PCA (Principal component Analysis)

GD

learning rate

$$\theta^{t+1} = \theta^{t} - \eta \underbrace{\sum_{i=1}^{N} \frac{\partial f}{\partial \theta}}_{\text{Slowed}}$$

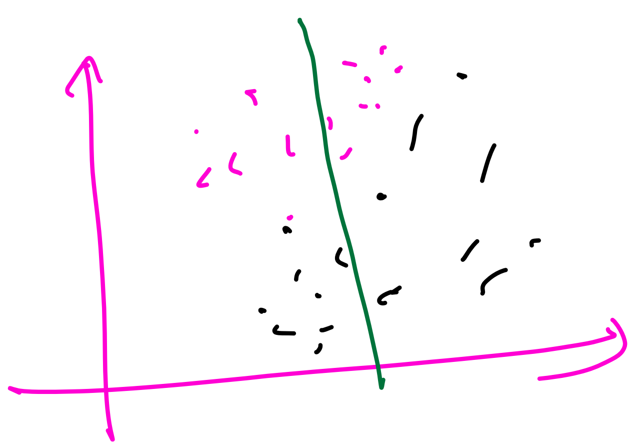
1 million

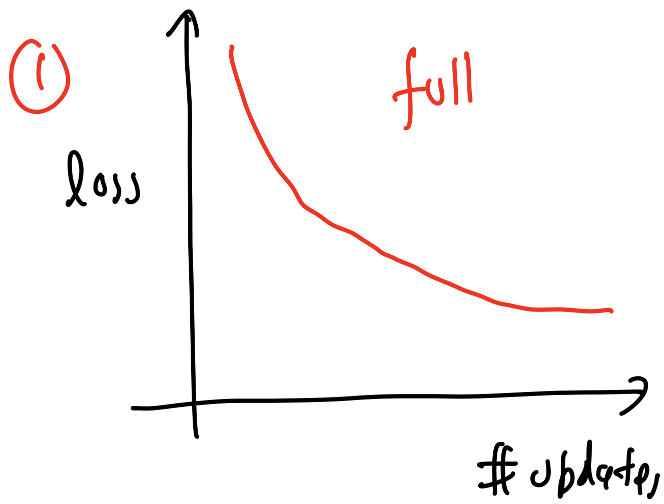
Batch Gradient Descent

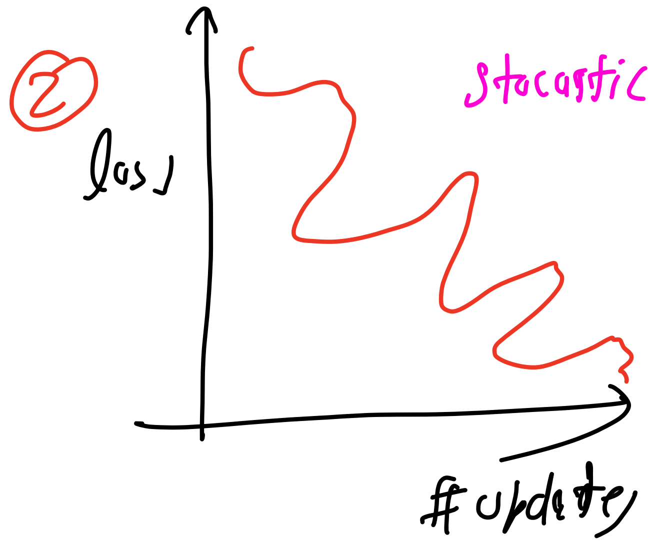
$$\theta^{t+1} = \theta^{t} - \eta \sum_{i \in B} \frac{\partial f}{\partial \theta}$$

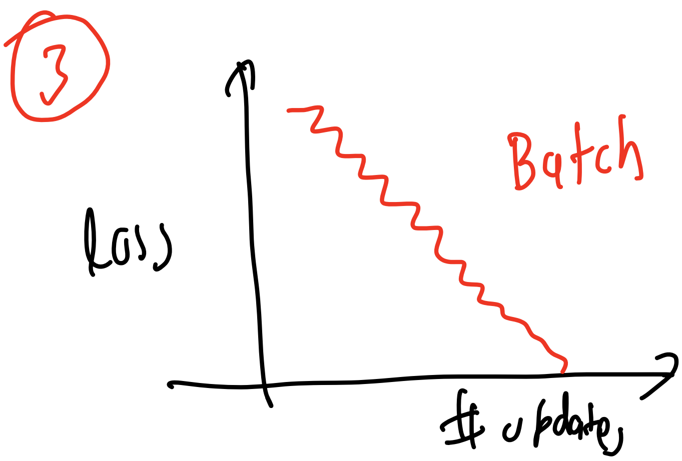
Stocastic GD

$$\theta^{t+1} = \theta^{t} - \eta \frac{\partial f}{\partial \theta}$$



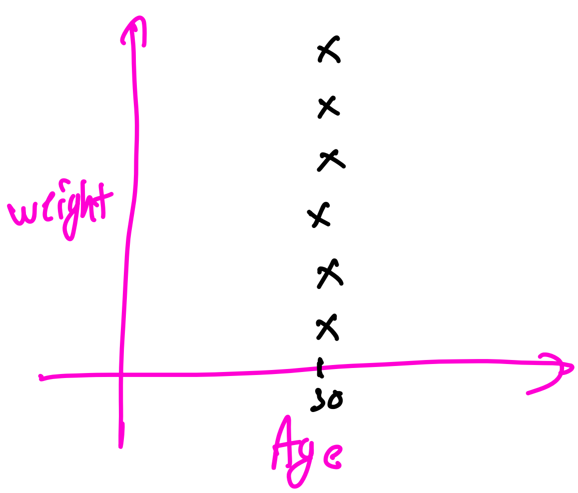


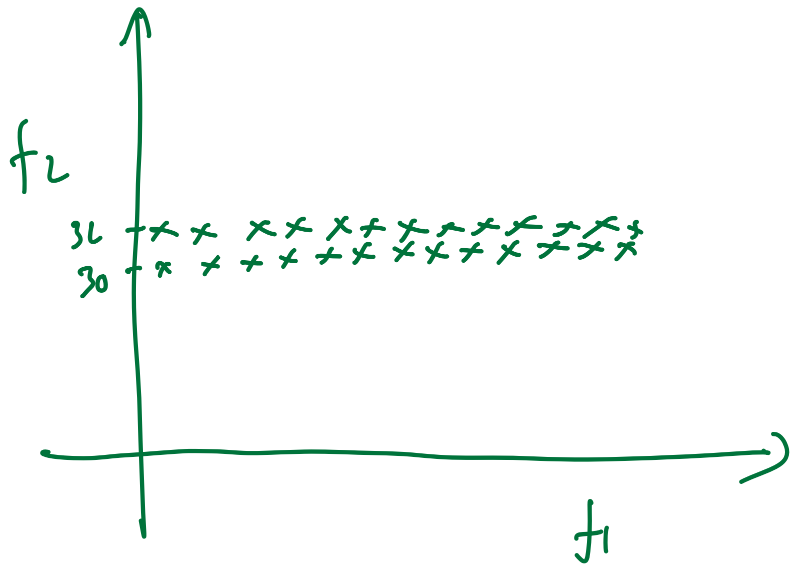


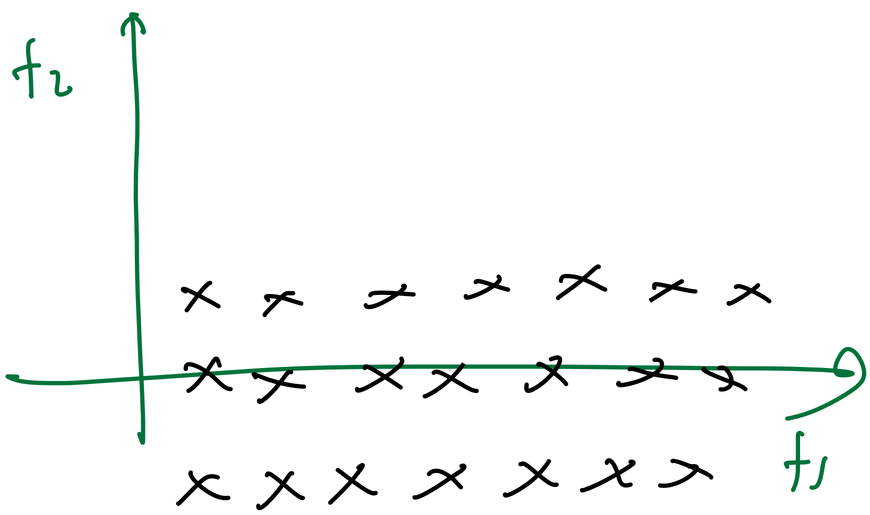


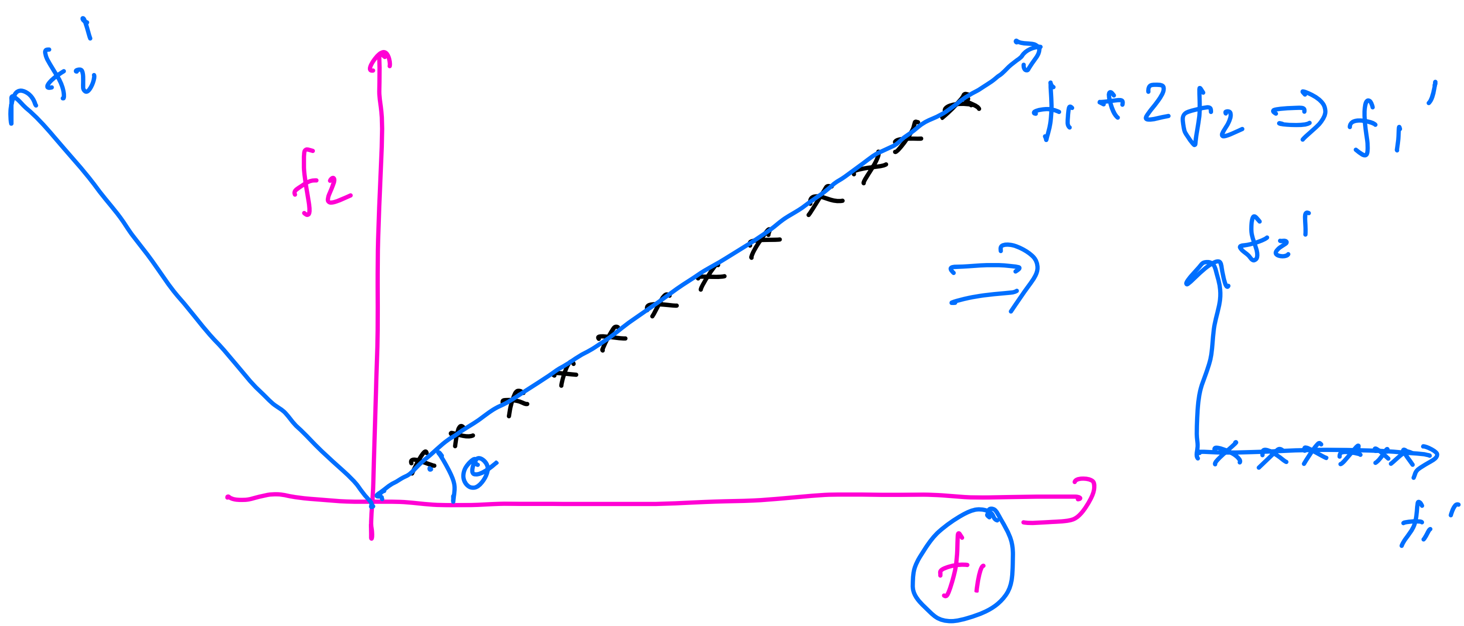
PCA

weight	Age	Diabetes
20	30	-
30	30	-
25	30	-
45	30	-
64	30	-




f2
32
30
f1

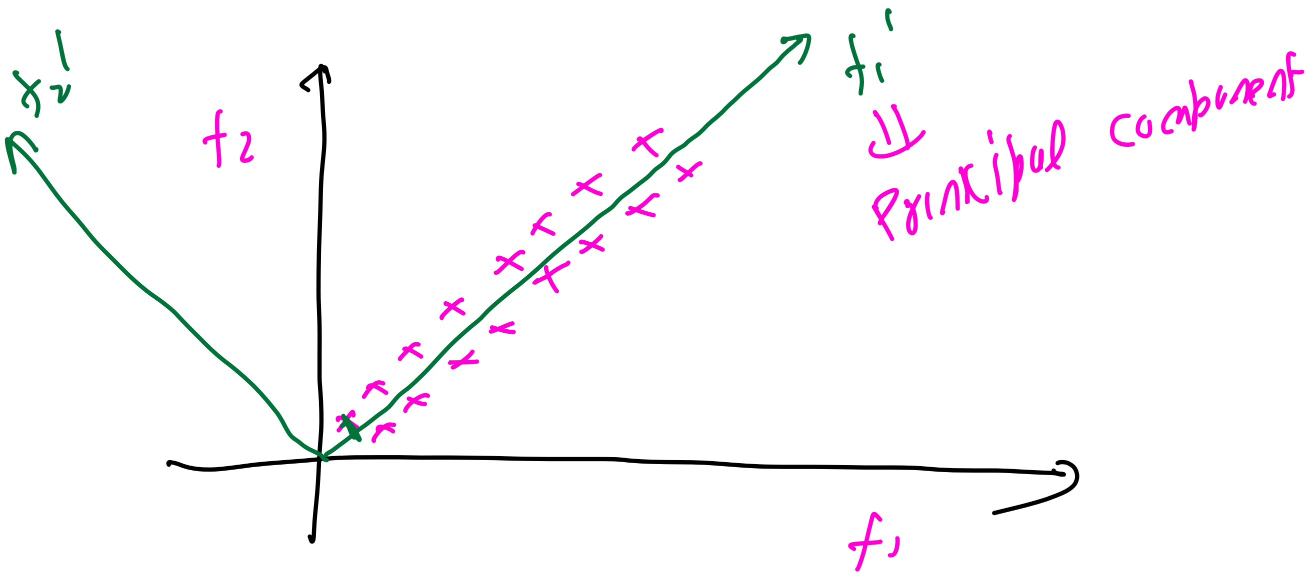

f2
f1


f2'
f2
θ
f1
f1 + 2f2 ⇒ f1'
⇒
f2'
f1'

f_1	f_2
1	2
3	4
5	6
7	8

$f_1 + 2f_2$
5
11
17
23

$f' \Rightarrow$ Principal component



weight	Age
2000 g	20
5000 g	30

⇒ standardise

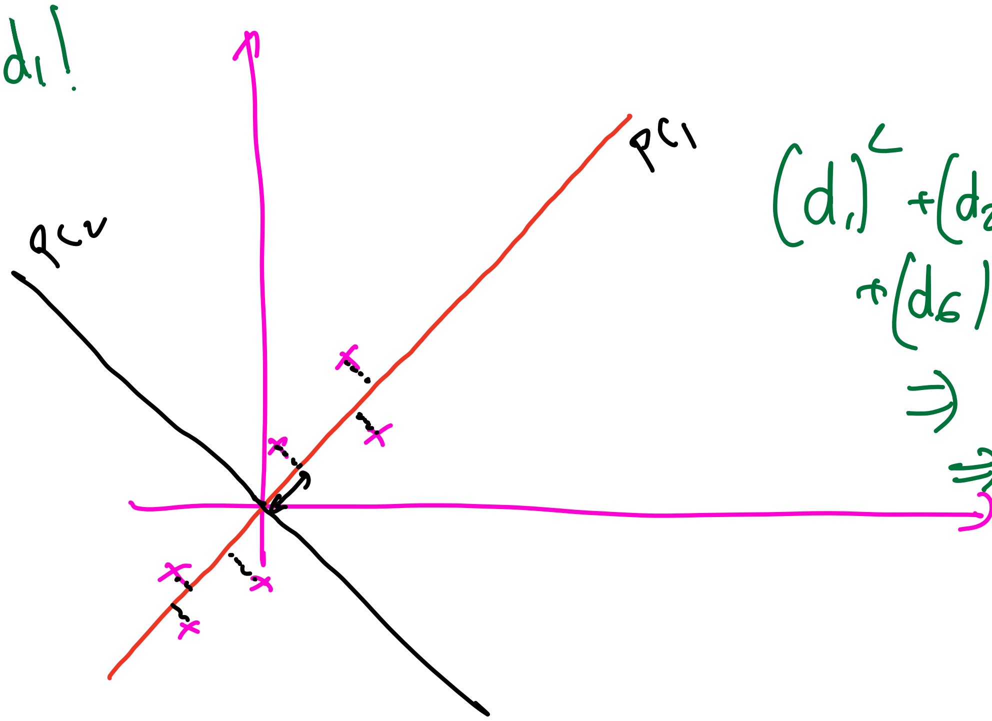
⇓

z - score

mean ⇒ 0

sd ⇒ 1

$|d_1|$



$$(d_1)^2 + (d_2)^2 + (d_3)^2 + (d_4)^2 + (d_5)^2 + (d_6)^2$$

⇒ sum of sq distance

⇒ SS (distance)

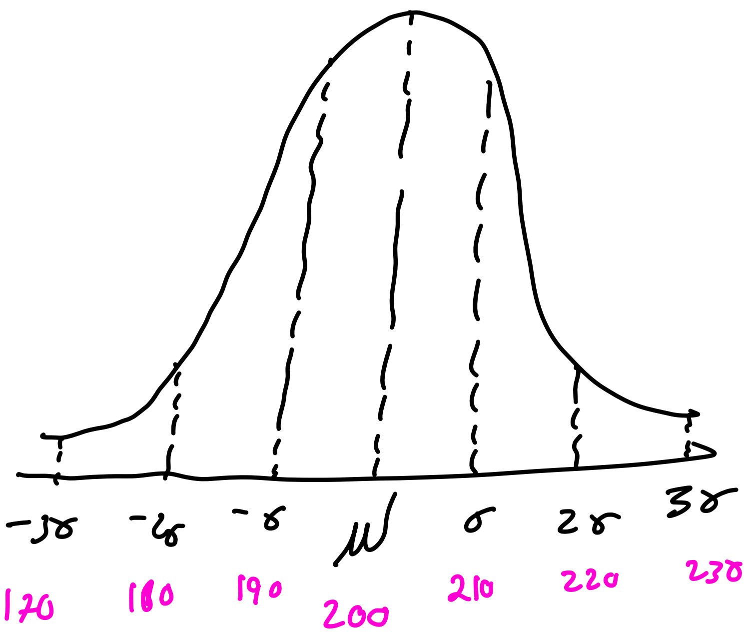
z - score

f1	f2
1000	20
2000	40

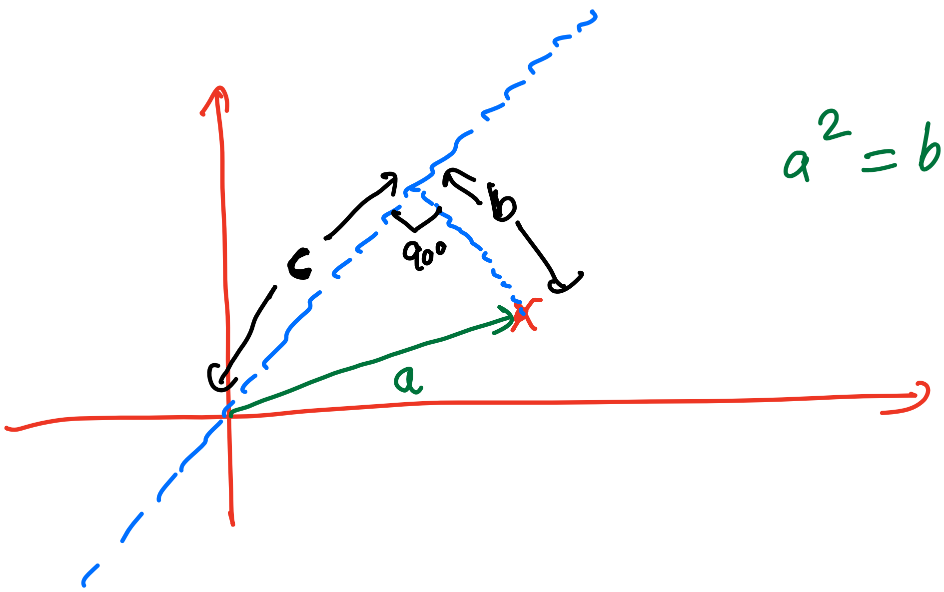
⇒ [-1, 1]

$235 \Rightarrow$ z-score

3.5

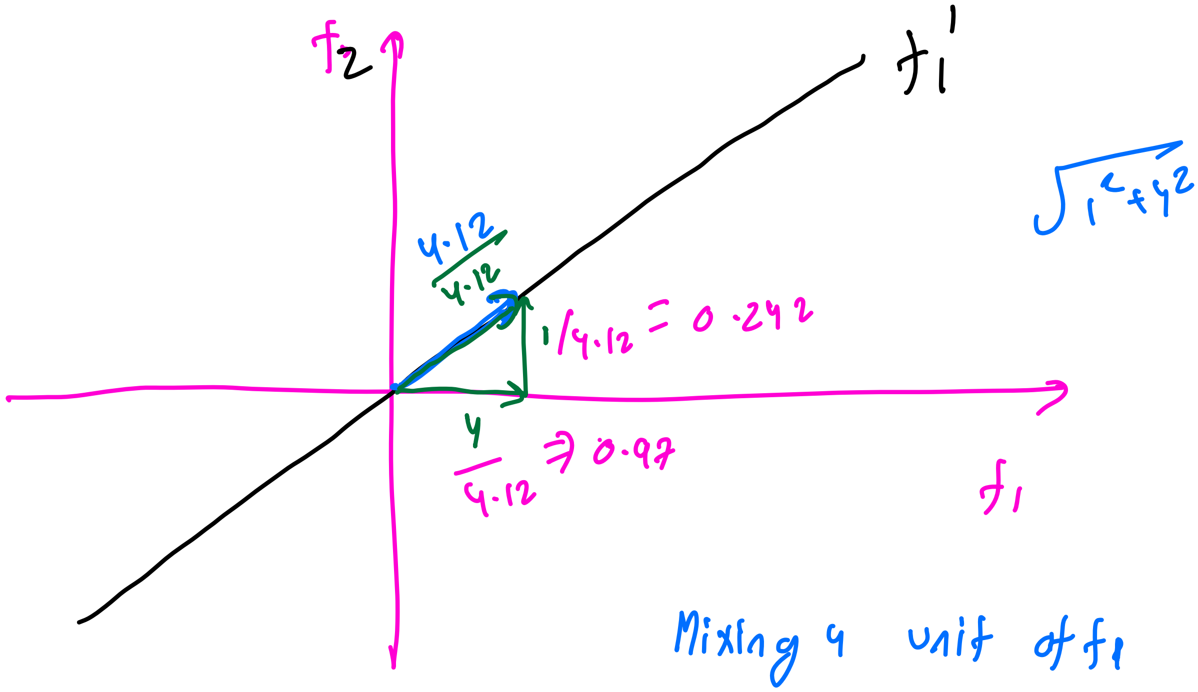


$\sigma = 10$



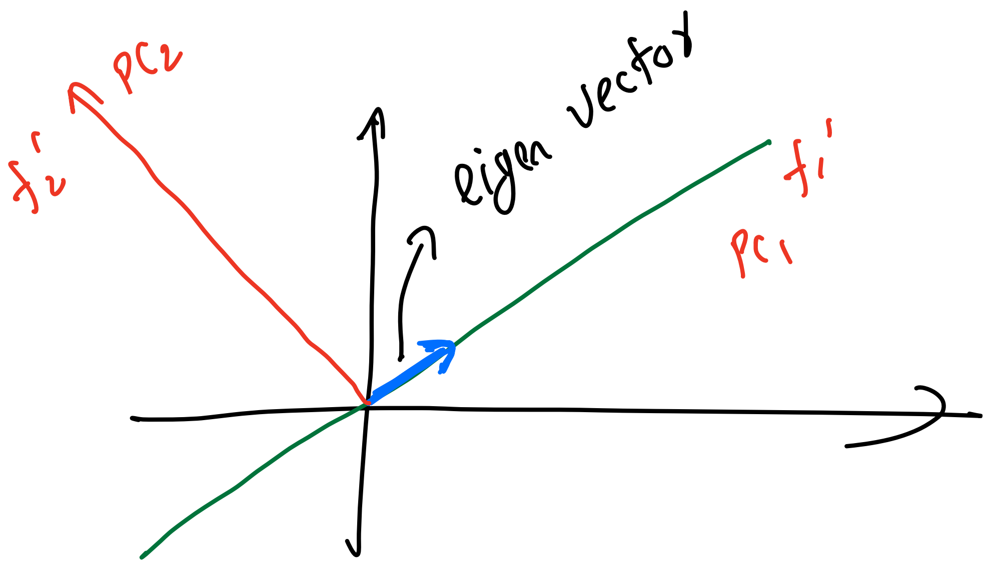
$a^2 = b^2 + c^2$

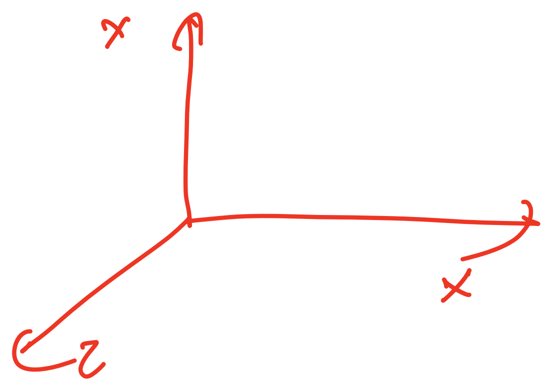
Break: 8:14 am



Mixing $0.97 \to f_1$
with $0.242 \to f_2$
$\Downarrow$
PC1

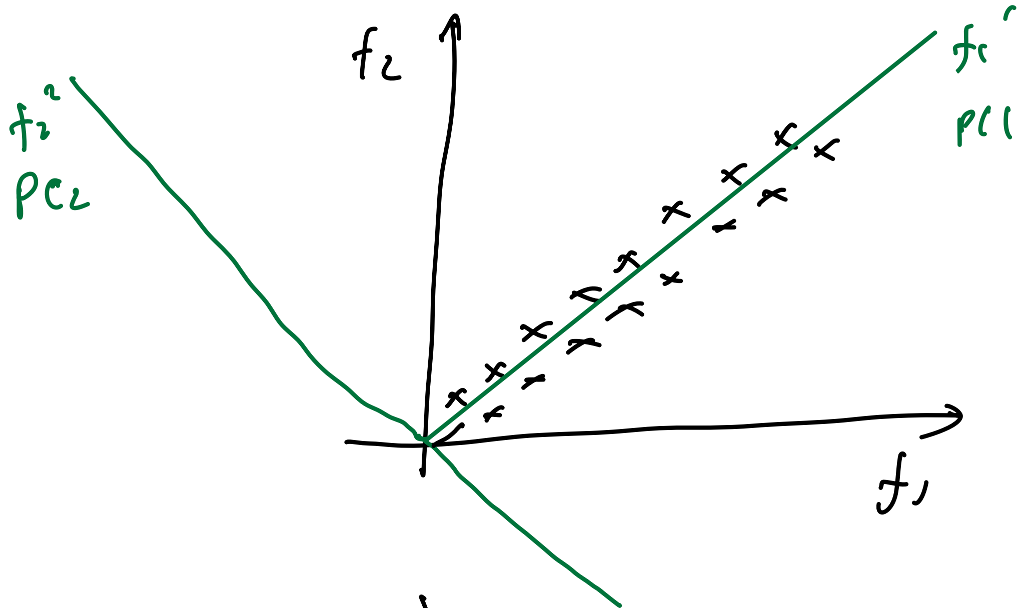
Mixing 4 unit of f_1
1 unit of f_2
$\Downarrow$
PC1





$$\frac{SS(\text{distance of } PC_1)}{n-1} = \text{Variance of } PC_1$$

$$\frac{SS(\text{distance of } PC_2)}{n-1} = \text{variance of } PC_2$$



SS (distance of PC1) ⇒ Eigen value of PC1

$var(PC1) = 15 \Rightarrow 15/17 = 0.88$

$var(PC2) = 2 \Rightarrow 2/17 = 0.12$

C_1	C_2	C_3	C_4

PC_1 PC_2 PC_3 PC_4

↓ ↓ ↓ ↓

var va

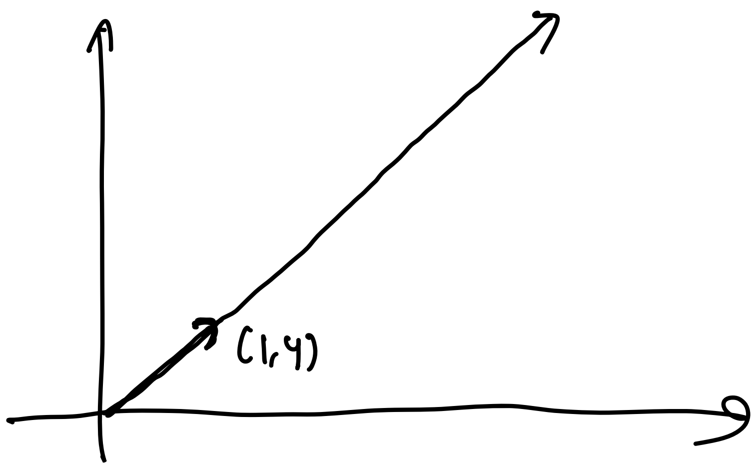
60%   35%   3%   2%

$$\Rightarrow \begin{bmatrix} -6 & 3 \\ 4 & 5 \end{bmatrix} \begin{bmatrix} 1 \\ 4 \end{bmatrix} = 6 \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$

A

eigen vector

eigen value



$$A \cdot \vec{x} = \lambda \vec{x}$$