Lecture-29

→ Singular Value Decomposition = SVD

→ $A = U \Sigma V^T$ // Σ diagonal
U, V orthogonal

$\Rightarrow AV = U\Sigma$

$A = U\Sigma V^{-1} = U\Sigma V^T$ {V is orthonormal}

$A^TA = (V\Sigma^T \cancel{U^T})(\cancel{U}\Sigma V^T)$

$= V \begin{bmatrix} \sigma_1^2 & & \\ & \sigma_2^2 & \\ & & \ddots \end{bmatrix} V^T$

$V \longrightarrow$ Eigen Vector of A^TA

$U \rightarrow$ Eigen Vector of AA^T

Example

$$\begin{bmatrix} 4 & 4 \\ -3 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} \sqrt{32} & 0 \\ 0 & \sqrt{18} \end{bmatrix} \begin{bmatrix} 1/\sqrt{2} & 1/\sqrt{2} \\ 1/\sqrt{2} & -1/\sqrt{2} \end{bmatrix}$$