

$$A - \lambda I = \begin{bmatrix} 2-\lambda & 3 \\ 4 & 3-\lambda \end{bmatrix}$$

$$= \begin{bmatrix} (2-\lambda)(3-\lambda) - 12 \end{bmatrix}$$

$$= 6 - 2\lambda - 3\lambda + \lambda^2 - 12$$

$$= \lambda^2 - 5\lambda - 6$$

$$\lambda^2 - 5\lambda - 6 = 0$$

$$\lambda = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 1, \quad b = -5, \quad c = -6$$

$$= \frac{+5 \pm \sqrt{25 + 24}}{2}$$

$$\begin{aligned} a &= 1 \\ b &= -5 \\ c &= -6 \end{aligned}$$

$$= \frac{+5 \pm \sqrt{49}}{2} = \frac{+5 \pm 7}{2}$$

$$\lambda_1 = \frac{12}{2} = 6, \quad \lambda_2 = \frac{-2}{2} = -1$$

$$\lambda_1 = 6, \quad \lambda_2 = -1, \quad \lambda_1 > \lambda_2$$

$$\lambda_1 = 6 //$$

$$\begin{bmatrix} 2-\lambda & 3 \\ 4 & 3-\lambda \end{bmatrix} \cdot x = 0$$

Row Echelon  
method

$\lambda_1 =$   
Eigen  
vector

$$\begin{bmatrix} 2-\lambda & 3 \\ 4 & 3-\lambda \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$$

Eigen  
vector  
values

Eigen  
Value

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 8 \\ 4 \end{bmatrix}$$

PC1

$x_1$	$x_2$
<del>Eigen</del>	<del>6</del>
<del>values</del>	<del>8</del>
<del>4</del>	<del>11</del>

$$PC_1 = \underline{\underline{x_2}}$$

$$= x_2$$

A hand-drawn coordinate system on a white background. It consists of a horizontal axis and a vertical axis intersecting at the origin. The horizontal axis extends to the left and right, while the vertical axis extends upwards and downwards. In the upper-left quadrant, the label  $x_2$  is written in a cursive, handwritten style.

1 p4

File



PC2



PC1



2] Cov matrix  $\sigma^2$

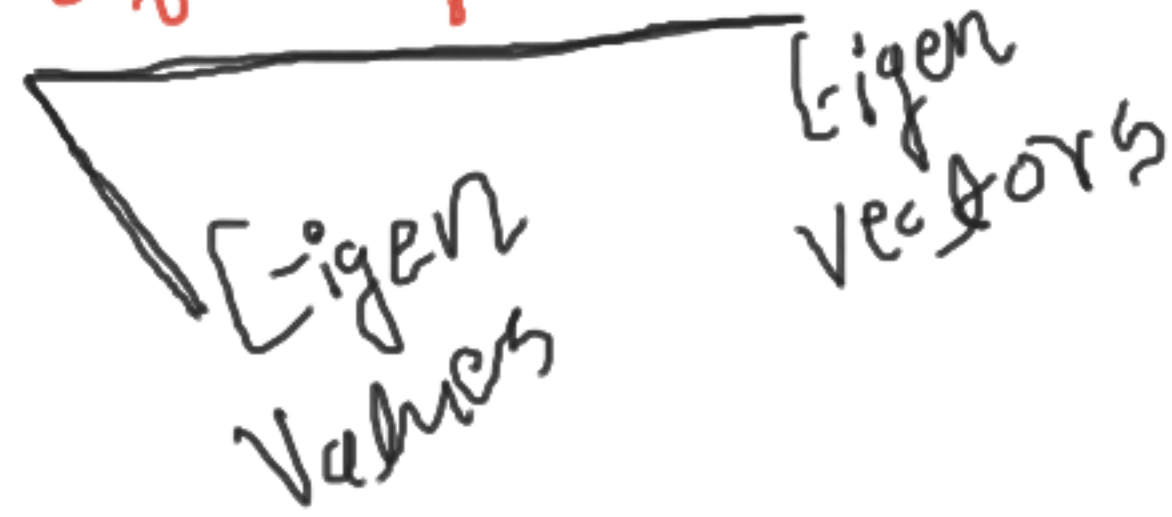
direction + 5pcard

$$\begin{array}{c} x_1 \\ x_2 \\ x_3 \end{array} \left[ \begin{array}{ccc} x_1 & x_2 & x_3 \\ \text{Var}(x_1) & \text{Cov}(x_1, x_2) & \text{Cov}(x_1, x_3) \\ \text{Cov}(x_2, x_1) & \text{Var}(x_2) & \text{Cov}(x_2, x_3) \\ \text{Cov}(x_3, x_1) & \text{Cov}(x_3, x_2) & \text{Var}(x_3) \end{array} \right]$$



3] Eigen

Decomposition:-



$$Ax = \lambda x$$

Diagram illustrating the eigenvalue equation  $Ax = \lambda x$ . The term  $x$  is labeled as 'vectors' and the term  $\lambda$  is labeled as 'values'.

4] Transformation:-

$$\vec{p} \cdot \vec{u}$$

$$PC_1, \textcircled{1} \quad 1000 \times 3, \quad 3 \times 1 = 1 \times 1000 = PC_1 \rightarrow$$

$$PC_2, \textcircled{11} \quad 1000 \times 3, \quad 3 \times 1, = 1000 \times 1 = PC_2 \rightarrow$$

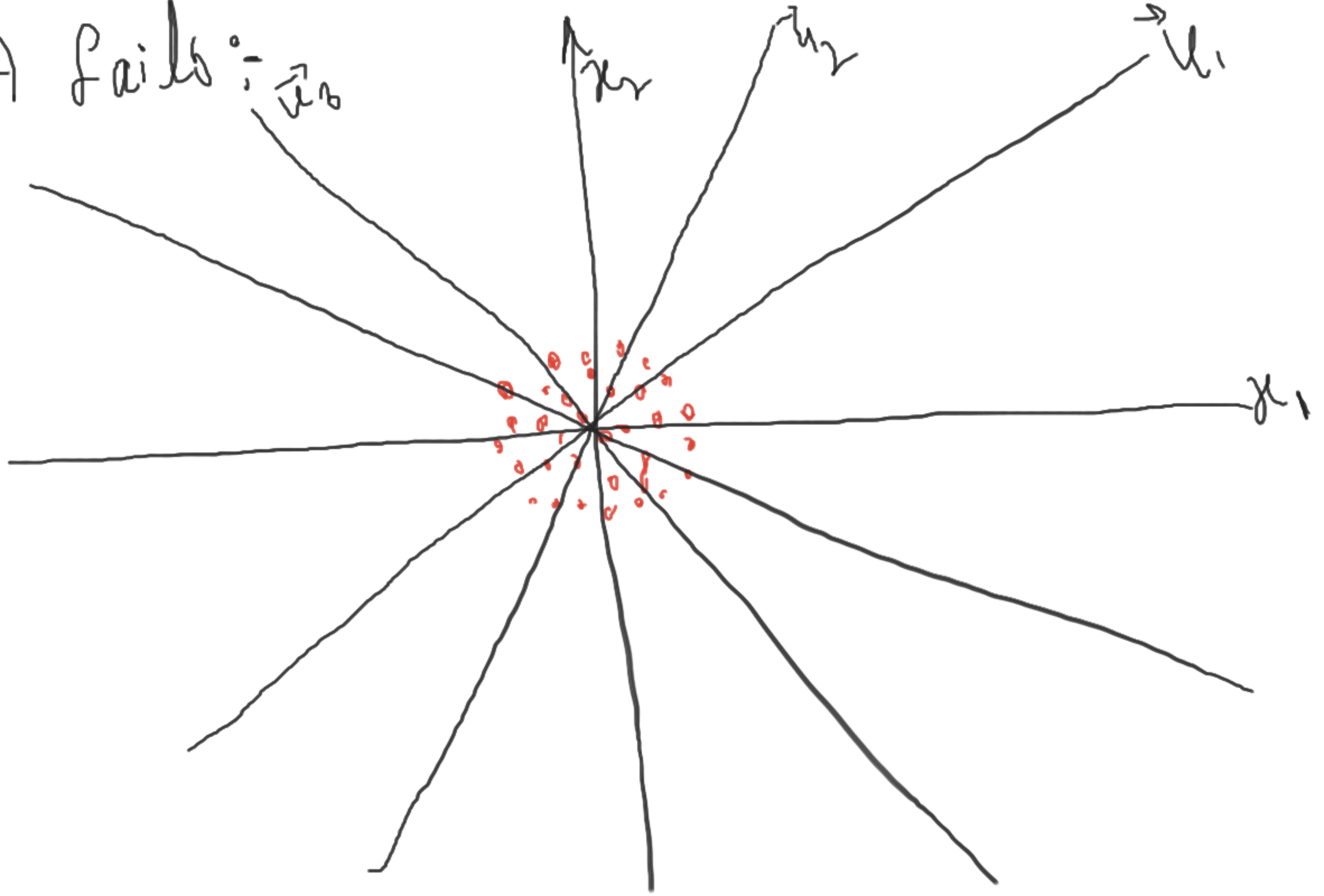
$$PC_3, \textcircled{111} \quad 1000 \times 3, \quad 3 \times 1 = 1000 \times 1 = PC_3 \rightarrow$$

= Principal Component  
 That can get considered  
 on top

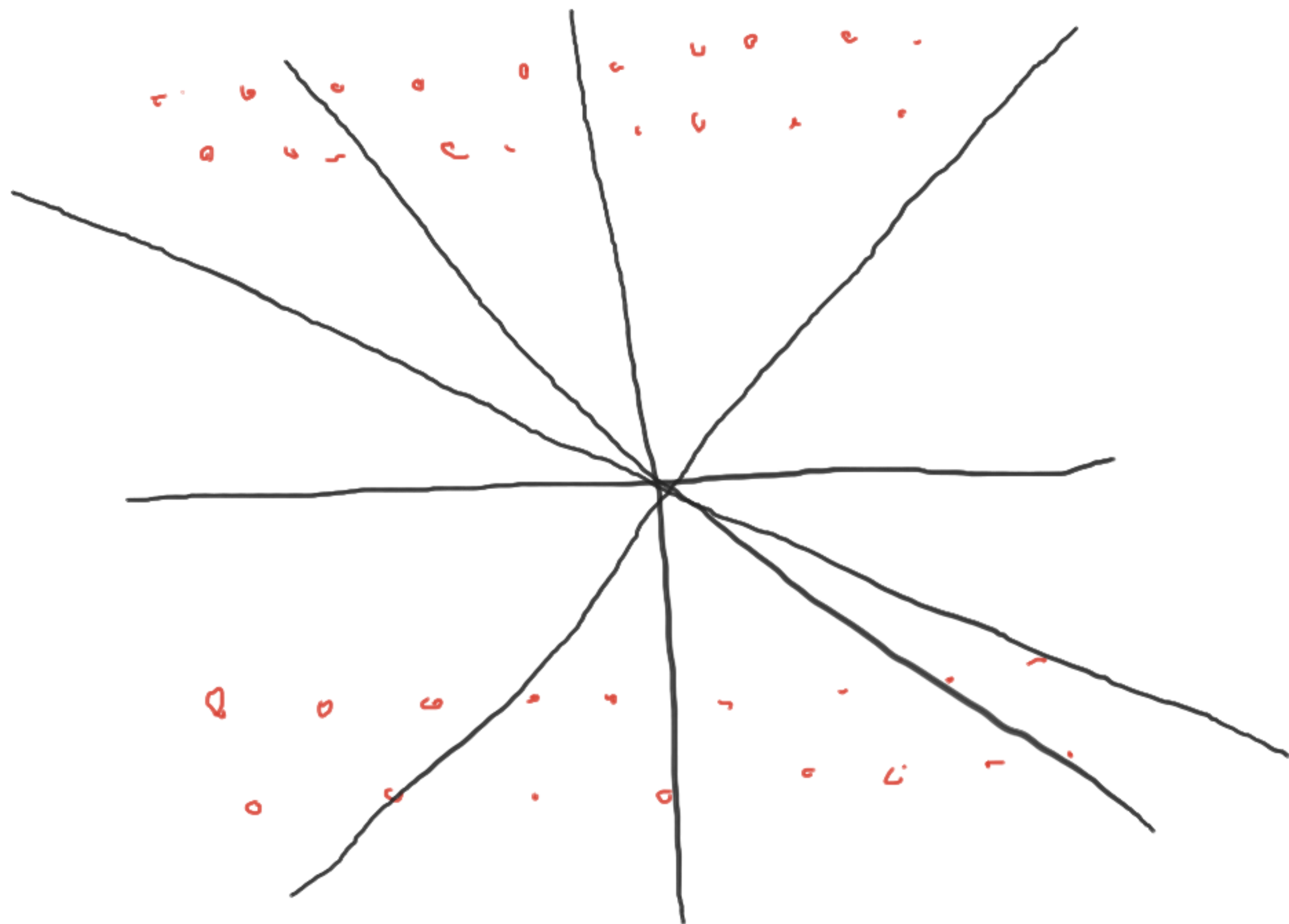
PC <sub>1</sub>	PC <sub>2</sub>	PC <sub>3</sub>	PC <sub>4</sub>	PC <sub>5</sub> <small>PC<sub>10</sub></small> <small>PC<sub>50</sub></small>	PC <sub>55</sub>	PC <sub>55</sub>	PC <sub>100</sub>
60%	5%	10%	1%	4% <u>0%</u> 5%	10%	2%	3%

PCALIO

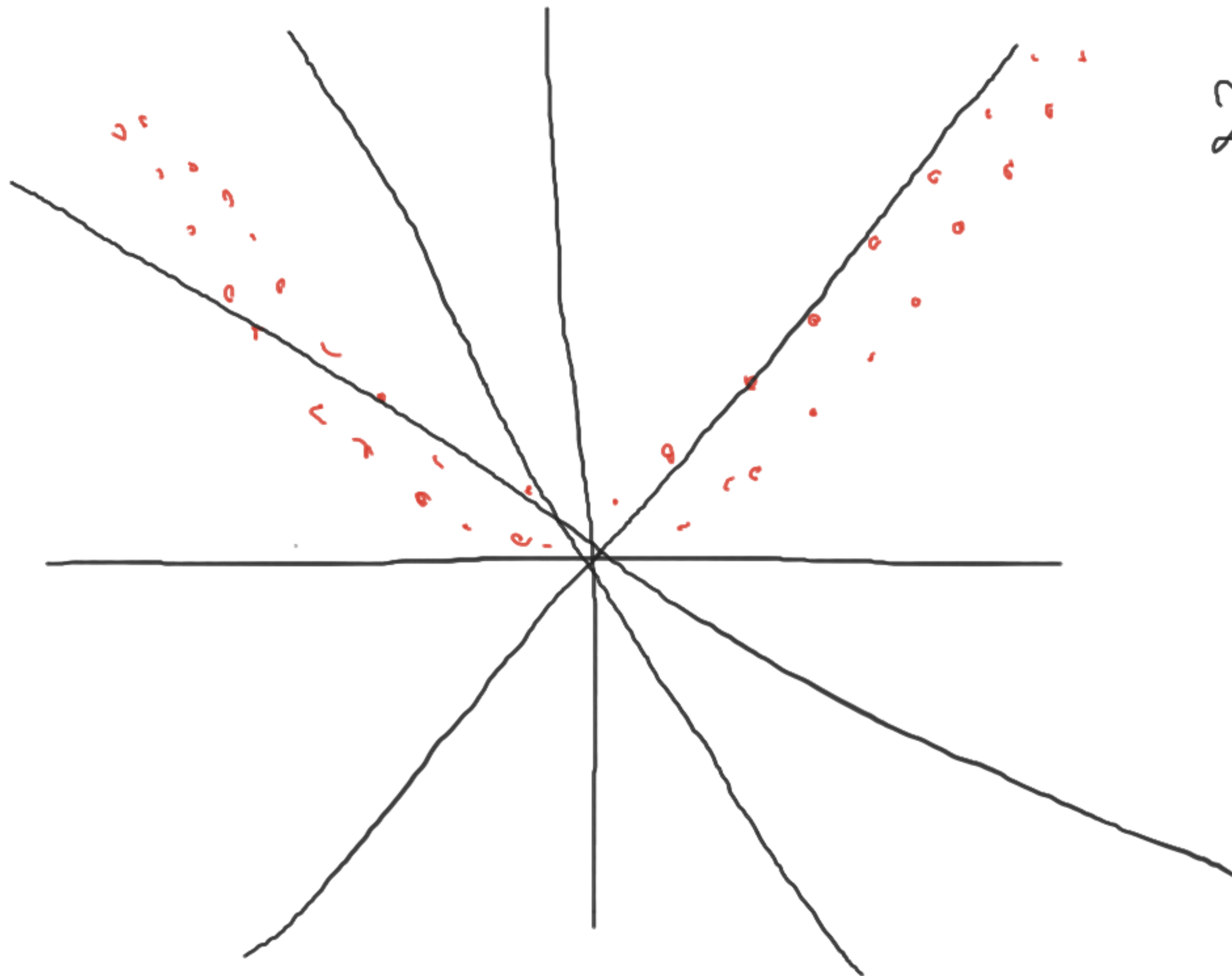
PCA fails:  $\vec{x}_0$



11



111



2①  
↓  
2①