Introduction

Boston University CS 506 - Lance Galletti

Data Representation

How we represent data is linked to what information we are able to retrieve from it.

Data Representation - Records

m-dimensional points / vectors

Example: (name, age, balance) -> (“John”, 20, 100)

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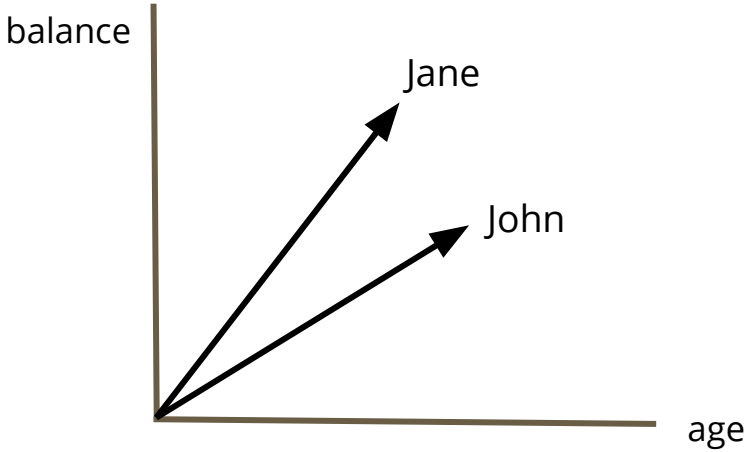
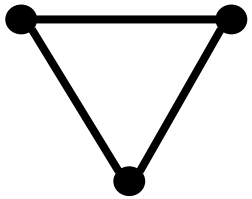
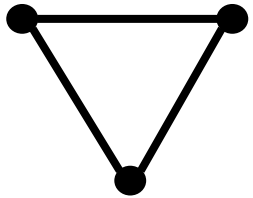


Data Representation - Graphs

Nodes connected by edges

Example:





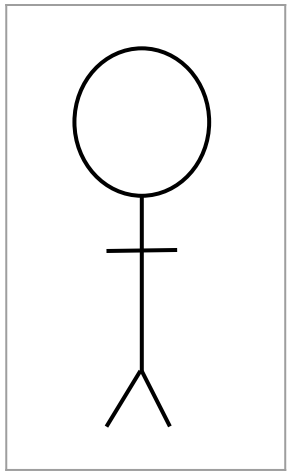
Adjacency Matrix

$$\begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{pmatrix}$$

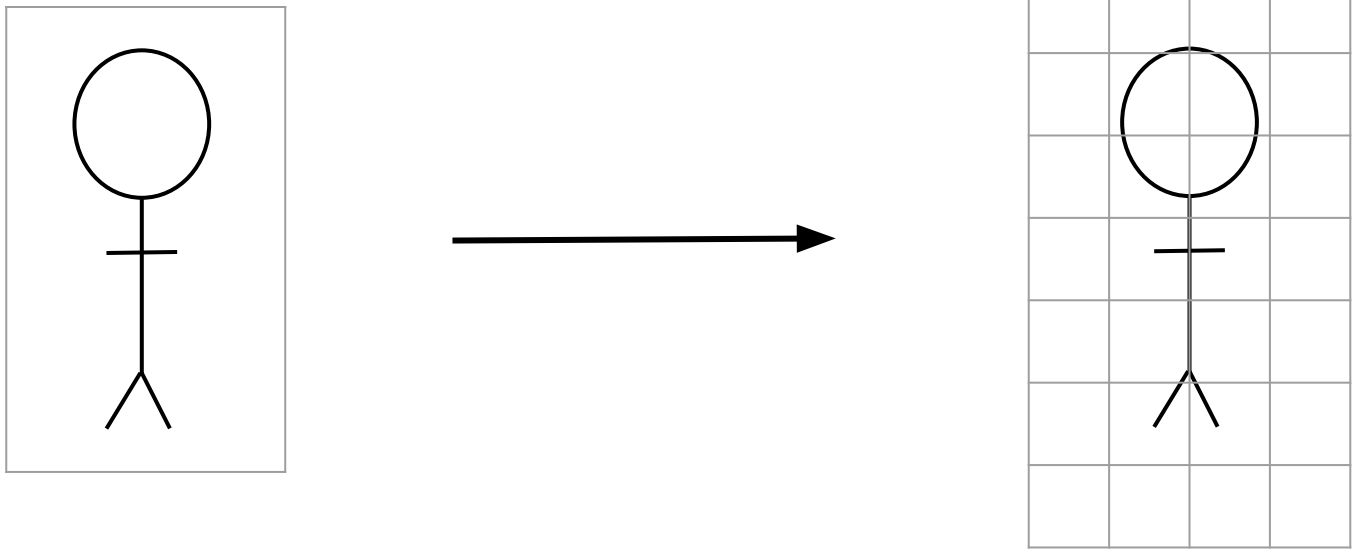
Adjacency List

1 : {2, 3}
2 : {1, 3}
3 : {1, 2}

Data Representation - Images



Data Representation - Images



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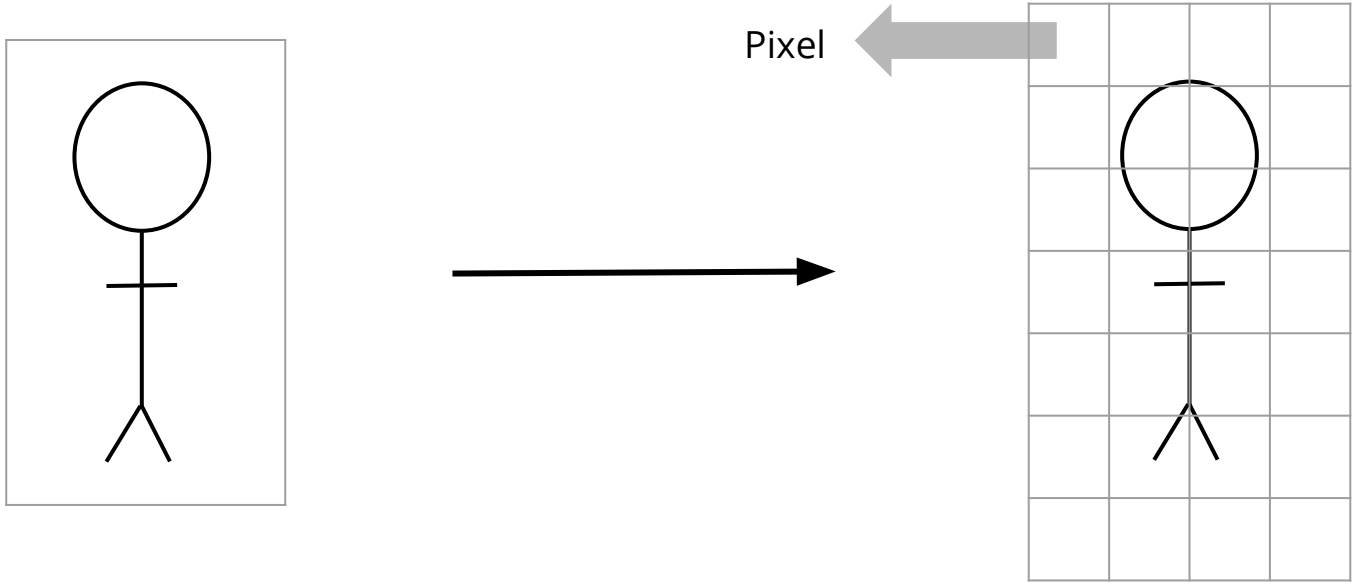
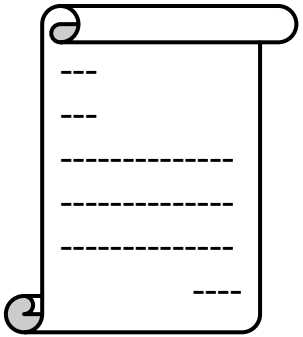


Data Representation - Text



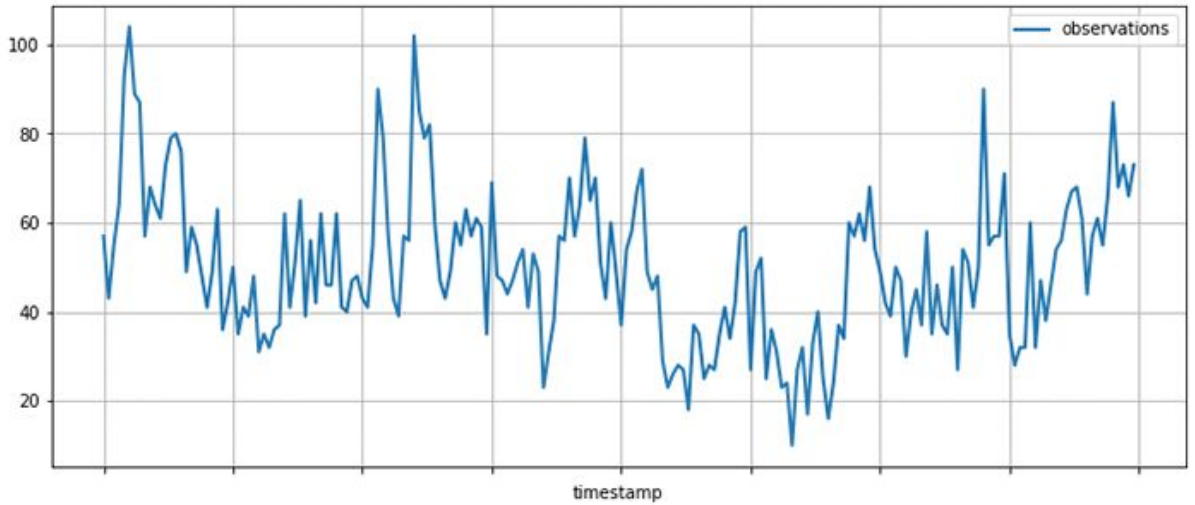
List of words

Data Representation - Strings

DNA seq (A T G C C G T A ...) -> list of characters

Data Representation - Time Series

List of data at specific intervals of time



Types of Learning

- Supervised Learning
- Unsupervised Learning

Supervised Learning

cricket chirps / min	temperature
10	40
5	37
17	53
55	103
40	78

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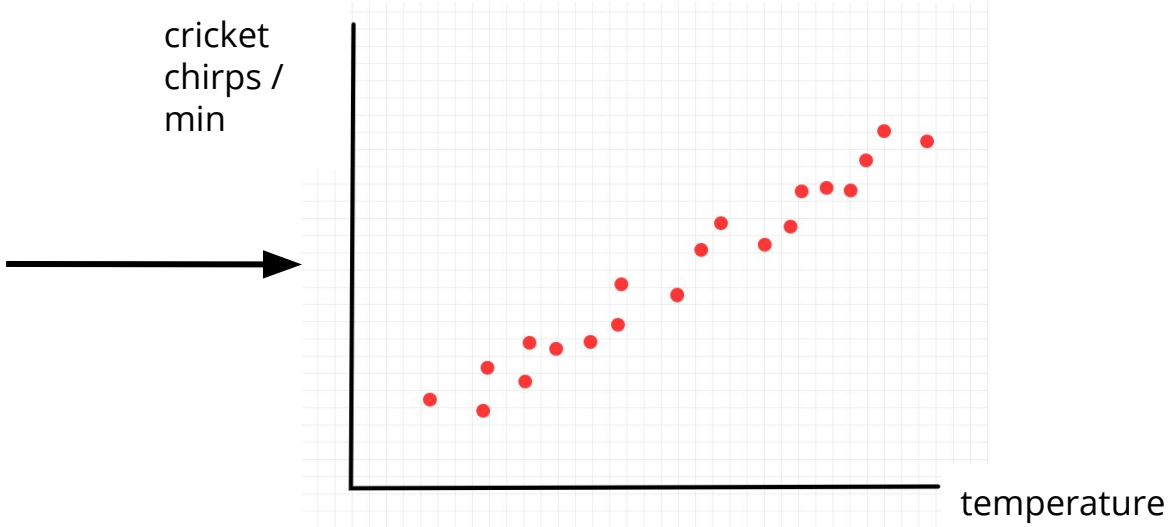

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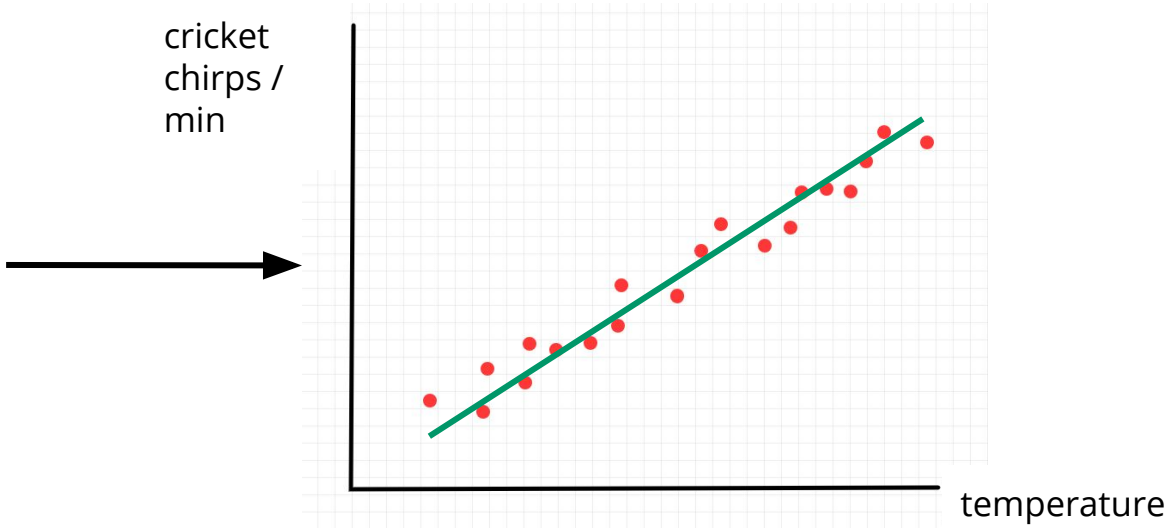

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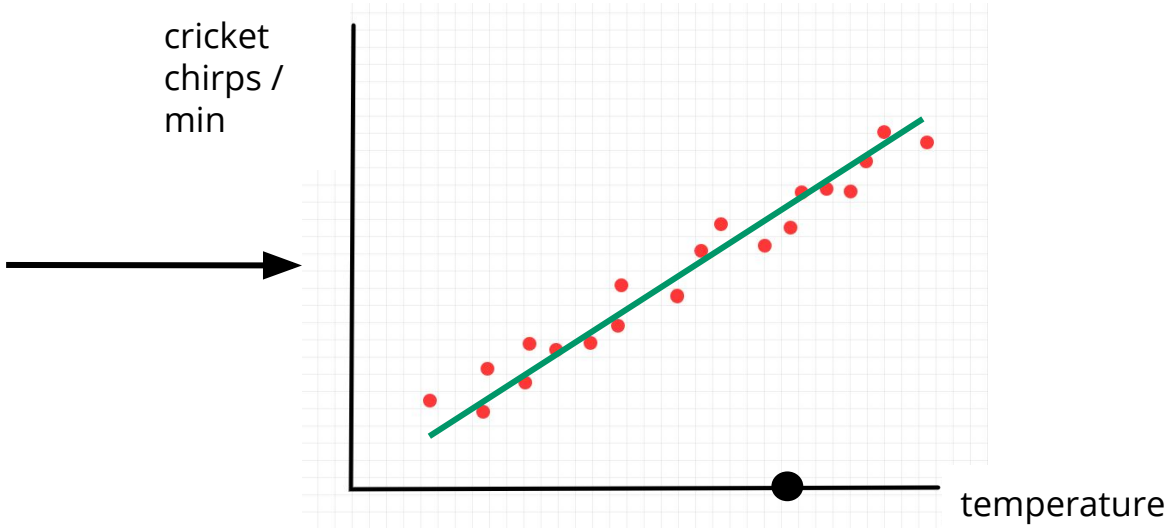

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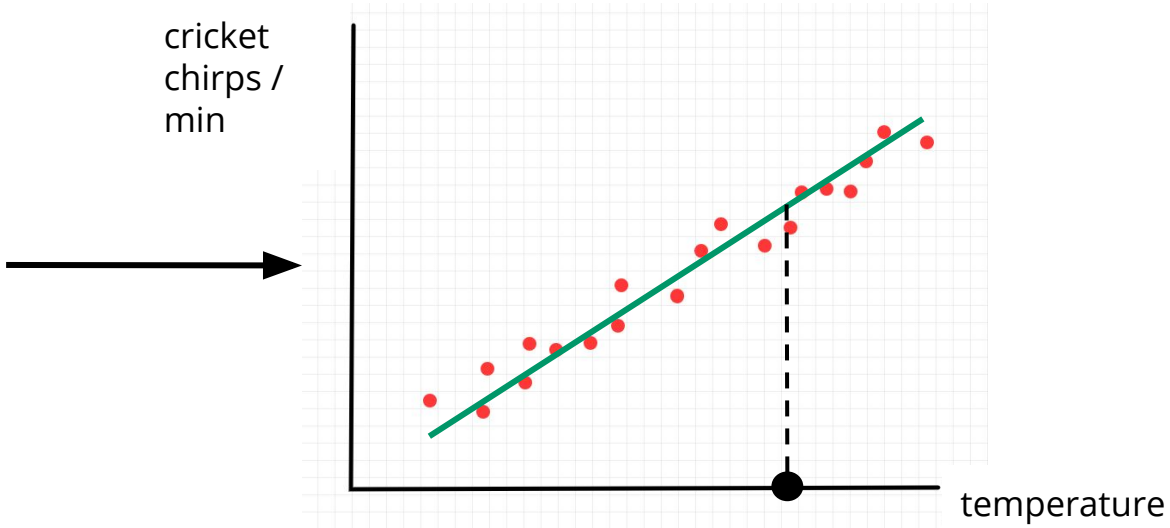

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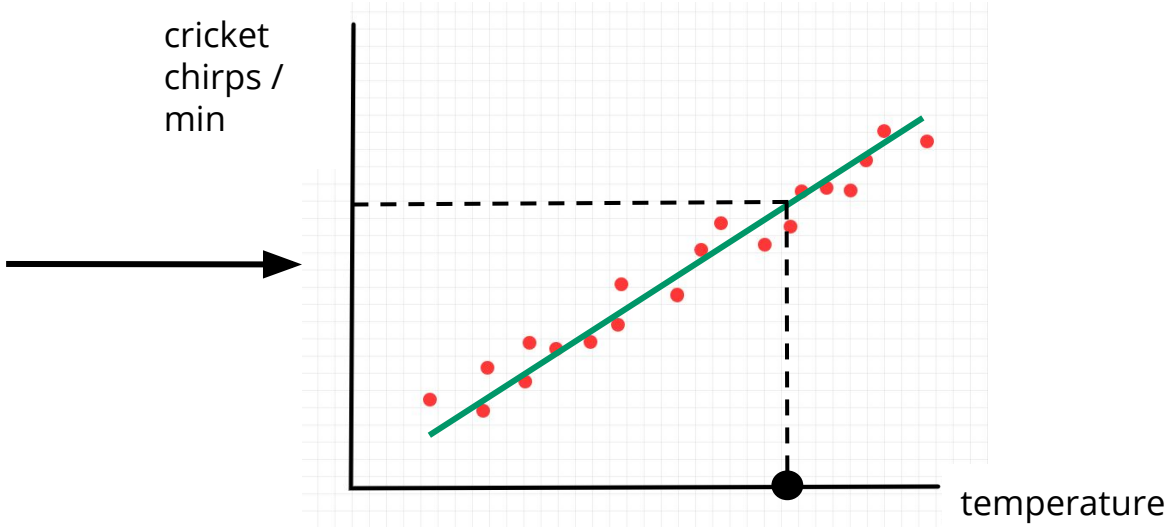

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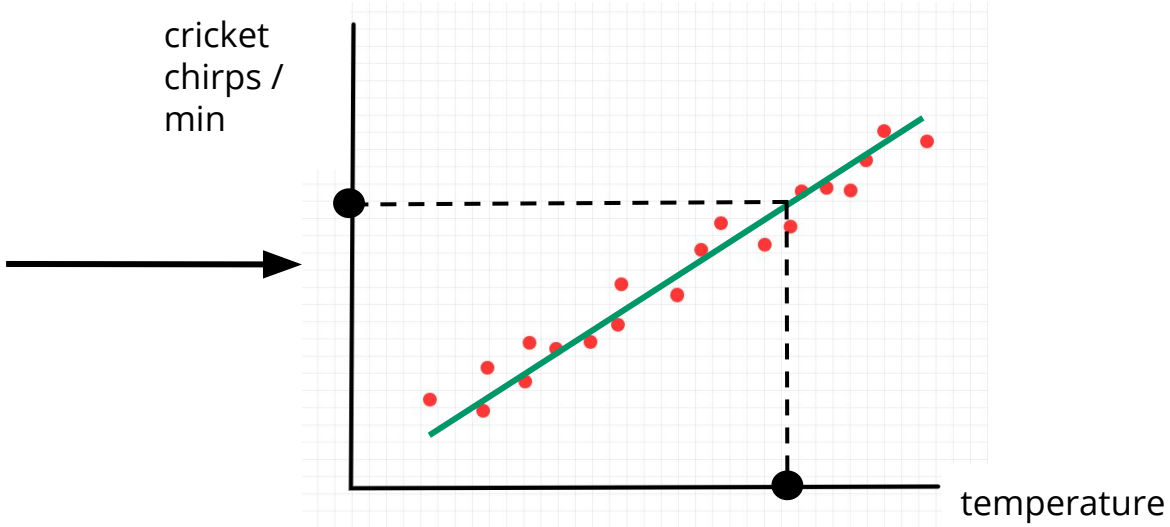

This type of supervised learning is referred to as regression

Supervised Learning

age	tumor size	malignant
20	12	0
22	15	1
47	20	1
59	2	1

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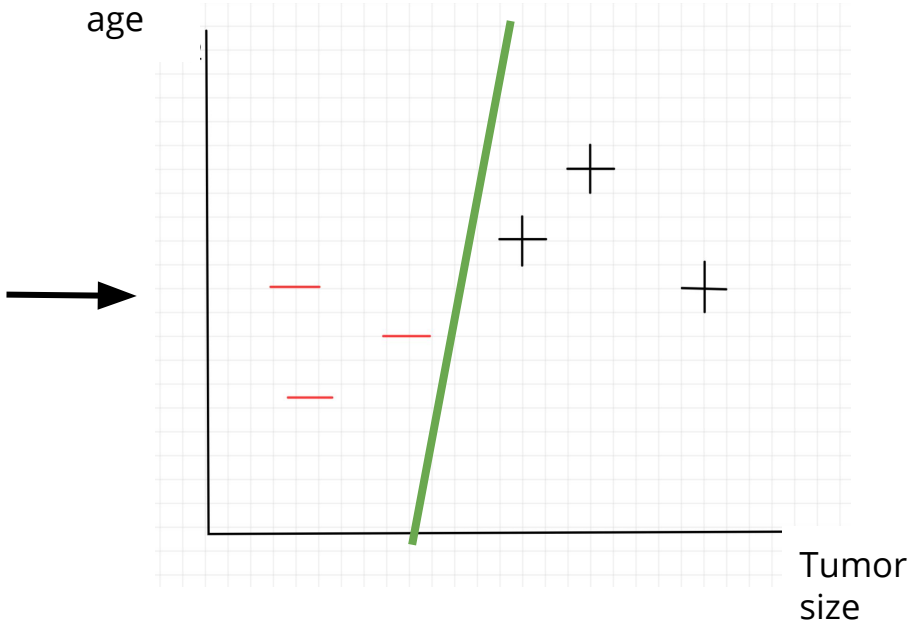

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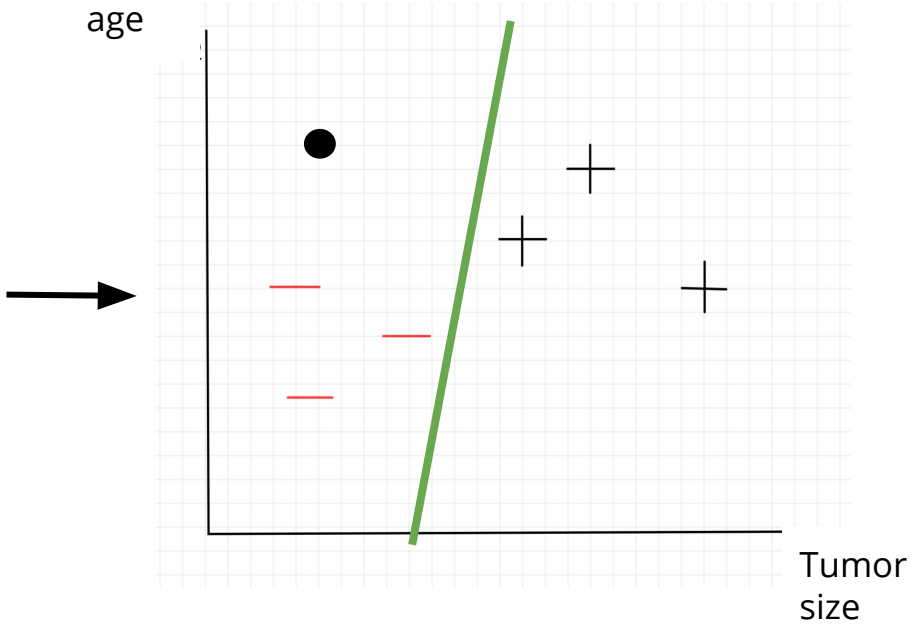

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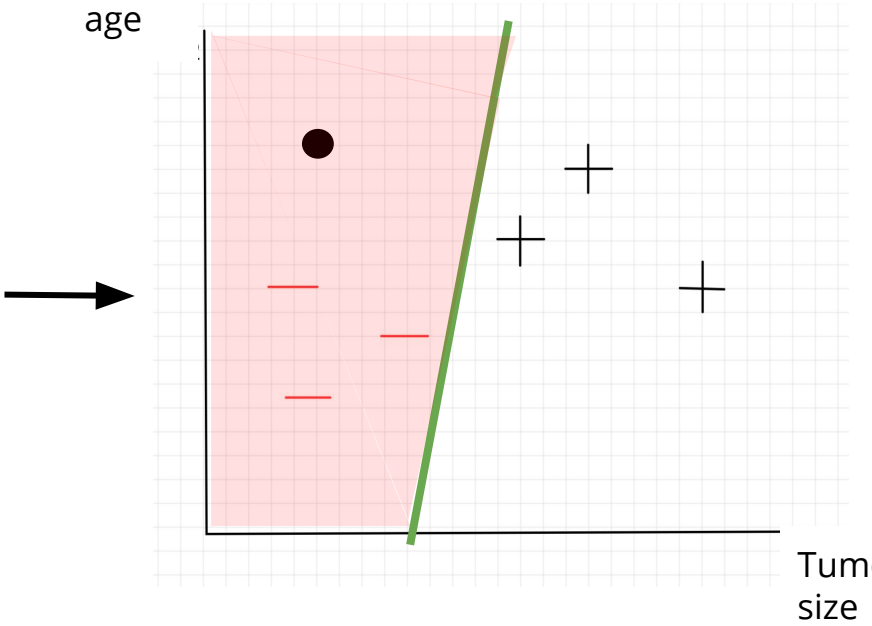
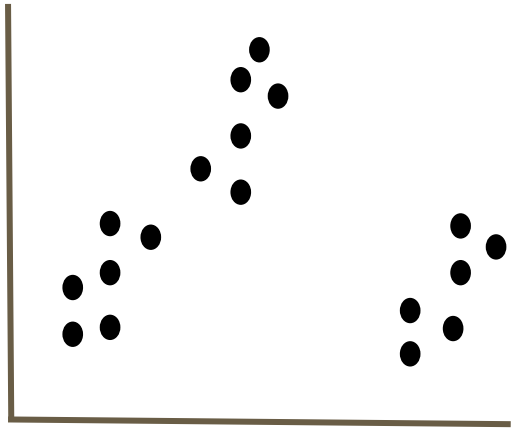


This type of supervised learning is referred to as classification

Unsupervised Learning

Goal: Find interesting structure in the data



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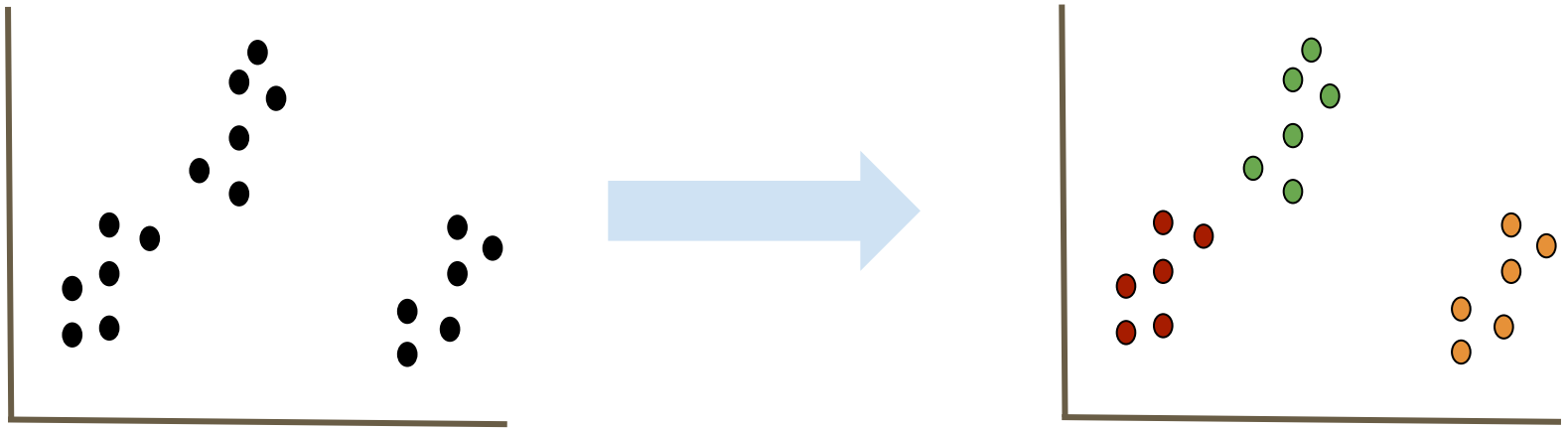

This type of unsupervised learning is referred to as clustering

Unsupervised Learning

Dataset: Collection of Articles

Question: Are these articles covering the same topics?