

ML Concepts

Framing

- What is ML?
 - learn how to combine input to produce useful predictions.
- Label (y)
 - the thing we're predicting.
- Features (\vec{x})
 - the thing we input to the model.
- Models
 - a model defines the relationship between \vec{x} & y .
 - or, mapping \vec{x} to y (\hat{y}).
 - $\begin{cases} \text{training} : \text{creating / learning the model.} \\ \text{inference} : \text{applying the model to unlabeled examples.} \end{cases}$ $\begin{cases} \text{Regression} \\ \text{Classification} \end{cases}$
- Regression & Classification.
 - R: continuous y .
 - C: discrete y .

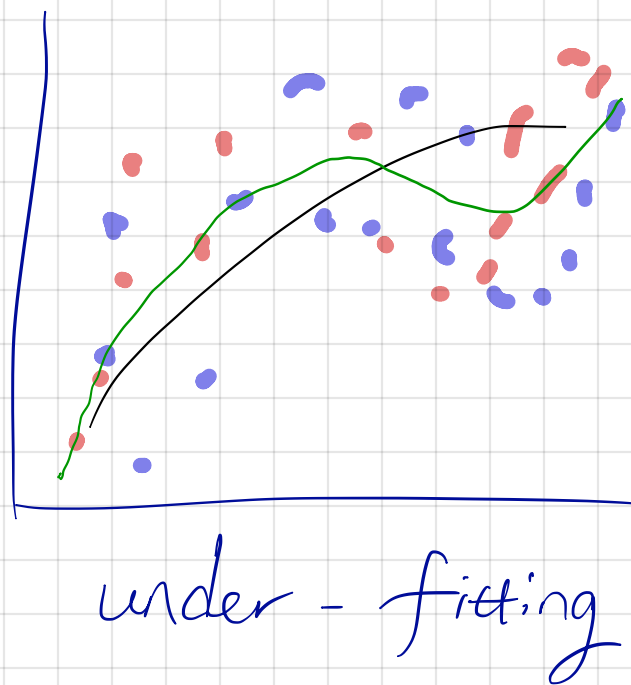
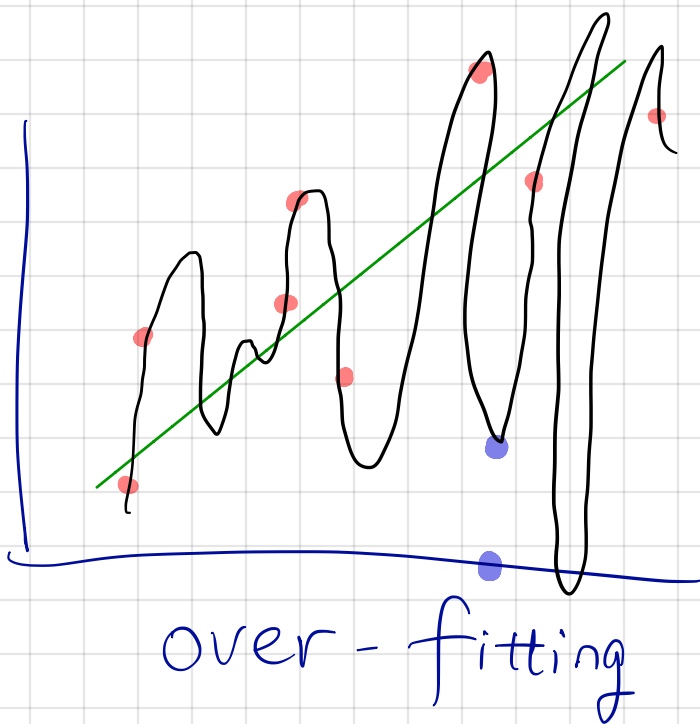
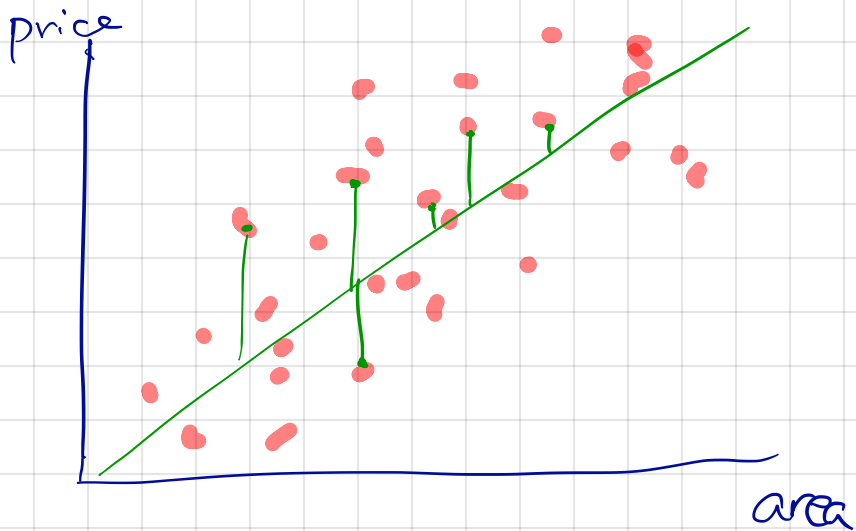
Descending to ML.

training \Rightarrow empirical risk minimization.

loss \Rightarrow the penalty for a (bad) prediction.

squared loss $\Rightarrow (y - \hat{y})^2$

\uparrow L2-loss



Representation



Feature engineering



Select good features



Clean data

→ scaling

min/max :

$$\left(\frac{x - x_{\min}}{x_{\max} - x_{\min}} \right) * (\max - \min) + \min$$

standard :

$$\frac{x - \mu}{\sigma}$$

numerical

string : one-hot

categorical { one-hot
boolean

Classification.




Thresholding.



True vs. False

Positive vs. Negative



TP	FP
FN	TN



Accuracy

$$\frac{\text{\# of correct pred.}}{\text{total \# of pred.}}$$

binary case:
$$\frac{TP + TN}{TP + FP + TN + FN}$$

# of room(s)	area	# of garage(s)
3	2200	2
4	2700	1
.	.	.

Price

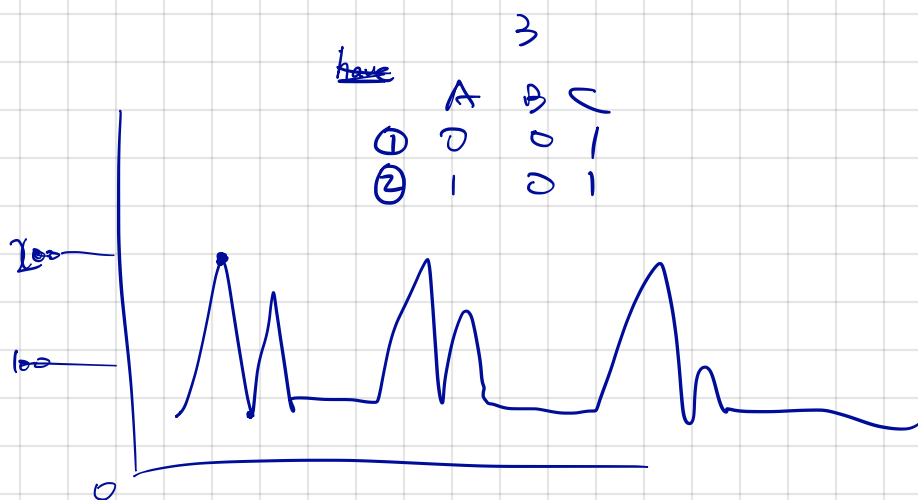
550,000

70,000


.

|

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HR	A	B	C
200	0	0	1
50	0	0	1



A diagram showing a data point $X^{(1)}$ on a grid. An arrow points from the text "1st data point" to the superscript (1) . Another arrow points from the text "1st feature" to the first element of the vector X .

0	1	0
0	1	0
1	1	0

A hand-drawn red smiley face with two vertical lines for eyes and a curved line for a mouth, located in the bottom right corner of the page.

$$x^{(1)} \rightarrow \begin{bmatrix} 0 & 1 & 0 & 0 & 1 & 0 & 1 & 0 \end{bmatrix}$$

A hand-drawn diagram on a grid background. On the left, a blue square contains a 3x3 grid. A red line connects the top-right corner of this square to the top-left corner of a red rectangle on the right. The red rectangle contains a 1x5 grid.

$$\begin{bmatrix} \begin{bmatrix} 0 & 210 & 13 \\ 27 & 18 & 29 \\ 210 & 26 & 73 \end{bmatrix} & \begin{bmatrix} 210 & 0 & 17 \\ 13 & 19 & 101 \\ 50 & 47 & 46 \end{bmatrix} & \begin{bmatrix} \end{bmatrix} \end{bmatrix}$$

$$3 \times 3 \times 3$$