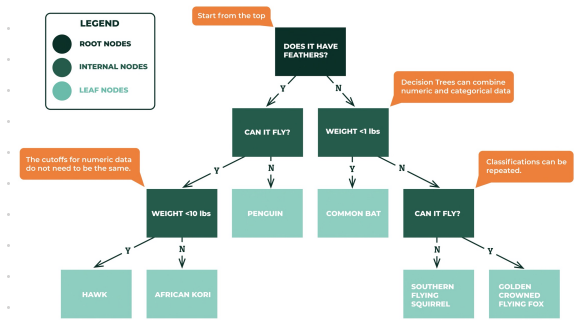


Ensemble method

→ weak classification
strong classification

Bootstrap

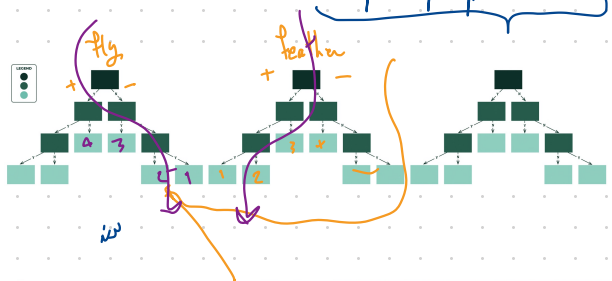


ORIGINAL DATASET

FEATHERS	LBS	FLY	ANIMAL
Yes	5	Yes	Hawk
Yes	6	No	African Kori
Yes	3	No	Penguin
Yes	.01	Yes	Common Bat
Yes	1.1	No	Flying Squirrel
Yes	2.4	Yes	Flying Fox

BOOTSTRAPPED DATASET

FEATHERS	LBS	FLY	ANIMAL
No	2.4	Yes	Flying Fox
Yes	6	No	African Kori
Yes	3	No	Penguin
Yes	4	No	Penguin
No	1.1	No	Flying Squirrel
Yes	6	No	African Kori



FEATHERS	LBS	FLY	TREE 1	TREE 2	TREE 3	TREE 4	TREE 5	TREE 6
Yes	5	Yes	Hawk	Penguin	Hawk	Hawk	Hawk	Hawk
Yes	6	No	Penguin	Hawk	Kori	Kori	Kori	Kori
Yes	3	No	Penguin	Penguin	Penguin	Penguin	Penguin	Penguin



random

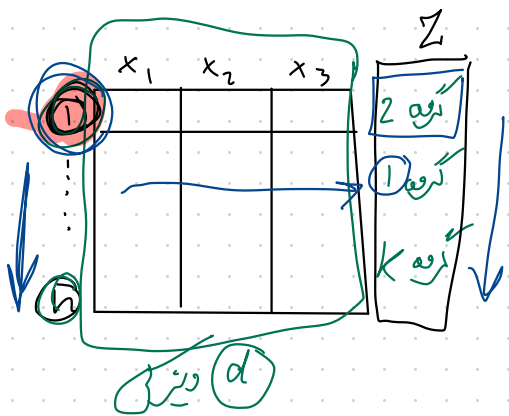
random forest

K-means Clustering → Unsupervised

گروہ بندی

cluster 1 گروہ 1
cluster 2 گروہ 2
cluster 3 گروہ 3

K means Clustering



$$x^{(i)} \rightarrow z^{(i)} [2, 1, 2, 3, K]$$

$$X \rightarrow Z [z^{(1)} \dots z^{(n)}]$$

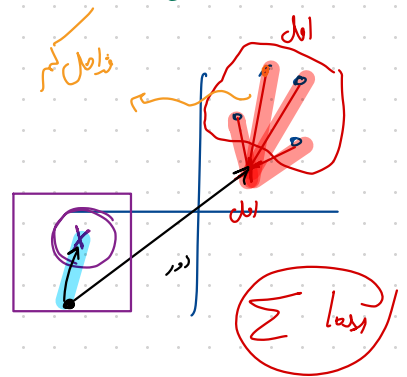
$$z^{(i)} \in \{1, 2, \dots, K\}$$

Centroid مرکزیت

$$\mu_i \in \mathbb{R}^d$$

K دسته/گروہ مختلف

$$\text{loss}(\mu, Z) = \sum_{i=1}^n \|x^{(i)} - \mu^{z^{(i)}}\|$$

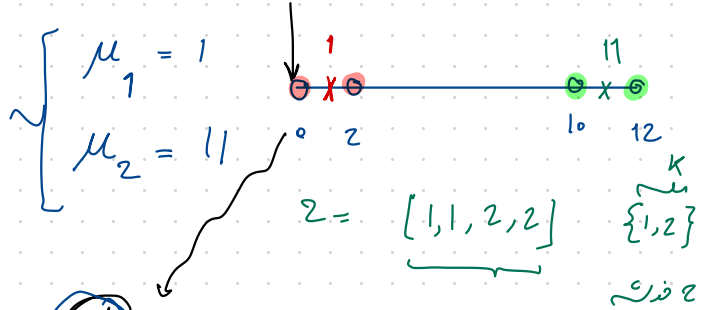


$$\min_{\mu} \min_Z \text{loss}(\mu, Z)$$



الکتریک

نقطة كنه μ هار ميون



$$Z^1 = \arg \min \{ (0-1)^2, (0-11)^2 \}$$

μ_1 و μ_2 الـ

$$Z^2 = \arg \min \{ (2-1)^2, (2-11)^2 \}$$

نقطة كنه فضاء هار ميون

Z
 μ ?

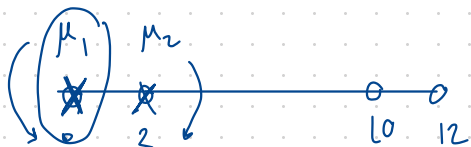


$$Z_1 = \mu_1 = \arg \min \{ (0-\mu)^2 + (2-\mu)^2 \}$$

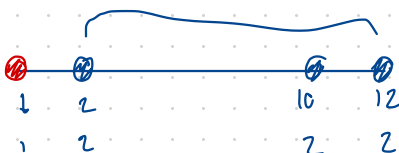
$$\mu_2 = \arg \min \{ (10-\mu)^2 + (12-\mu)^2 \}$$

Algorithm

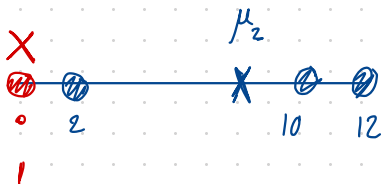
① K نقطه رسم از دیتا و انتخاب کن و بلبه μ ها وصل به



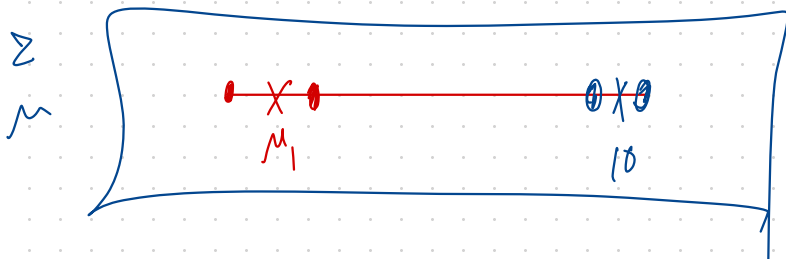
② μ ها بلبه Σ می آید



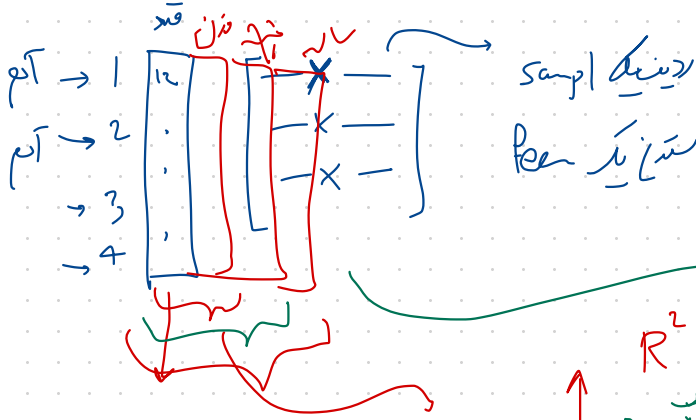
③ Σ رو داریم μ ها و می آید



④ μ ها در Σ



PCA - unsupervised dimensionality reduction

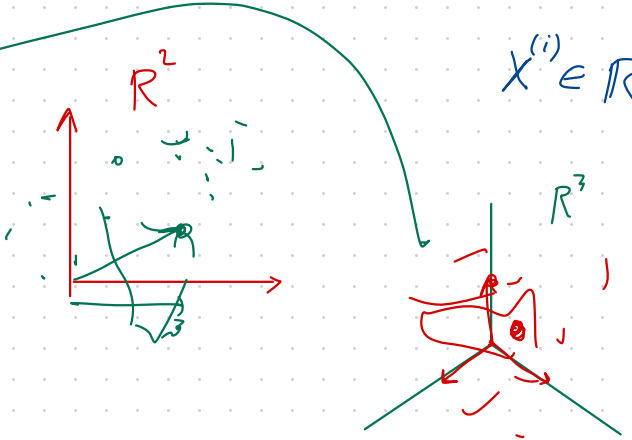


sample
feature

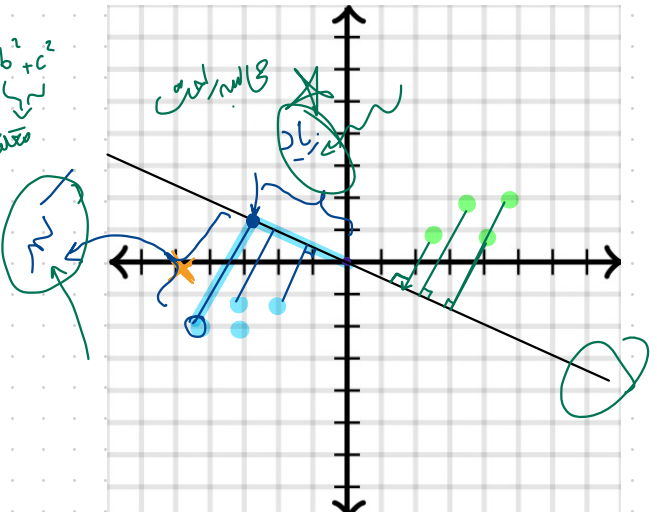
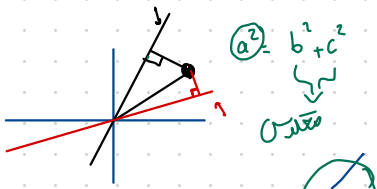
$$X^2 = [170]$$

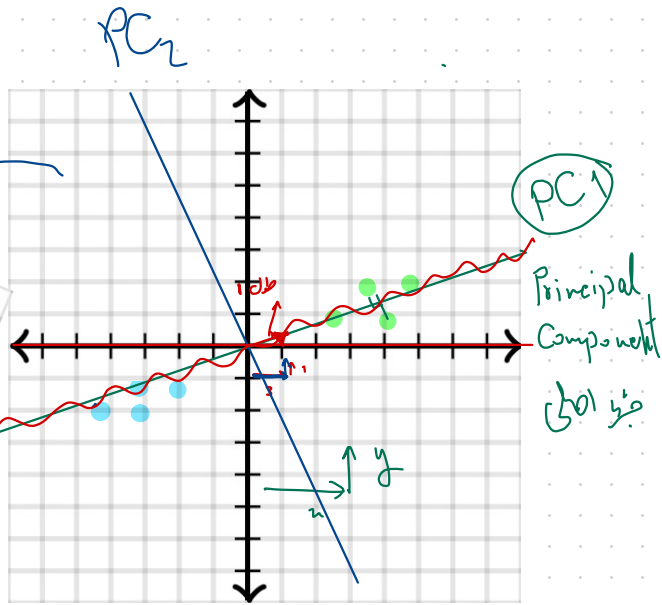
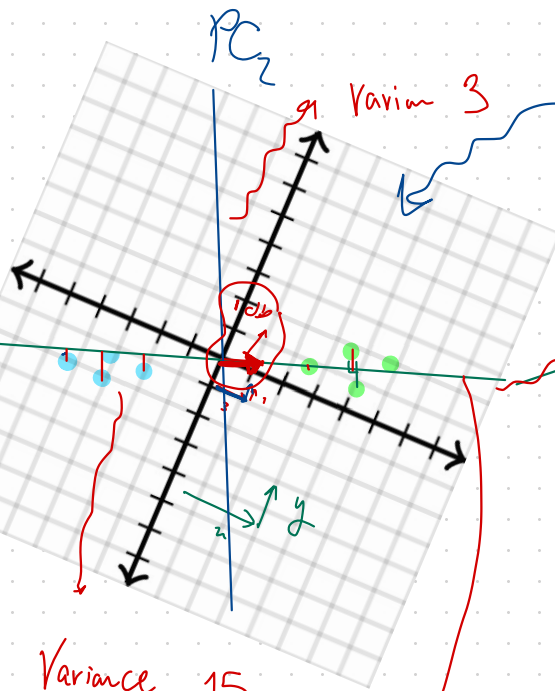
$$X^{(i)} \in \mathbb{R}^1$$

$$x \rightarrow \mathbb{R}^1$$



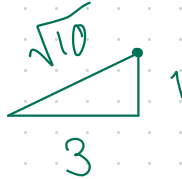
- حساب \bar{x}, \bar{y}
- دیتا جایی کن بر طوری که
ش مرکز (\bar{x}, \bar{y})
- خط فیت پیدا کن





$$PC_1 \rightarrow (3)$$

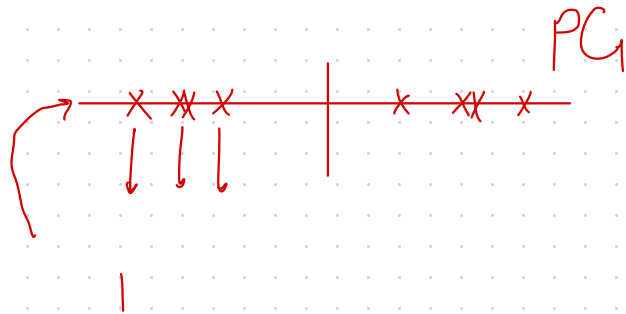
$$3x + 1y$$

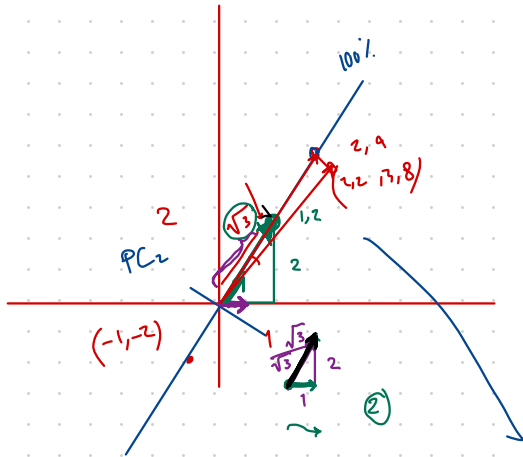


$$\frac{\sqrt{10}}{\sqrt{10}} \rightarrow \frac{1}{\sqrt{10}}$$

$$U_{varian} = \frac{84\% \cdot 15}{18} \quad PC_1$$

$$19\% \cdot \frac{3}{18} \quad PC_2$$





R^2

تغيير مينا

$(-1, -2) (1, 2) (2, 4)$
 $(-1, 0) (1, 0) (2, 0)$

