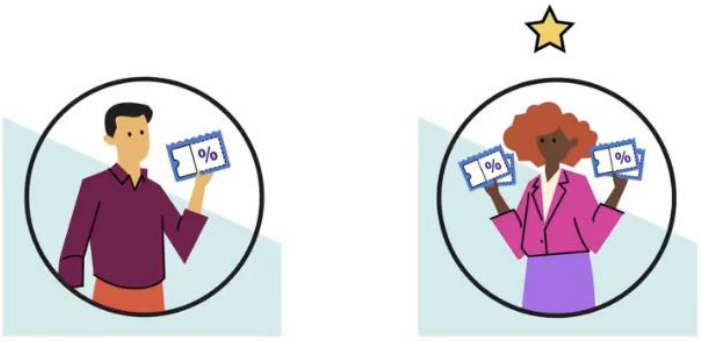
COMMON ALGORITHMS



Binary classification to unsupervised learning



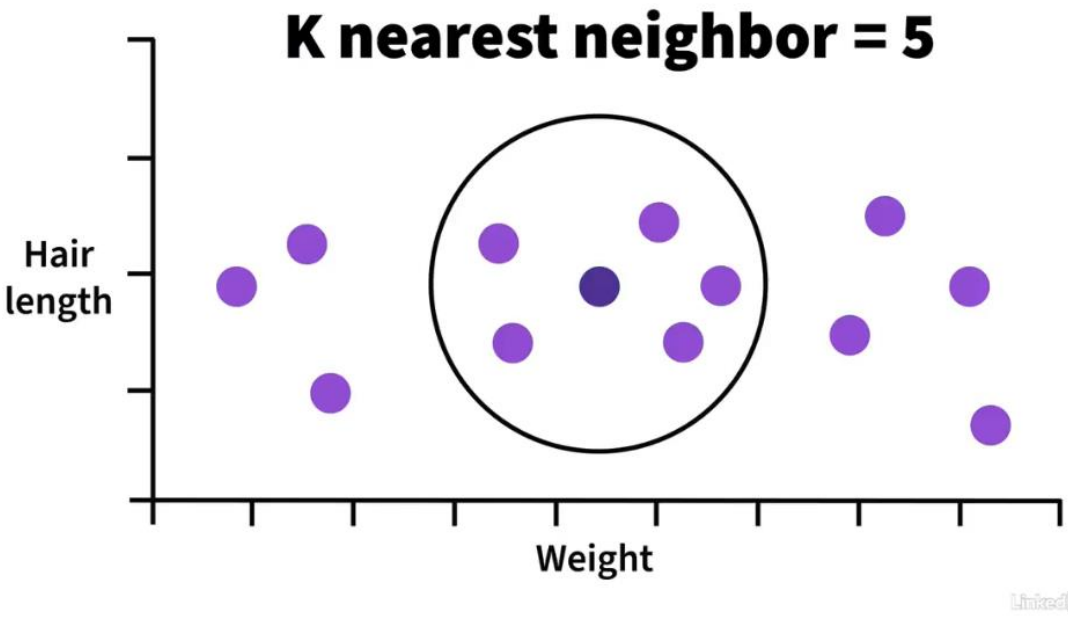
"Super Users"

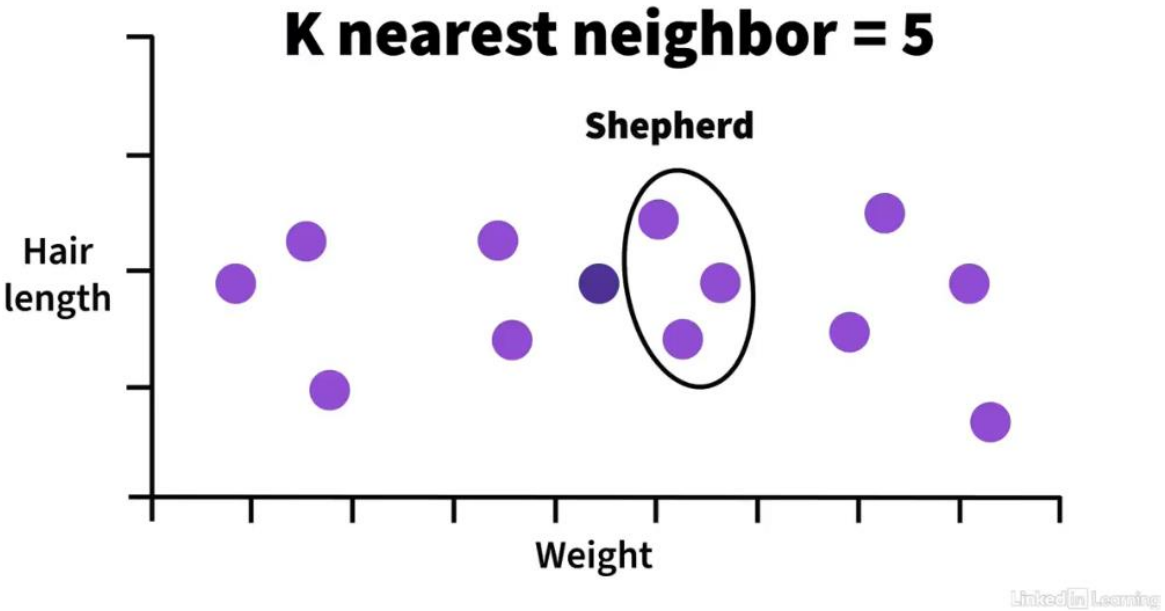


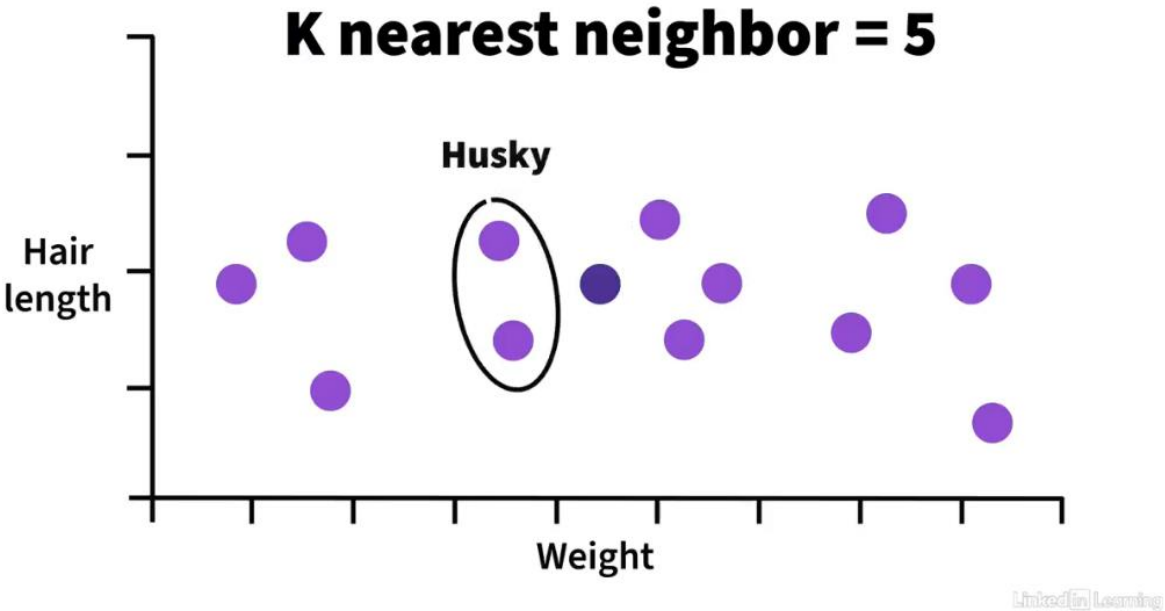
Find the right **algorithm** for each **task**.

K-NEAREST NEIGHBOR

Classification
Predictors







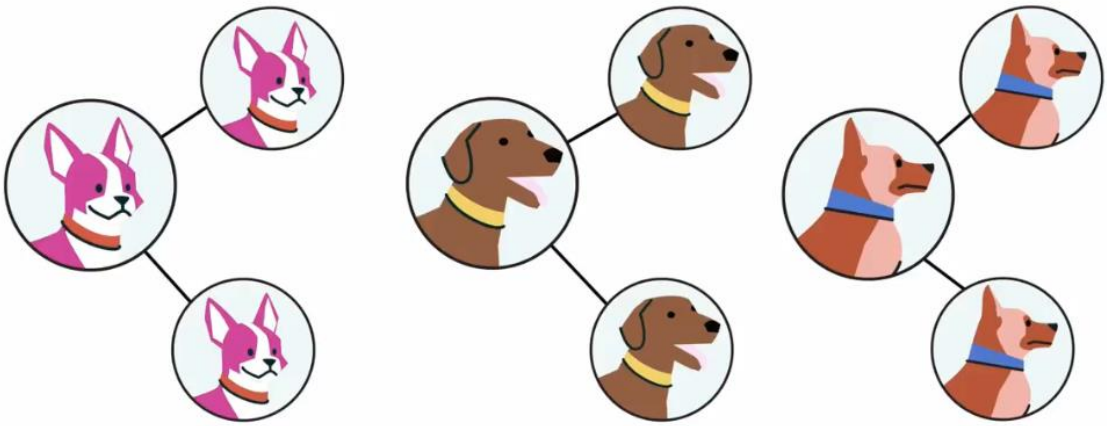
K-MEANS CLUSTERING

K-Means Clustering

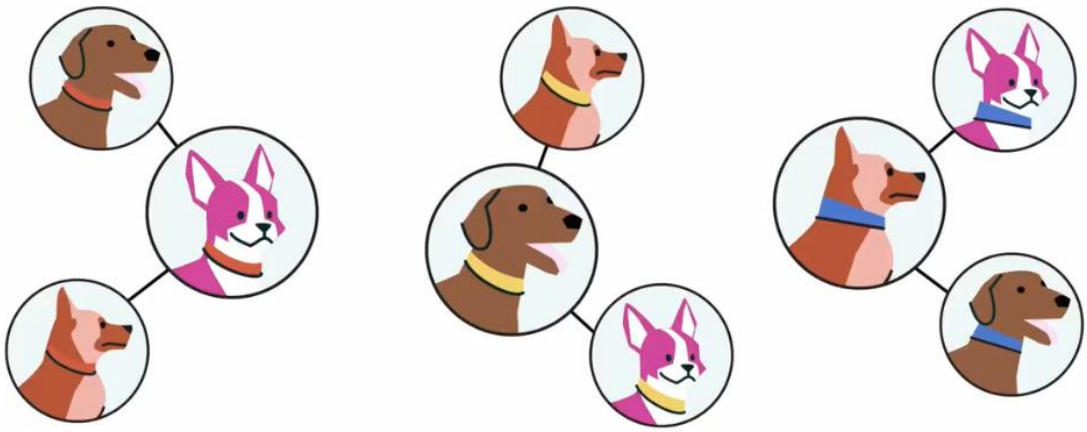
It's an unsupervised machine learning algorithm. It’s used to create clusters based on what the machine sees in the data.

"Centroid" dogs

"Centroid" dogs



"Centroid" dogs



LinkedIn Learning

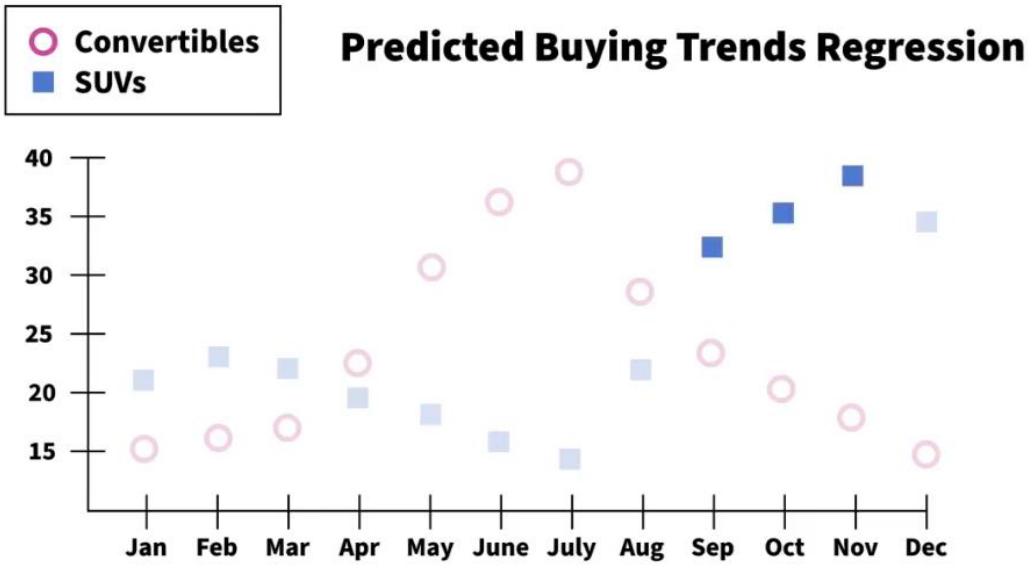
- Loyal customers
- Regular customers
- Low priced shoppers

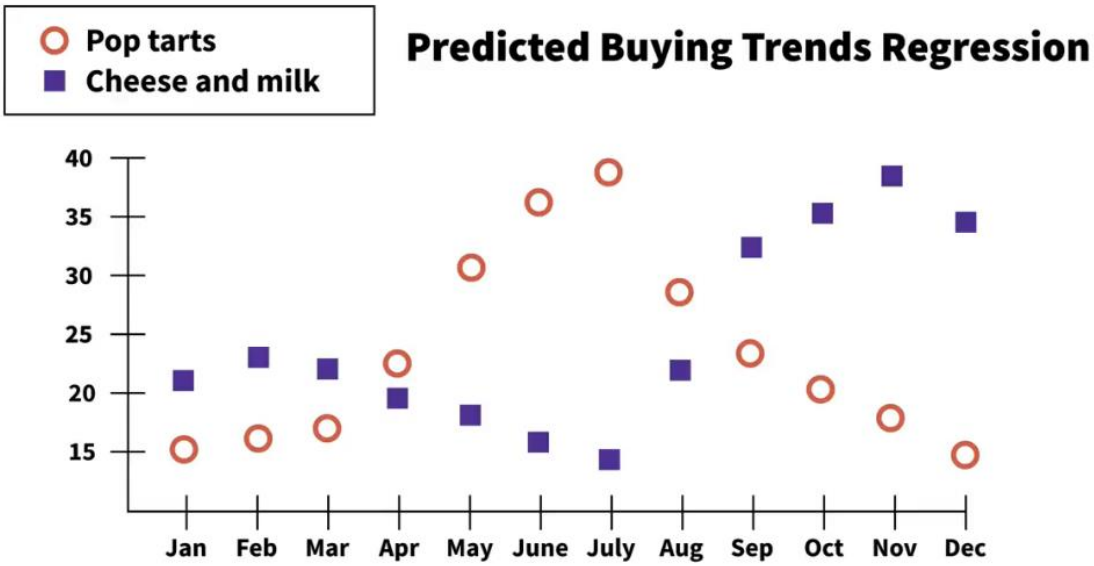
REGRESSION

Regression Analysis

A supervised machine learning algorithm that looks at predictors and the outcome

- Outcome
- Predictor





NAIVE BAYES

Naive Bayes Algorithm

Assumes that all the predictors are independent from one another

Breeds

Terriers

Hounds

Sport dogs

Predictors

- Hair length
- Height
- Weight

Class predictor probability



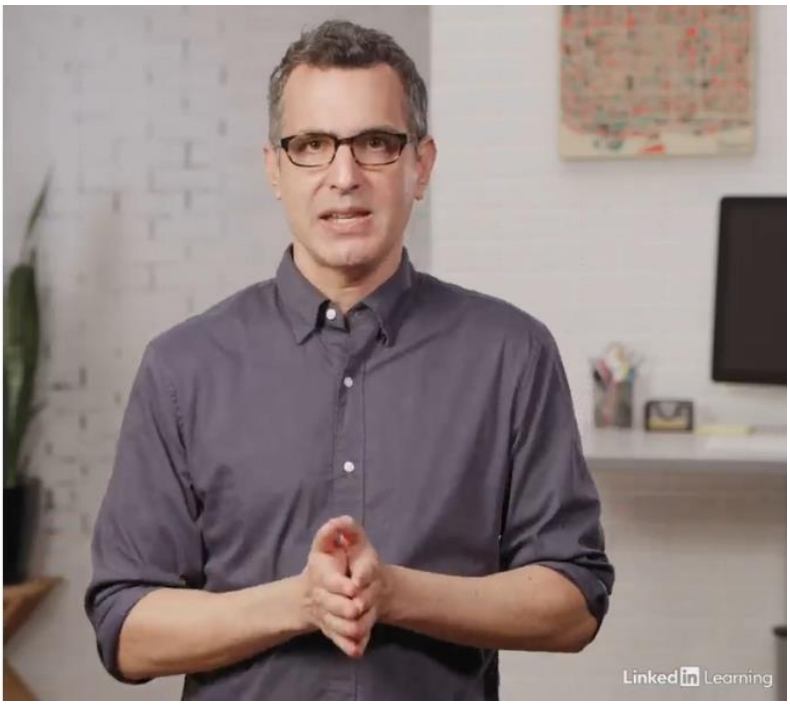
	Terrier	Hound	Sport
Hair	0.4	0.1	0.5
Height	0.2	0.1	0.7
Weight	0.1	0.05	0.85

7. FIT THE ALGORITHM

SELECT THE BEST ALGORITHM

Supervised Learning and Classifying

- K nearest neighbor
- Regression analysis
- Naive bayes



Supervised Learning and Classifying

- K nearest neighbor
- Regression analysis
- Naive bayes
- K means clustering

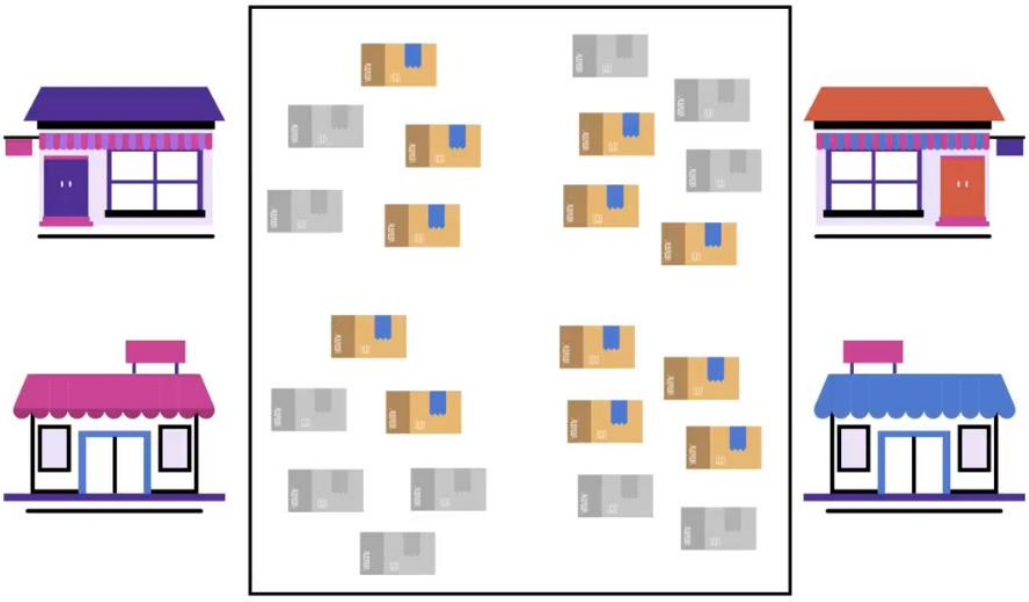
Ensemble modeling

Bagging

- When you use several versions of the same machine-learning algorithm

Stacking

- When you use several different machine-learning algorithms



FOLLOW THE DATA

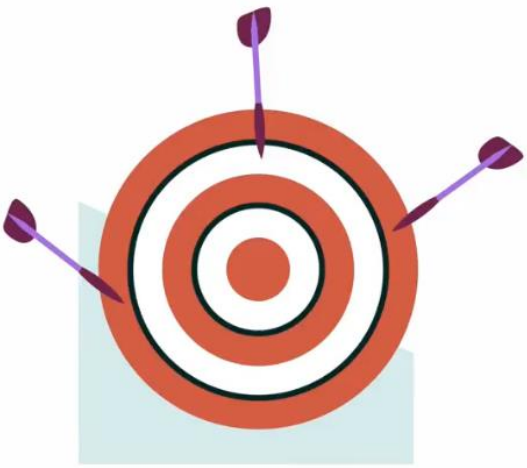
Bias and variance

Bias

The gap between the predicted value and the actual outcome

Best prediction

High bias and low variance



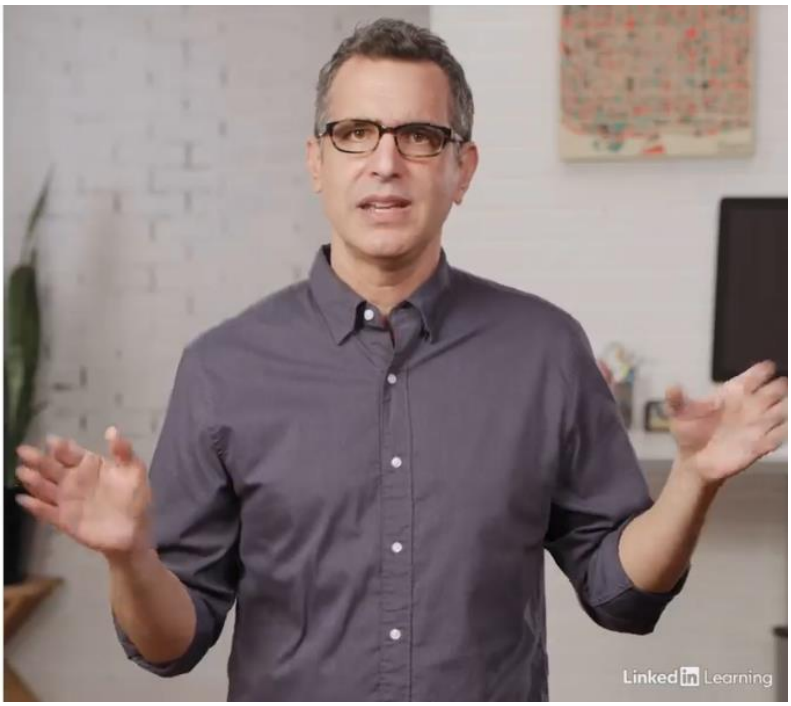
High bias and high variance

Low bias and low variance

An AI system can create simple rules in its training data that don't work well with the larger test data.

Underfitting the data to the model

Overfitting the data to the model



Predictors

- Square footage
- Location
- Number of bathrooms
- Number of bedrooms

Add More Predictors

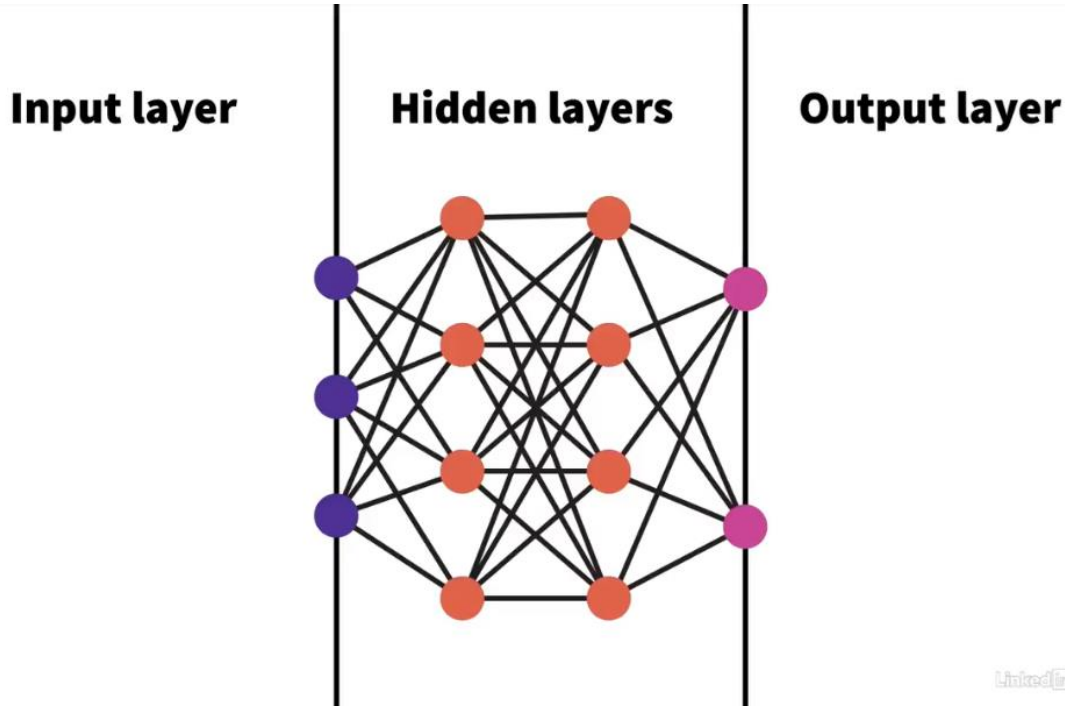
- Square footage
- Location
- Number of bathrooms
- Number of bedrooms
- **Quality of view**
- **Modern appliances**
- **Flooring**
- **Walkability**

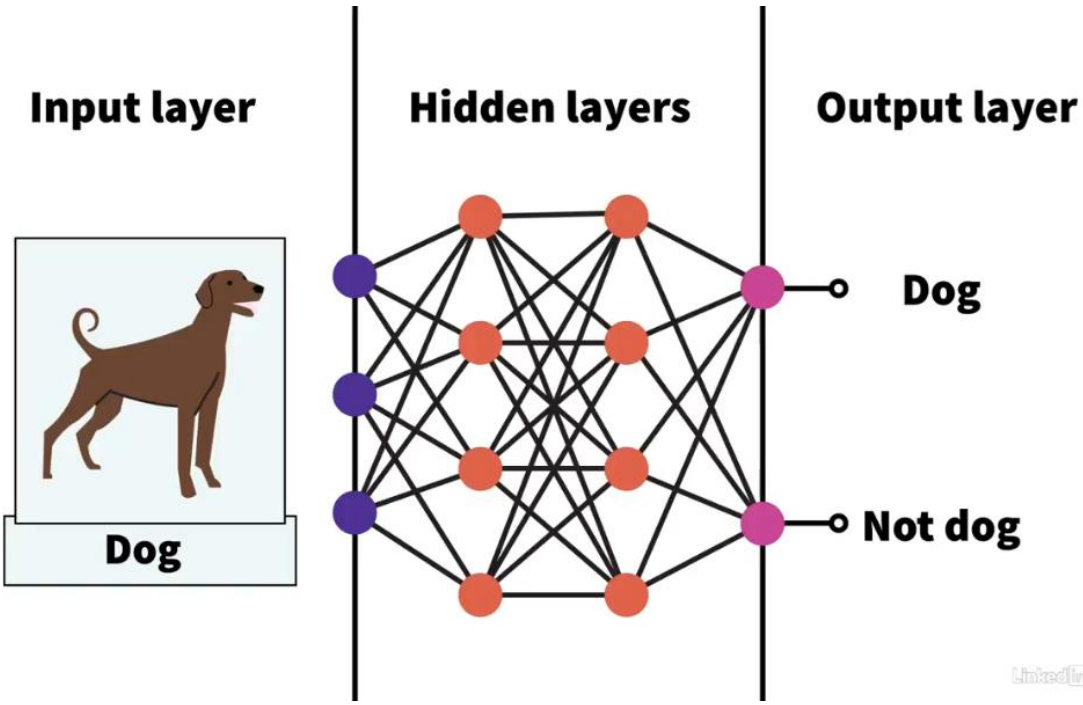
8. ARTIFICIAL NEURAL NETWORKS

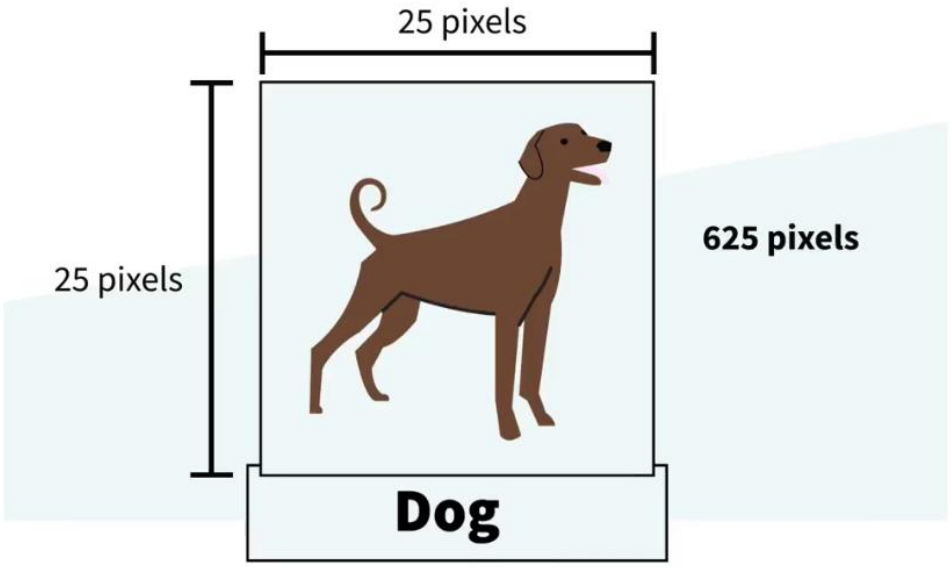
BUILD A NEURAL NETWORK

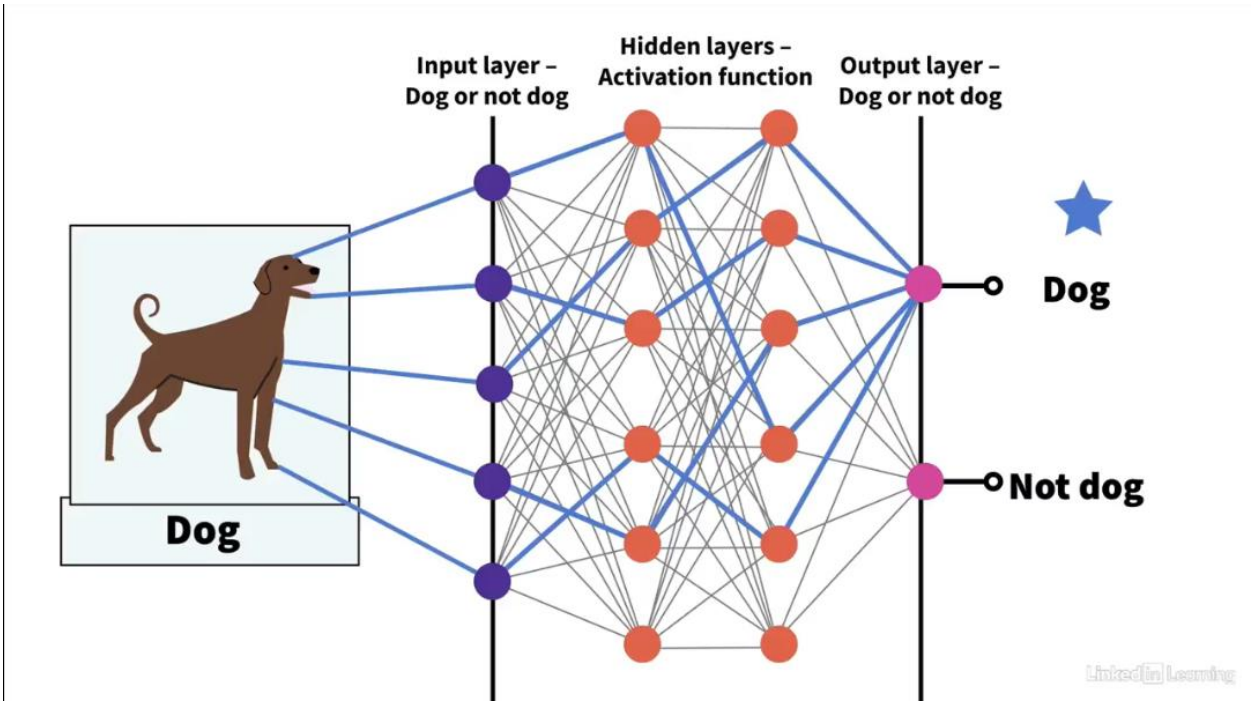
Artificial Neural Networks

A type of machine learning that uses a structure like the human brain to break down massive datasets





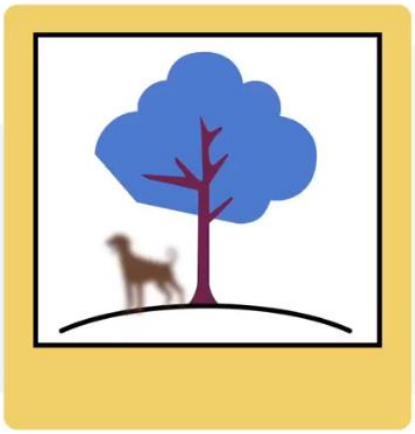




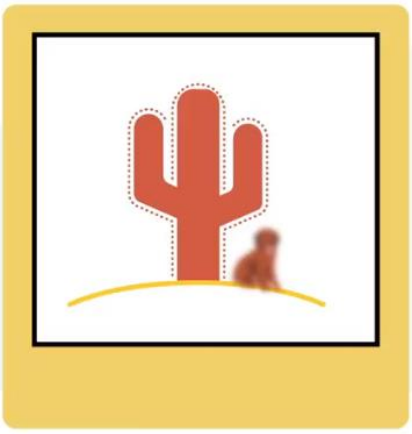
Feedforward
Neural Network

WEIGHING THE CONNECTIONS

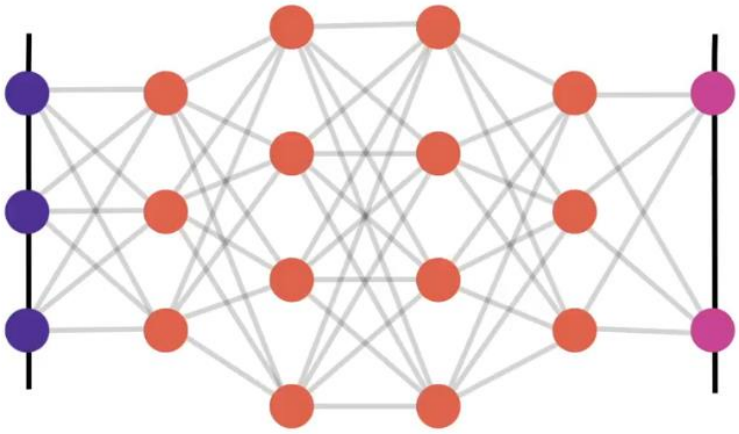
Probably a dog?



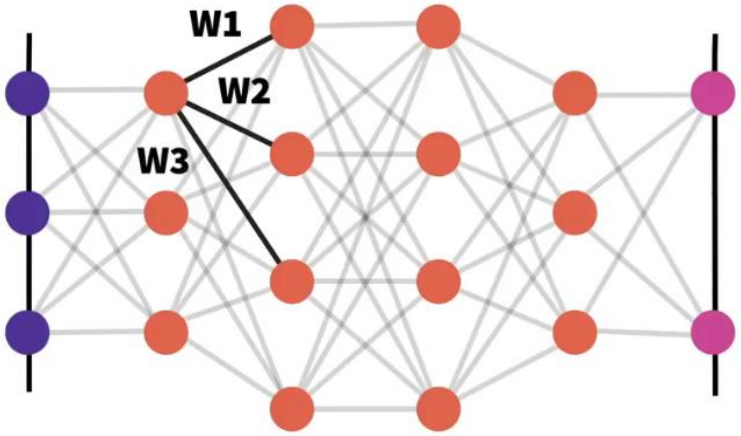
Probably not a dog?



Add weights to the connections

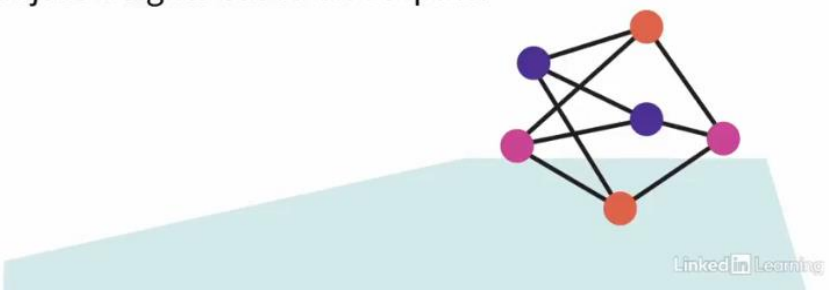


Add weights to the connections



Weights in the neural network

1. Initialize the neural network.
2. Feed the training data.
3. Let the system adjust weights based on outputs.

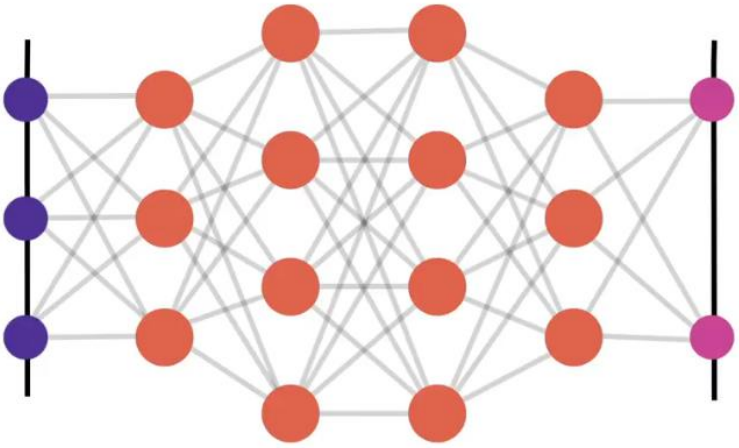


THE ACTIVATION BIAS

Low bias and low variance

When making a prediction, you need to balance the bias and variance in the data.

Bias is on the neuron, not the connection.

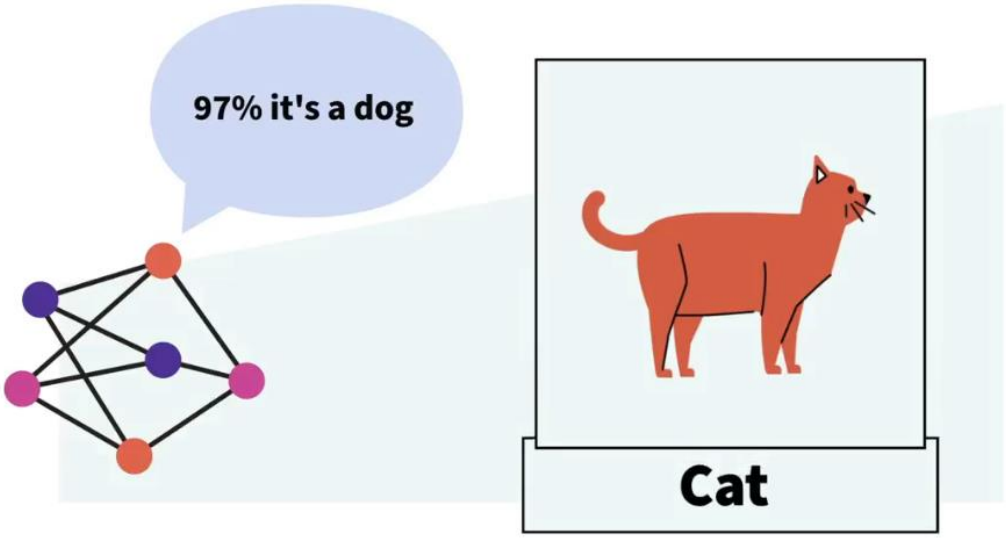


9. IMPROVE ACCURACY

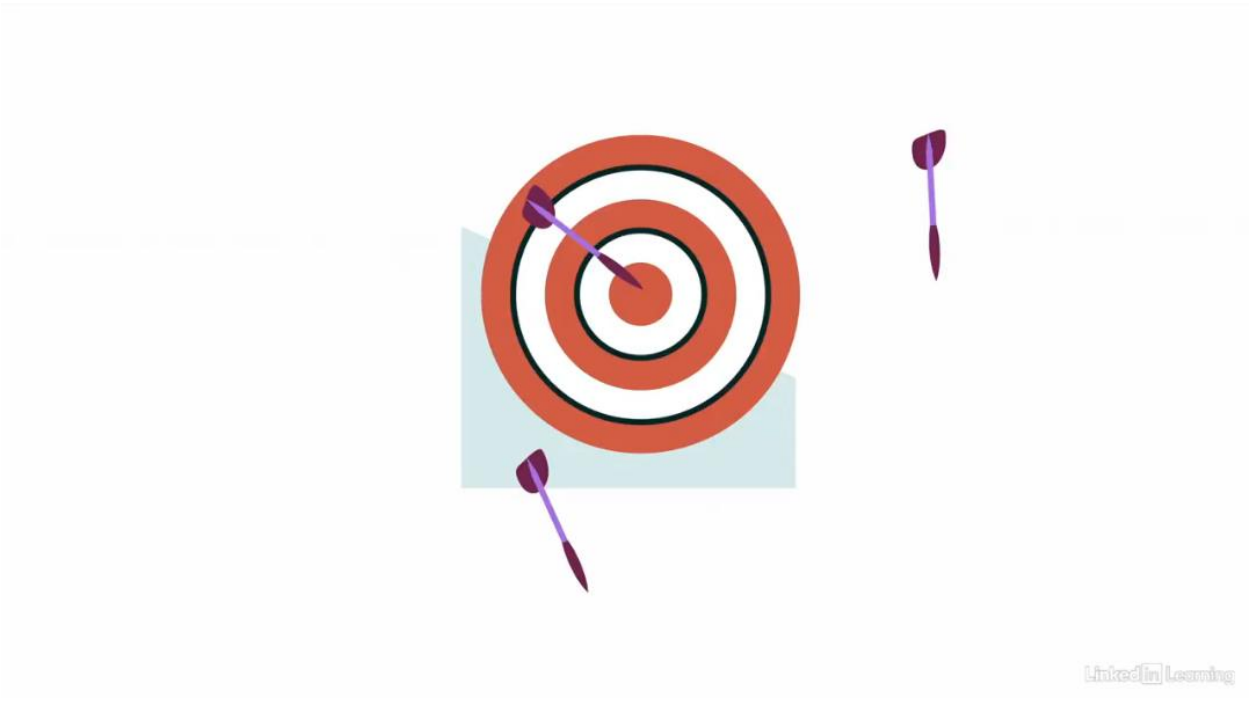
LEARNING FROM MISTAKES

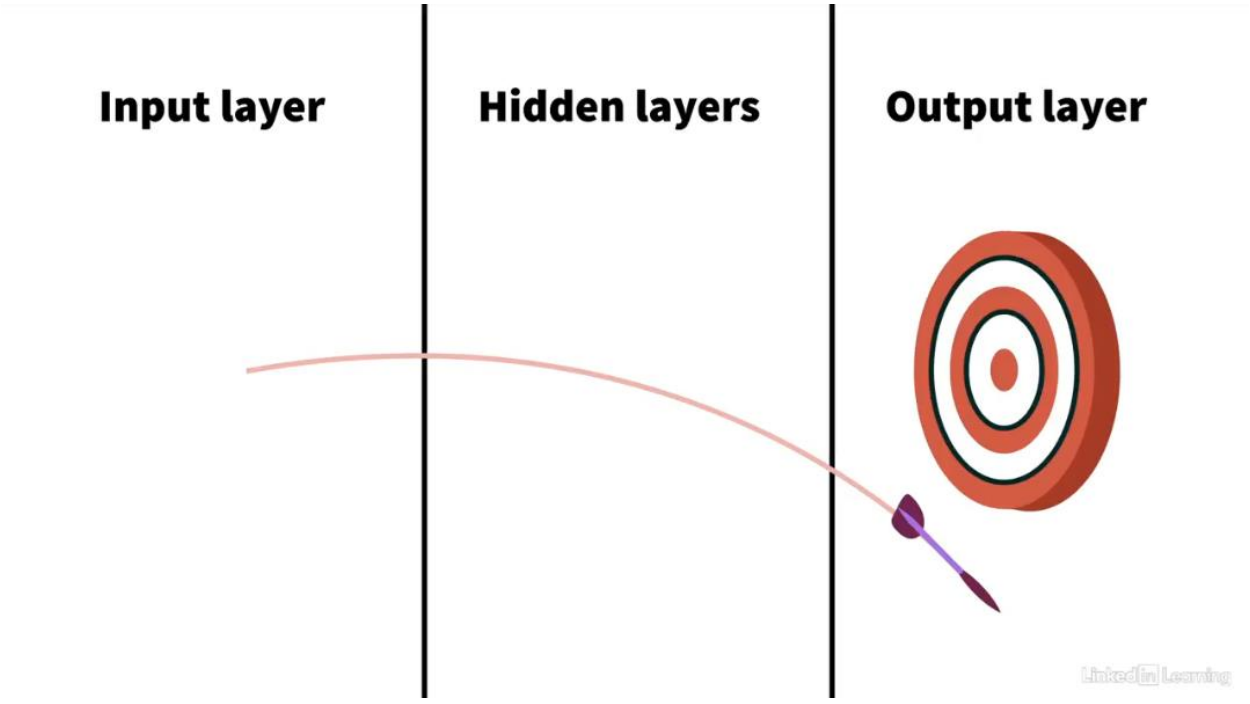
Cost Function

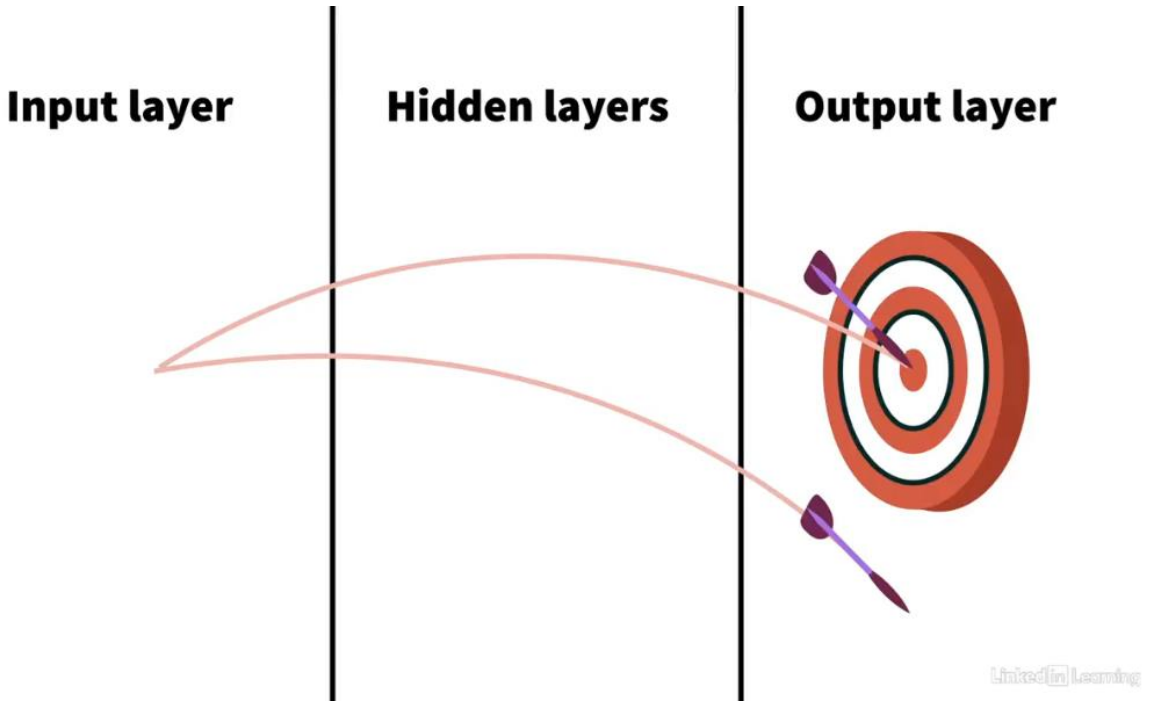
A number that the system uses to measure its answer against the correct answer



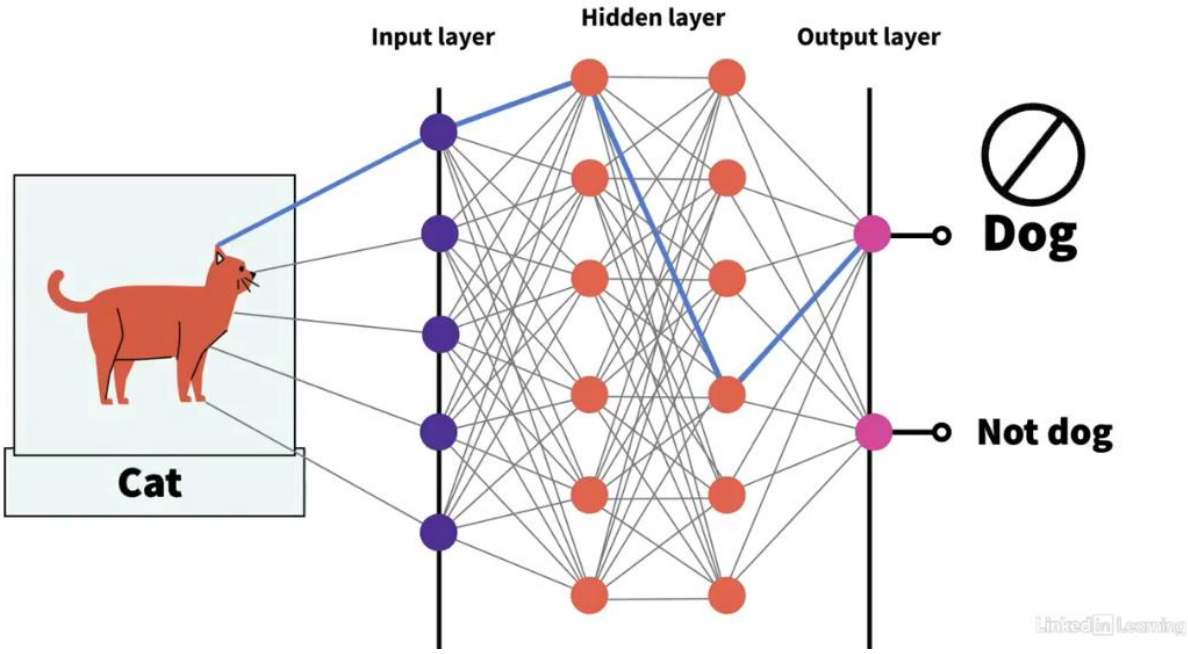
Gradient descent

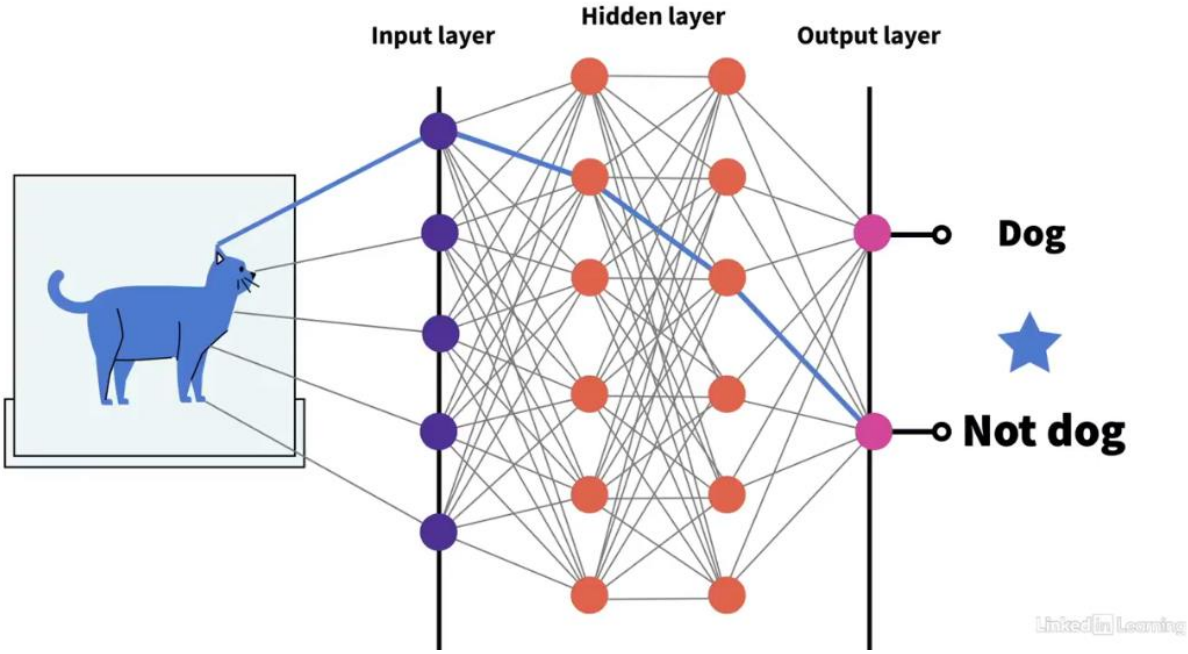



Input layer
Hidden layers
Output layer



Backpropagation of errors (backprop)


Input layer
Hidden layer
Output layer
Dog
Not dog
Cat
LinkedIn Learning


Input layer
Hidden layer
Output layer
Dog
Not dog
LinkedIn Learning

Building an AI System

1 Figure out what you want from the data.

Binary classification has two possible classifications.

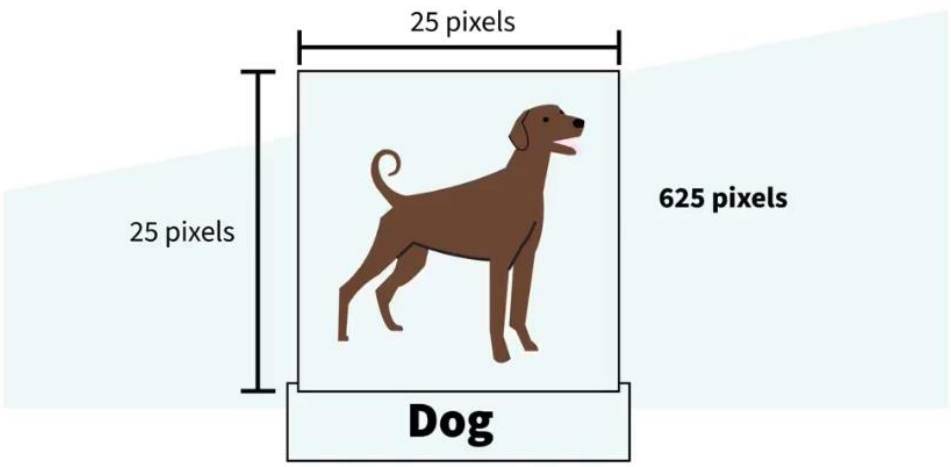
Building an AI System

2 Determine the type of machine learning model you need, **standard ML algorithms** or **artificial neural network**.

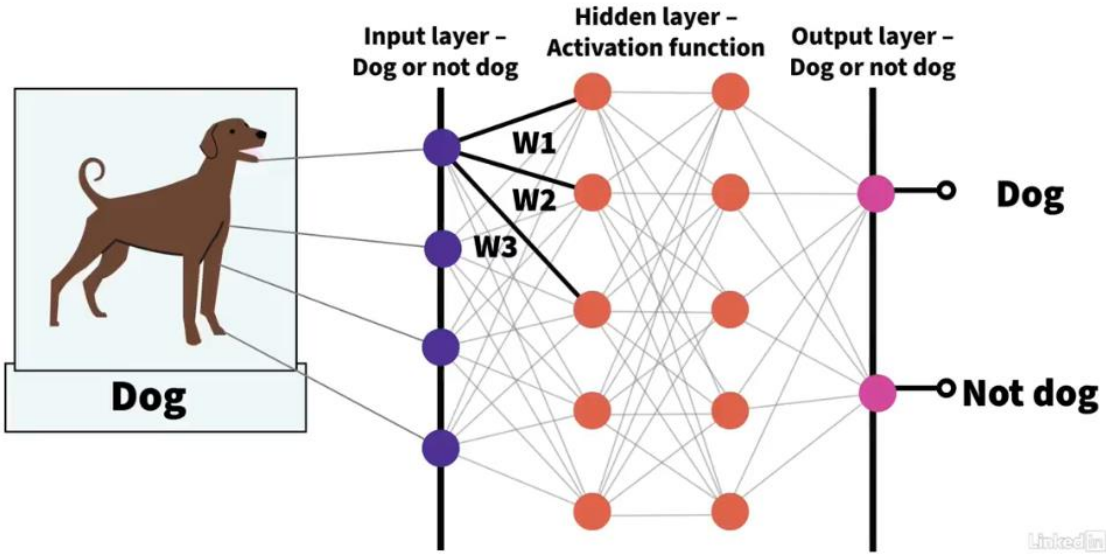
Machine Learning Algorithms

- K nearest neighbor
- Naive Bayes

Artificial Neural Network

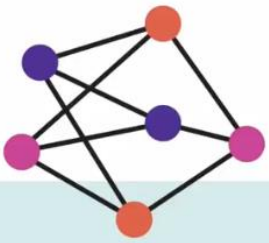


Artificial Neural Network



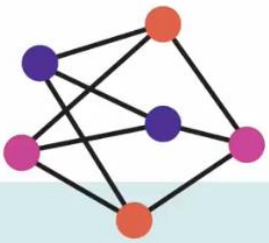
Artificial Neural Network

- Feed training set



Artificial Neural Network

- Determines how much to change the weights



Use backpropagation to adjust the weights to lower the cost function.

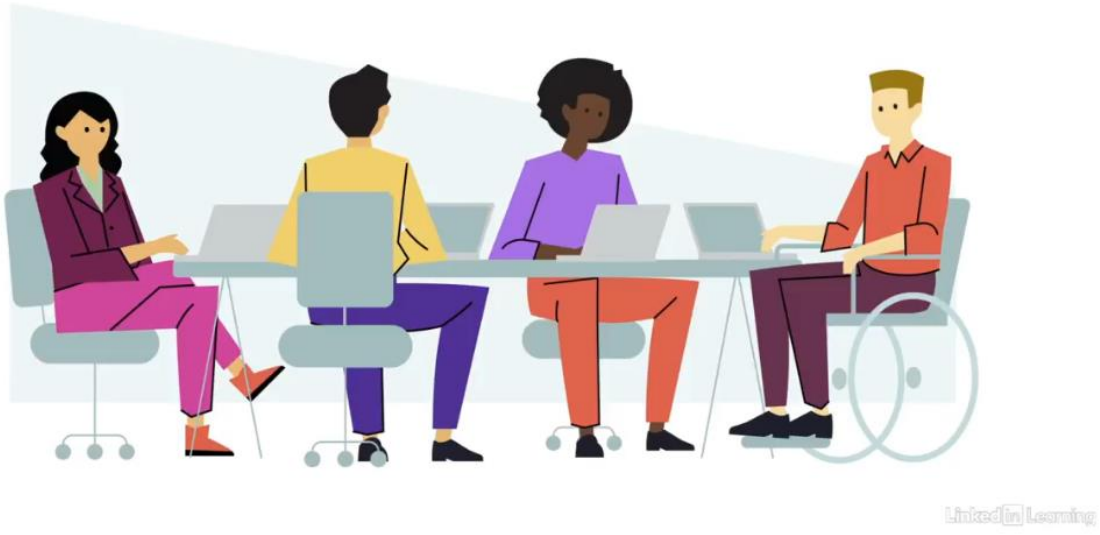
Artificial Neural Network

- Add data from the test set

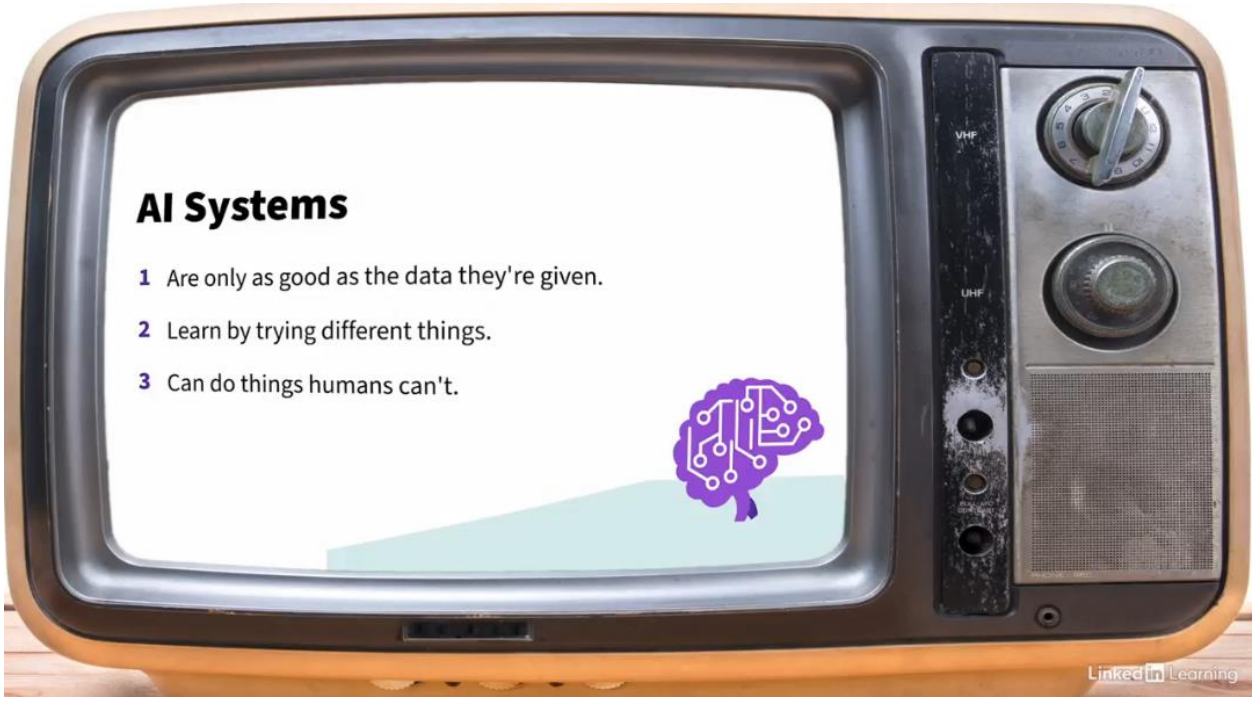
Overfitting the data

10. WHERE TO GO FROM HERE

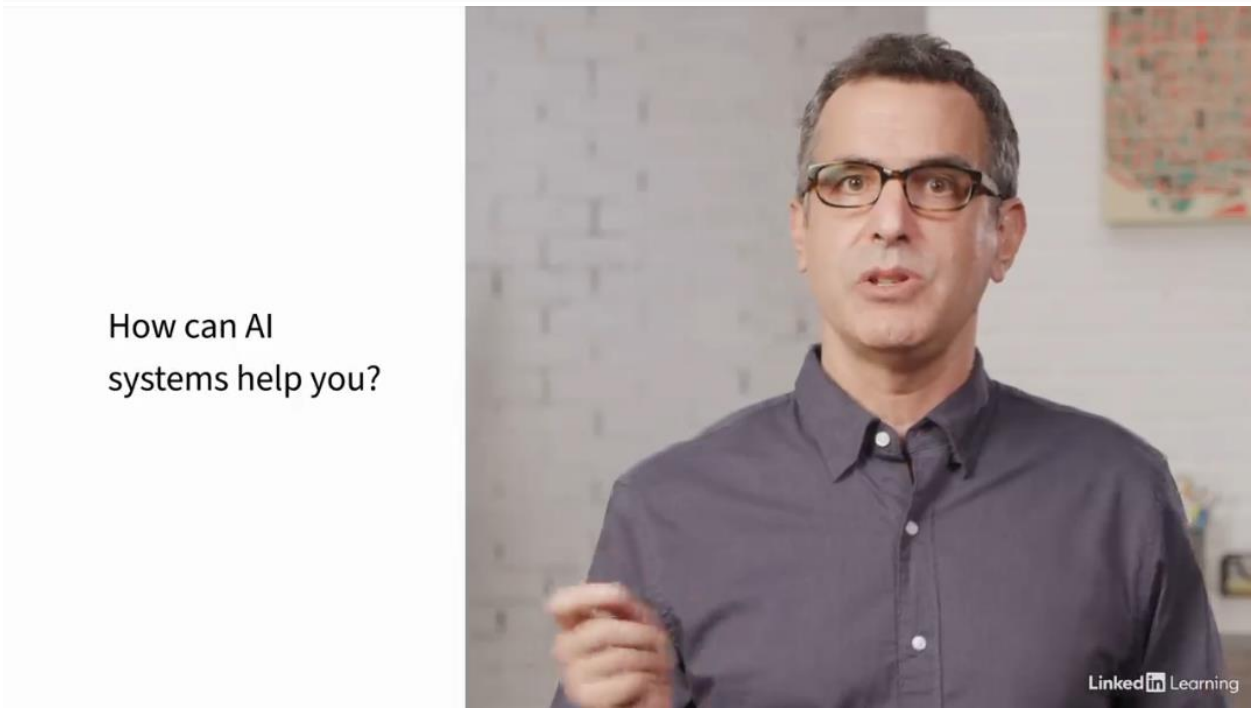
USING AI SYSTEMS




Managers need to be able to
set the right goals, evaluate results,
and give feedback for AI.
VHF
UHF
LinkedIn Learning


AI Systems
1 Are only as good as the data they're given.
2 Learn by trying different things.
3 Can do things humans can't.
VHF
UHF
LinkedIn Learning

Generative
Pre-trained
Transformer (GPT)



APPLYING AI TO SOLVE PROBLEMS

- Machine learning
- Algorithms
- Artificial neural networks

Consider the **ethical challenges** behind AI.