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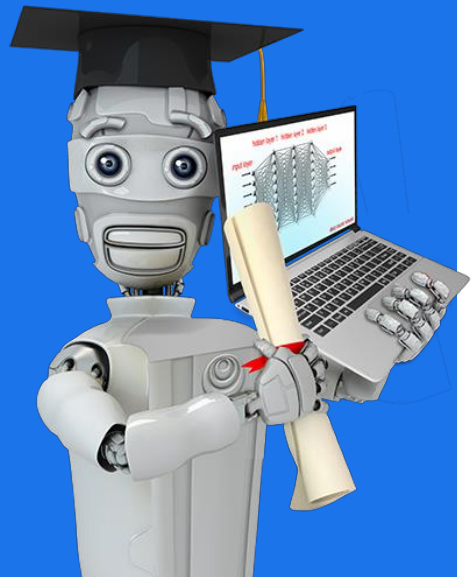


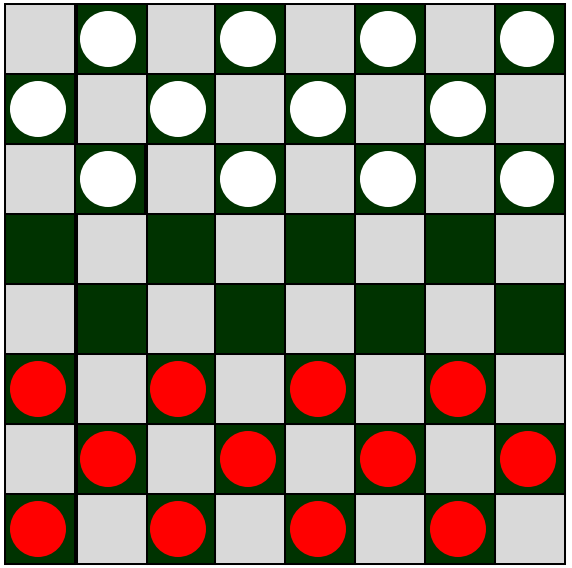
Machine Learning Overview

What is Machine Learning?

Machine learning

"Field of study that gives computers the ability to learn without being explicitly programmed."

Arthur Samuel (1959)



Question

If the checkers program had been allowed to play only ten games (instead of tens of thousands) against itself, a much smaller number of games, how would this have affected its performance?

- Would have made it better
- Would have made it worse

Machine learning algorithms

rapid advancements

used most in real-world applications

- Supervised learning ← course 1, 2
- Unsupervised learning ← course 3
- Recommender systems
- Reinforcement learning

Practical advice for applying learning algorithms

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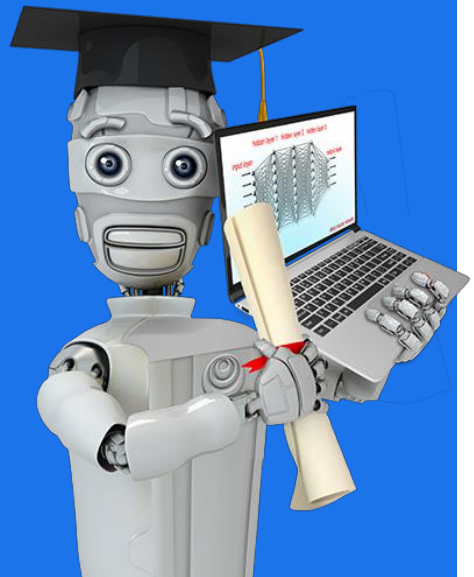
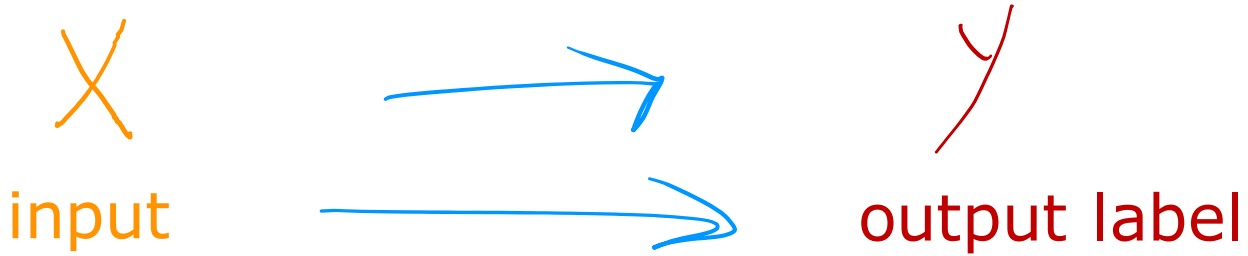


Machine Learning Overview

Supervised Learning Part 1

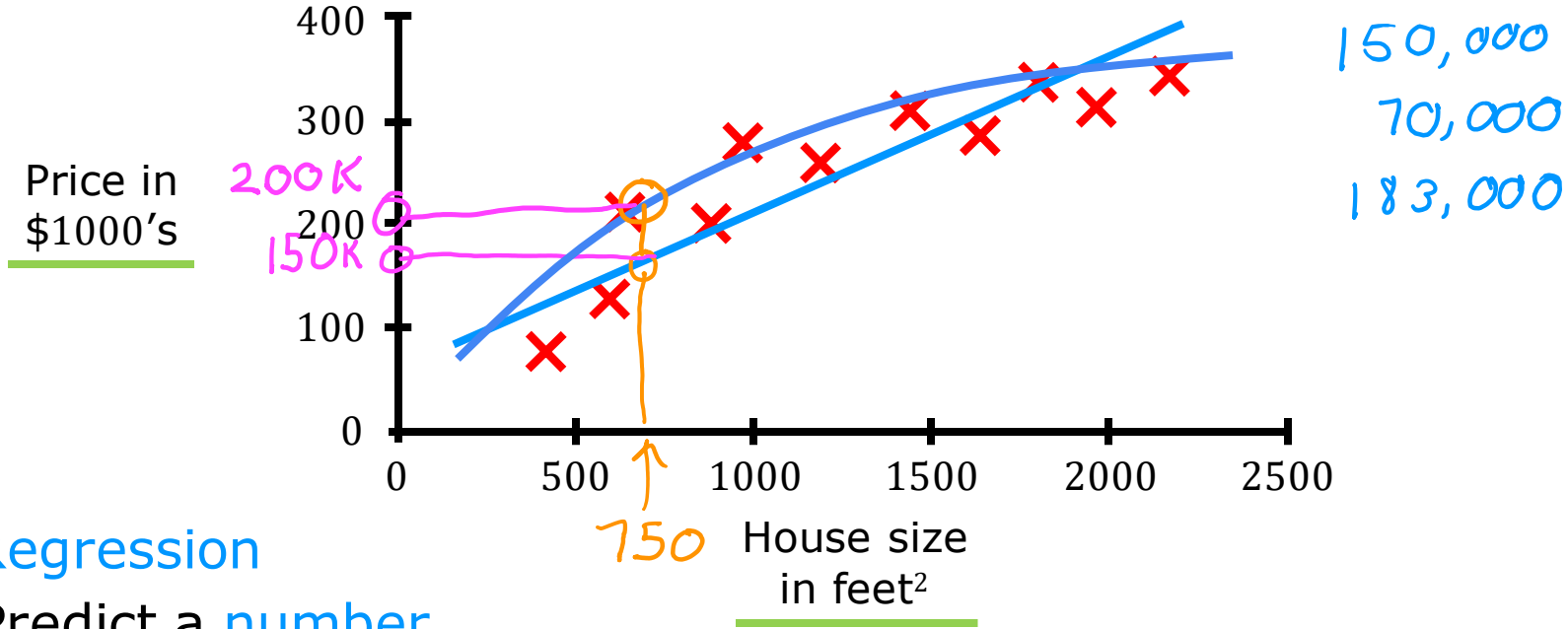
Supervised learning



Learns from being given “right answers”

Input (X)	Output (Y)	Application
email	spam? (0/1)	spam filtering
audio	text transcripts	speech recognition
English	Spanish	machine translation
ad, user info	click? (0/1)	online advertising
image, radar info	position of other cars	self-driving car
image of phone	defect? (0/1)	visual inspection

Regression: Housing price prediction



Regression

Predict a number

infinitely many possible outputs

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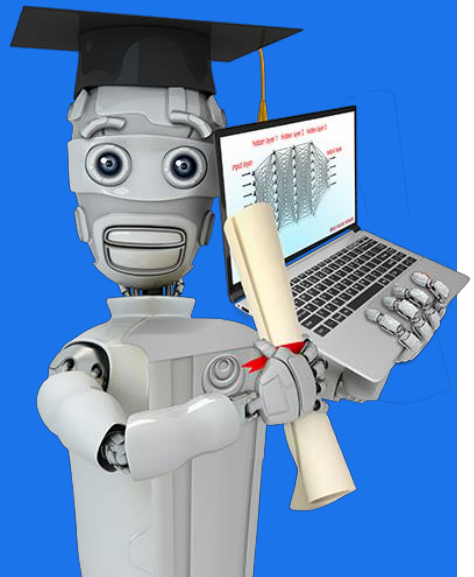
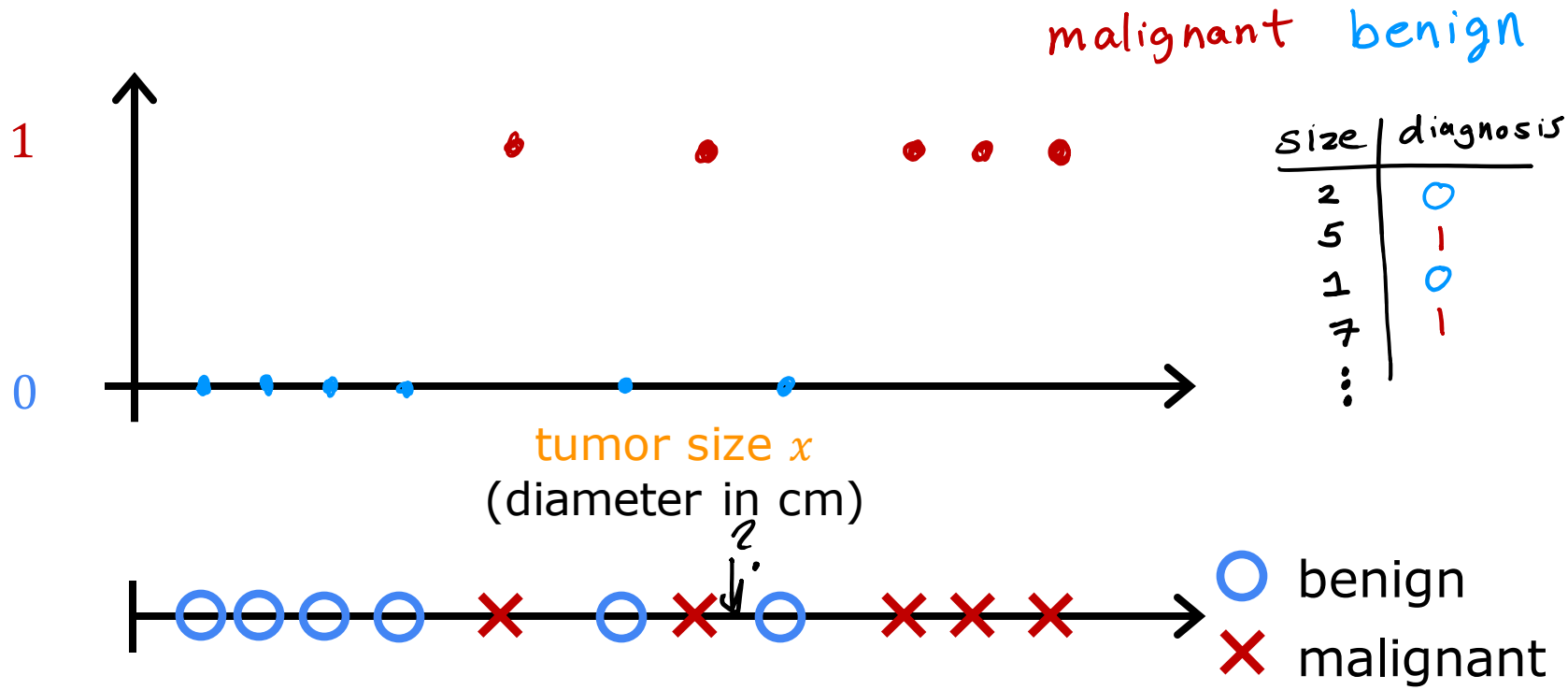


Machine Learning Overview

Supervised Learning Part 2

Classification: Breast cancer detection

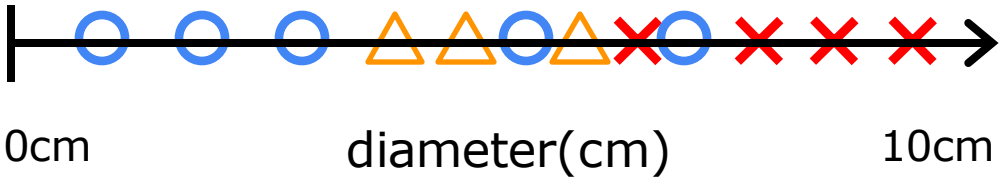


Classification: Breast cancer detection

benign

malignant type1

malignant type 2



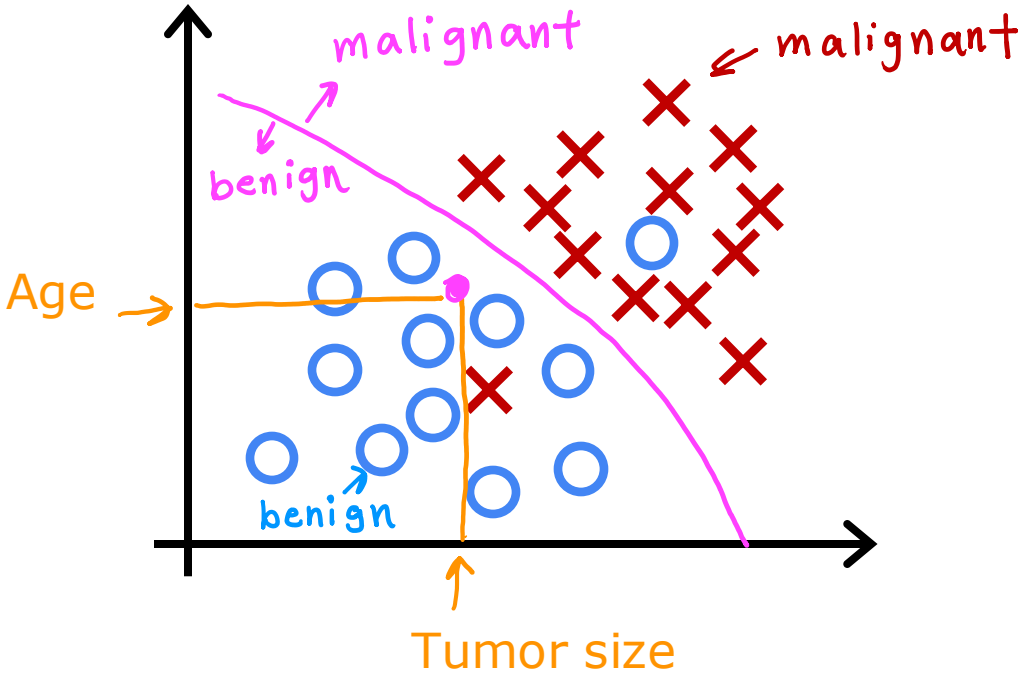
class category

Classification

predict categories cat dog benign malignant 0, 1, 2

small number of possible outputs

Two or more inputs



Supervised learning

Learns from being given "right answers"

Regression

Predict a number

infinitely many possible outputs

Classification

predict categories

small number of possible outputs

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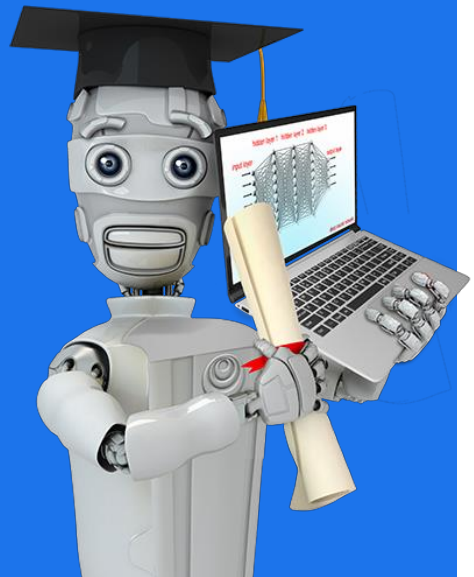
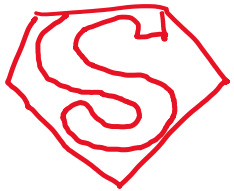


Machine Learning Overview

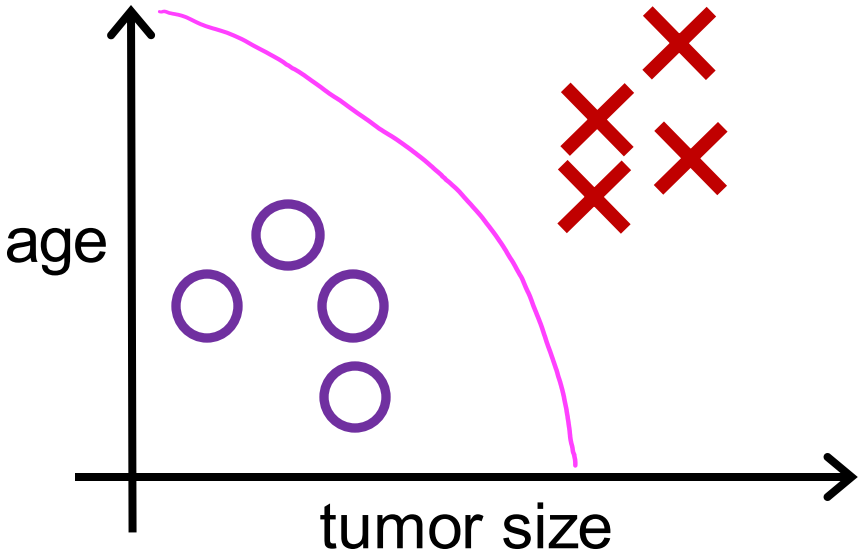
Unsupervised Learning Part 1

Previous: Supervised learning

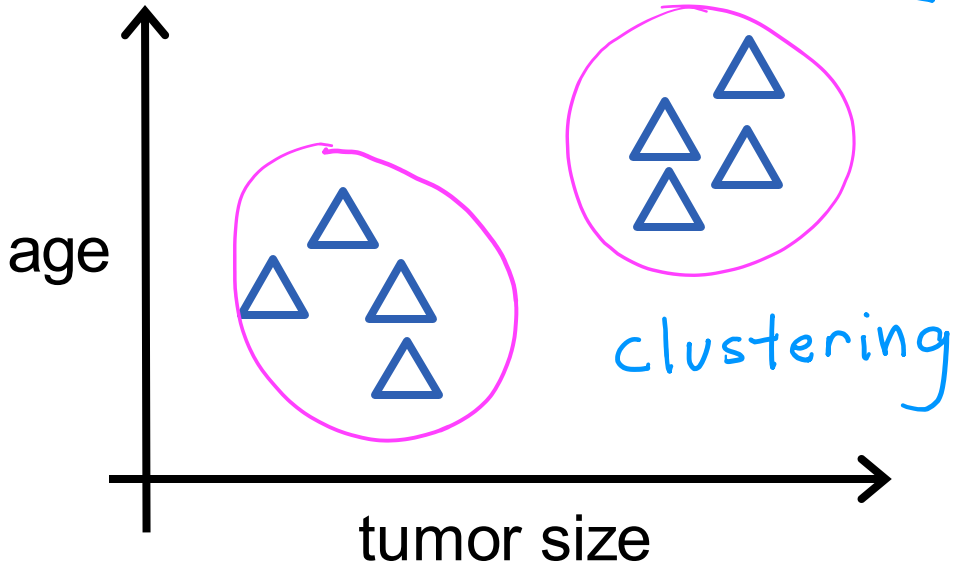
Now: Unsupervised learning



Supervised learning
Learn from data labeled with the "right answers"

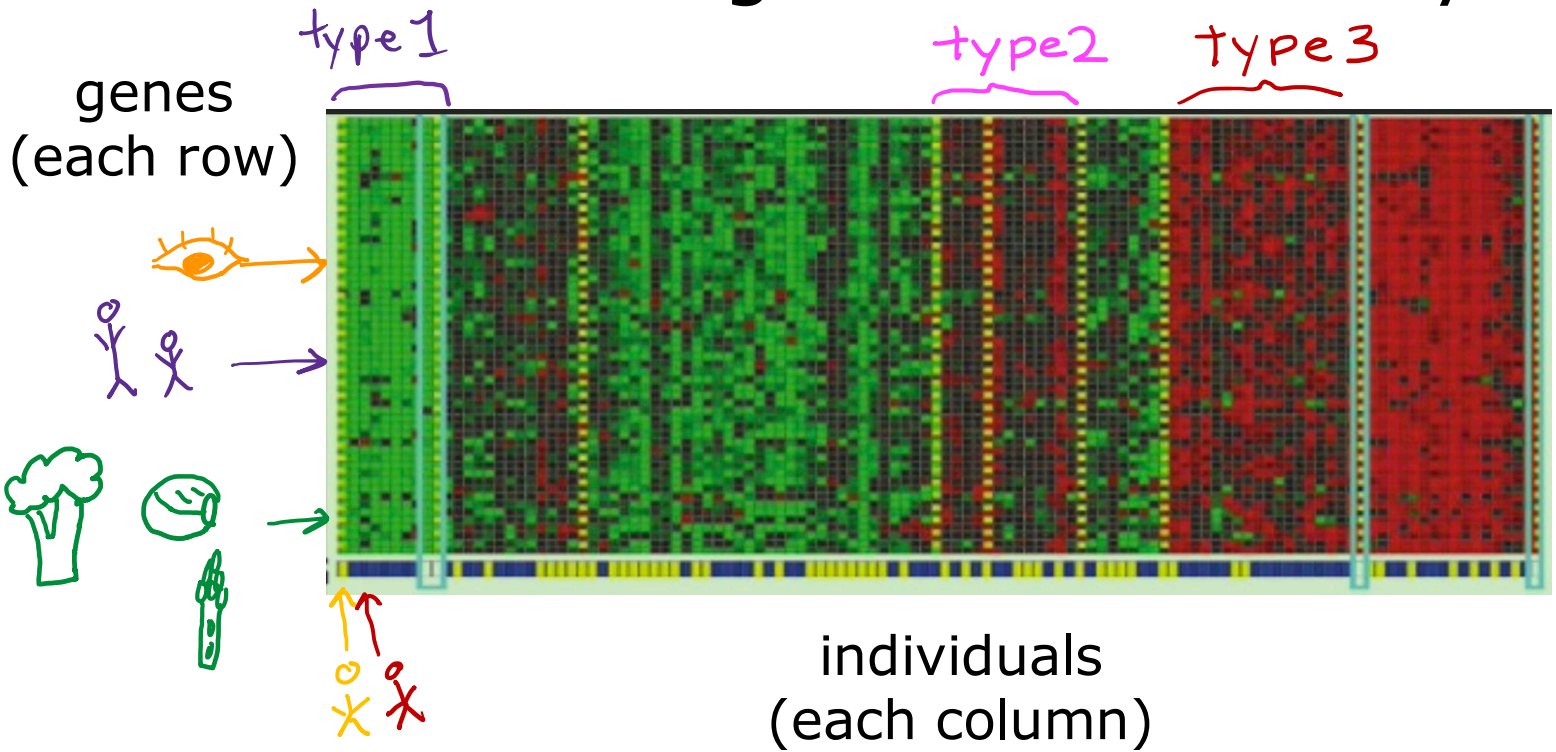


Unsupervised learning
Find something interesting in unlabeled data.

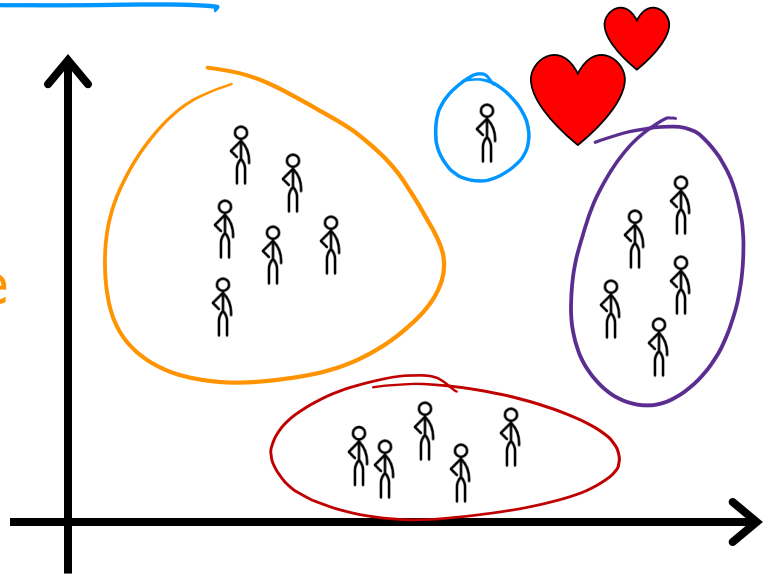


Clustering: Google news

Clustering: DNA microarray



Clustering: Grouping customers



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develop career

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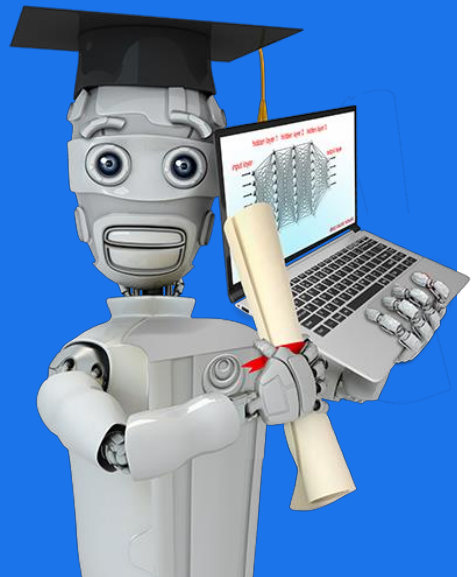

Machine Learning Overview

Unsupervised Learning Part 2

Unsupervised learning

Data only comes with inputs x, but not output labels y.
Algorithm has to find structure in the data.

Clustering
Group similar data points together.

Dimensionality reduction
Compress data using fewer numbers.

Anomaly detection
Find unusual data points.

Question

Of the following examples, which would you address using an unsupervised learning algorithm?

- [ ] Given email labeled as spam/not spam, learn a spam filter.

- [x] Given a set of news articles found on the web, group them into sets of articles about the same story.

- [x] Given a database of customer data, automatically discover market segments and group customers into different market segments.

- [ ] Given a dataset of patients diagnosed as either having diabetes or not, learn to classify new patients as having diabetes or not

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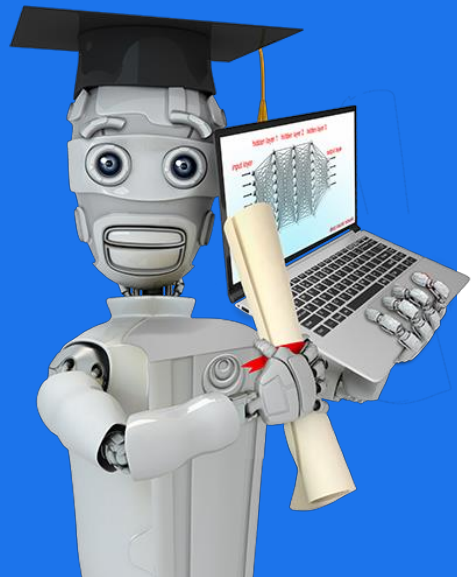

Machine Learning Overview

Jupyter Notebooks