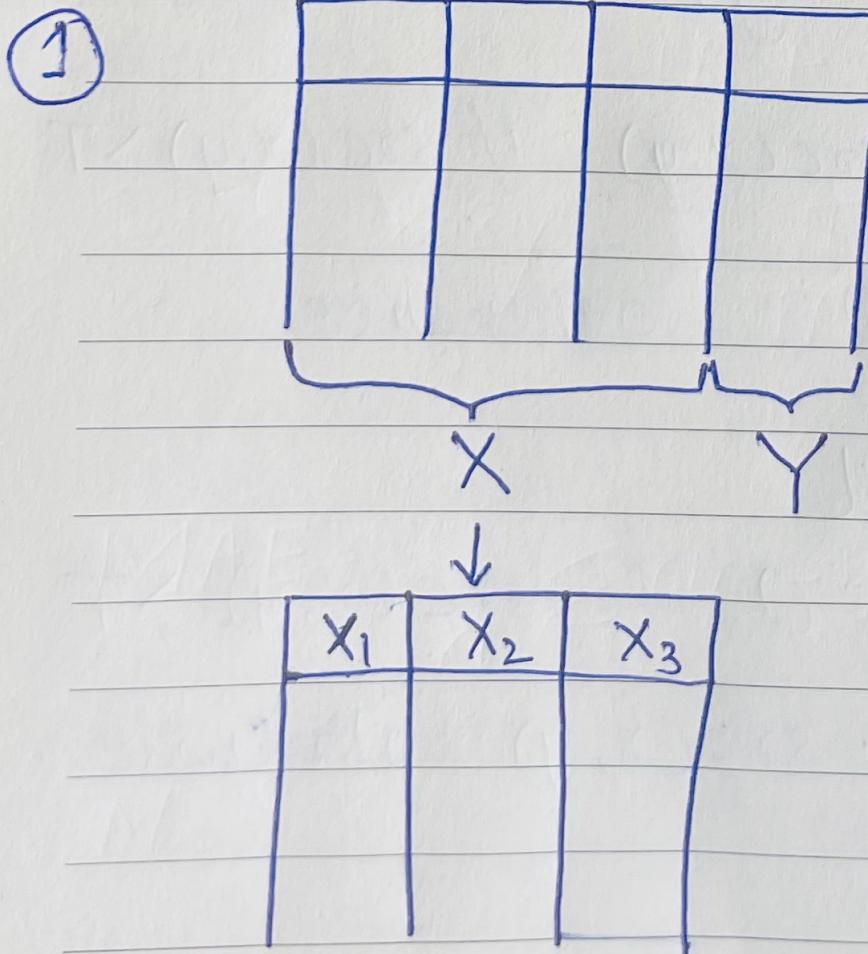


PCA

- 1) $D + 1 \rightarrow D$
- 2) Mean for every D
- 3) Covariance Matrix
- 4) Eigen Vectors & Eigen Values
- 5) Top 'K' Eigen Values
for 'K' PCs.



$$\textcircled{2} \quad \bar{x}_1, \bar{x}_2, \bar{x}_3$$

$$\textcircled{3} \quad \text{cov}(x, y) = \frac{1}{n} \sum_{i=1}^n (x - \bar{x})(y - \bar{y})$$



$$A = \begin{bmatrix} x_1 & x_2 & x_3 \\ x_1 & \dots & \dots \\ x_2 & \dots & \dots \\ x_3 & \dots & \dots \end{bmatrix}$$

$$\textcircled{4} \quad |A - \lambda I| = 0$$

$$\det \left(\begin{bmatrix} x_1 x_1 & x_1 x_2 & x_1 x_3 \\ x_2 x_1 & x_2 x_2 & x_2 x_3 \\ x_3 x_1 & x_3 x_2 & x_3 x_3 \end{bmatrix} - \lambda \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \right) = 0$$

$$\rightarrow \lambda_1, \lambda_2, \lambda_3$$

$$\rightarrow A\vec{v} = \lambda \vec{v} \rightarrow \begin{bmatrix} A \\ \vdots \end{bmatrix} \begin{bmatrix} v_1 \\ \vdots \end{bmatrix} = \begin{bmatrix} \lambda_1 \\ \vdots \end{bmatrix} \begin{bmatrix} v_1 \\ \vdots \end{bmatrix}$$

⑤ Select the top eigen values.