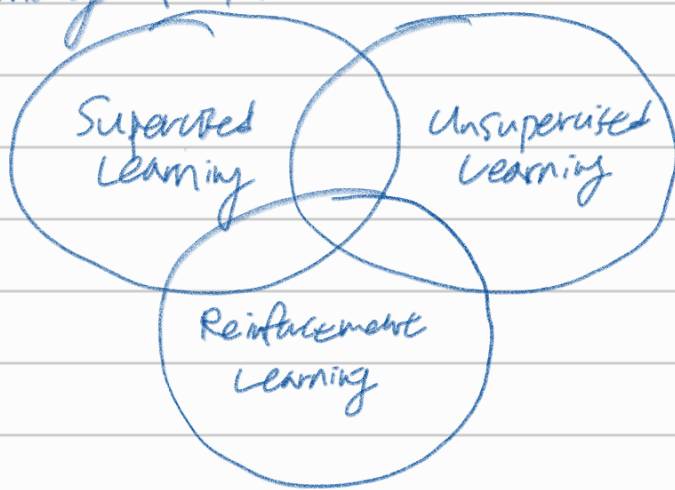


Taxonomy of ML



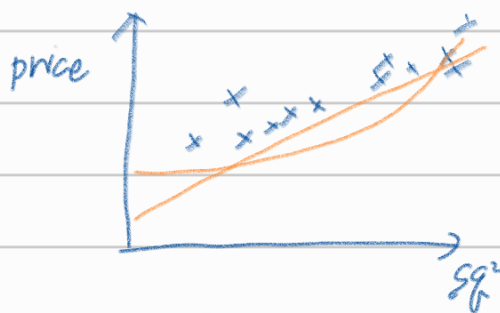
Supervised Learning

Housing Price Prediction

given: a dataset that contains n samples

$$(x^{(1)}, y^{(1)}) \dots (x^{(n)}, y^{(n)})$$

Task: if a residence has x square feet, predict its price?



① linear regression

③ quadratic

Note: Features ^{input param}

- Suppose we also know the lot size
- Task: find a function that maps

$$\underbrace{(\text{size}, \text{lot size})}_{\substack{\text{features/input} \\ x \in \mathbb{R}^2}} \rightarrow \underbrace{\text{price}}_{\substack{\text{label/output} \\ y \in \mathbb{R}}}$$

a set of labels: supervision

↓
"supervised"
learning

- Dataset: $(x^{(1)}, y^{(1)}) \dots (x^{(n)}, y^{(n)})$ where $x^{(i)} = (x_1^{(i)}, x_2^{(i)})$

- "supervision" refers to $y^{(1)} \dots y^{(n)}$

High-dimensional Features

- $x \in \mathbb{R}^d$ for large d

- E.g.

$$x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ \vdots \\ x_d \end{bmatrix} \begin{array}{l} \text{— living size} \\ \text{— lot size} \\ \text{— \# floors} \\ \vdots \end{array}$$

$\rightarrow y = \text{price}$

Regression vs. Classification

- regression: if $y \in \mathbb{R}$ is a continuous variable

e.g. price prediction

- classification: the label is a discrete variable "type"

e.g. (size, lot size) $\rightarrow y = \text{house or townhouse?}$

Supervised Learning in Computer Vision

- Image Classification

x : raw pixels of the image (matrix), y : the main object

- Object localization and detection

x : raw pixels of the image y : the bounding boxes (2 coordinates)

Supervised Learning in NLP (CS224N, CS231N)

- Machine translation

chinese sentence \rightarrow english sentence

x

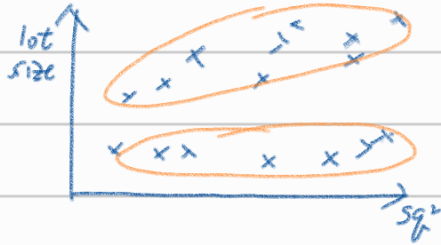
y

sort of classification
 \therefore finite number of y s

Unsupervised Learning

- data set contains no labels: $x^{(1)} \dots x^{(n)}$ but no y s

clustering



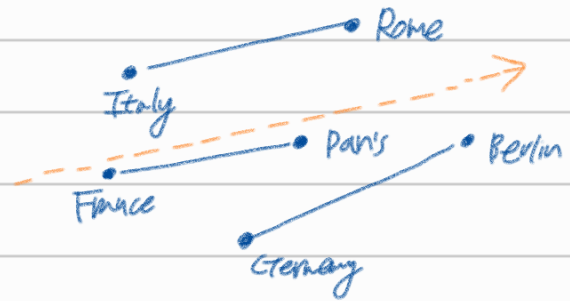
A good algorithm will produce a good clusters

Word Embeddings

- Represent words by vectors

word $\xrightarrow{\text{encode}}$ vector

relation $\xrightarrow{\text{encode}}$ direction



Clustering Words with Similar Meanings (Hierarchically)

여기 그림 생략함

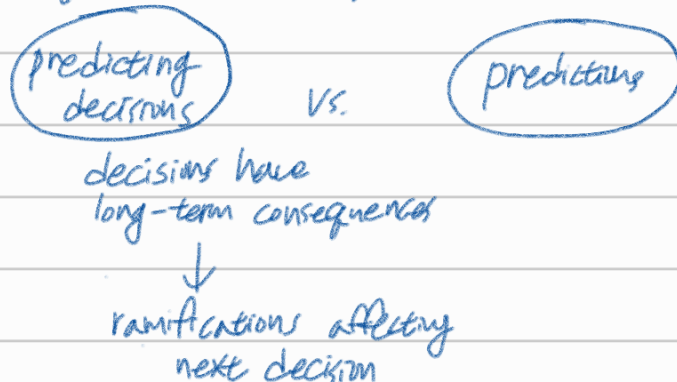
tag 들이 서로 다른 upper jump의 높낮이 정도

LLM?

corpus: 대량의 언어 자료 집
training corpus

Reinforcement Learning

- learning to make seq decisions



- The algorithm can collect data interactively

