3) how to find nearest

knn

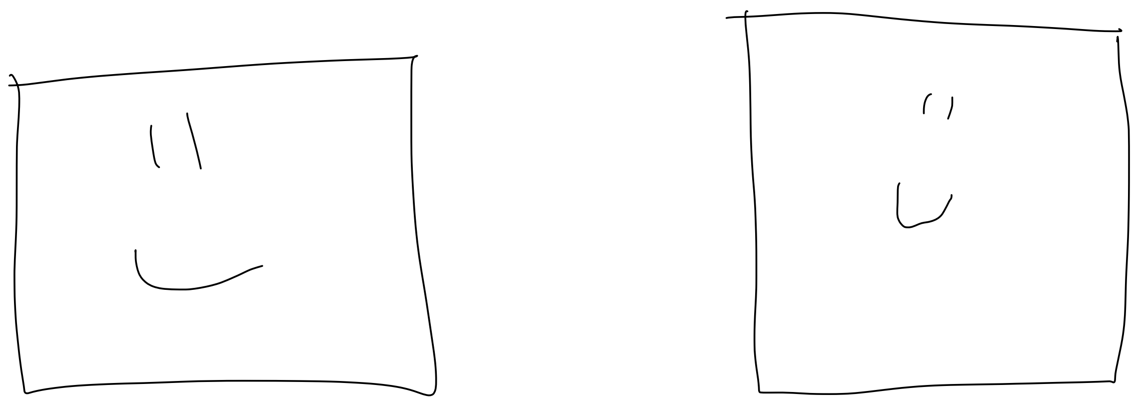
a) brute force

b) tree

c) approximate nearest neighbor

Scaling

$$\frac{V - V_{min}}{V_{max} - V_{min}}$$



# Naive Bayes

$p(y \mid \vec{x})$ - choose $y$ with max

Bayes rule

$$\underbrace{p(y \mid \vec{x})}_{\text{posterior}} = \frac{\overbrace{p(\vec{x} \mid y)}^{\text{liklihood}} \; \overbrace{p(y)}^{\text{prior}}}{p(x)}$$

"Naive" assumption

$\vec{x}_i$ : i-th feature vector

$x^{(j)}$ : j-th element of feature vector

$$p(\vec{x}|y) = p(x^{(1)}|y)\, p(x^{(2)}|y) \cdot \ldots \cdot p(x^{(d)}|y)$$

$$= \prod_j p(x^{(j)}|y)$$

$\sum \rightarrow$ sum

$\prod \rightarrow$ multiply

$$p(y \mid \vec{x}) = \frac{\left(\prod_i p(x^{(i)} \mid y)\right) p(y)}{p(\vec{x})}$$

$$\propto \left(\prod_i p(x^{(i)} \mid y)\right) p(y)$$

proportional to

$$\propto p(y) \prod_i p(x^{(i)} \mid y)$$

$p(\text{accident} \mid \text{rain})$

$p(\text{umbrella} \mid \text{rain})$

choose class with largest $\underbrace{p(y \mid \vec{x})}$

$$\prod_j p(x^{(j)} \mid y)\, p(y)$$

MAP

maximum a posteriori

$$\underbrace{p(y \mid \vec{x})}_{\text{posterior}}$$

$$p(y == c) = \frac{\text{\# of samples with class c}}{\text{\# of samples}}$$

$$= \sum_{i=0}^{N-1} \delta(y_i == c)$$

$$p(x^{(j)} == t \mid y == c) = \frac{\text{\# of times } j^{th} \text{ attribute was } t \text{ and } y \text{ was } c}{\text{\# of samples with class c}}$$

$$= \frac{\sum_{i=0}^{N-1} \delta(x_i^{(j)} == t \,\&\&\, y_i == c)}{\sum_{i=0}^{N-1} \delta(y_i == c)}$$

$$p(y)\prod p(x|y)$$

$$\log(ab) = \log(a) + \log(b)$$