Eigen Vectors and Eigen Values

[Linear transformation] [Eigen decomposition of covariance Matrix]

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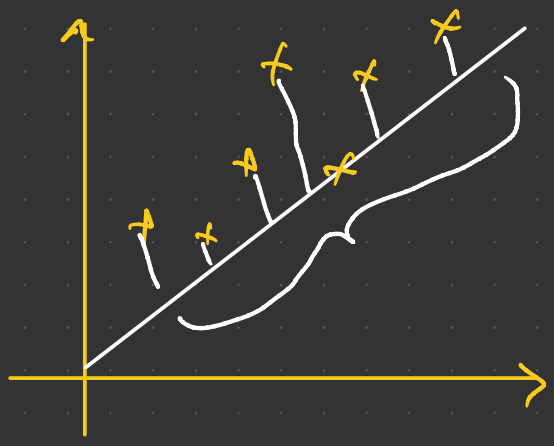
Eigen vectors and Eigen values



$$A \cdot V = \lambda \times V$$

A – Matrix

V – Vector

λ – Eigen value

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Eigen vector ⟶ whichever has maximum magnitude

⇓

Principal component

⇓

Maximum Variance

$$A \cdot V = \lambda \times V$$

⇓

From this equation we will get

⇓

Eigen Vector → Maximum magnitude

⇓

Maximum Eigen Vector

⇓

Best principal component

Steps to calculate Eigen values and Eigen vectors

① covariance of features

x, y	z

↓

x'

$$cov(x, y) = \sum_{i=1}^{n} \frac{(x_i - \bar{x})(y_i - \bar{y})}{N-1}$$

2 × 2

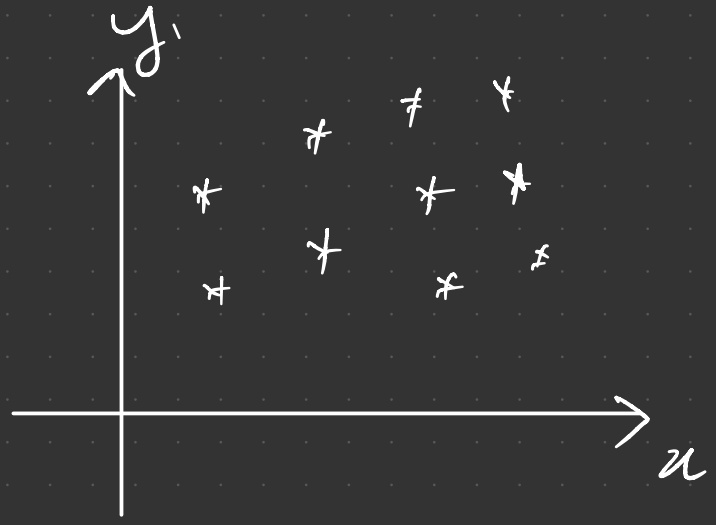
	x	y
x	var(x)	cov(x,y)
y	cov(y,x)	var(y)

$cov(x, x) = var(x)$

$cov(y, y) = var(y)$

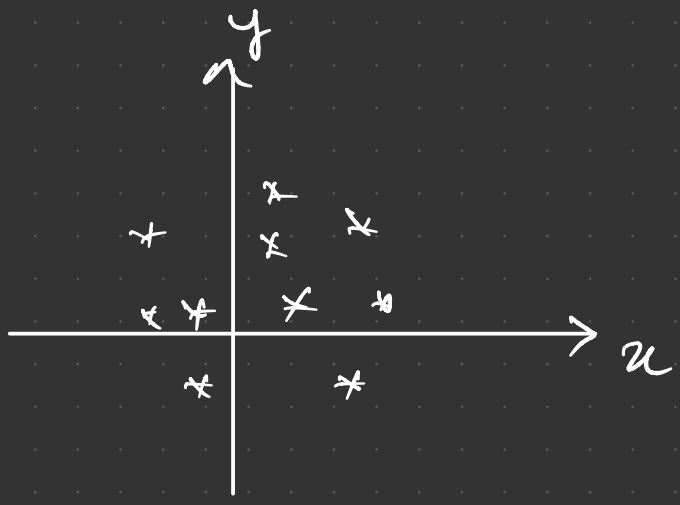
3 × 3

	x	y	z
x	var(x)		
y		var(y)	
z			var(z)

① 

2D → 1D

Standardize the data → zero centered



② Covariance matrix of x and y

	x	y
x	var(x)	cov(x, y)
y	cov(y, x)	var(y)

③ Find out Eigen vectors and values

$$Av = \lambda v$$

For 2×2

$$\lambda_1 \quad \lambda_2$$

⇒ Eigen values

PC_1 PC_2

λ_1 ⇒ magnitude of Eigen vector