

Δ Cholesky Decomposition

$A = LL^T$ Cholesky Decomp.

solving
 $Ax = b$

$\Rightarrow L^T x = b$

\downarrow triangular matrix

$L^T x = y$

\uparrow triangular matrix

$L^T x = y$

$L = U$

$L^T x = y$

solve x !

Δ QR decomposition

- first assume A square, invertible

$A = QR$

Q orthogonal matrix

R triangular matrix

$Q^T Q = I$

calc of Q from column basis

Gram-Schmidt process

$A = [a_1 \ a_2 \ a_3] \in \mathbb{R}^3$

transformation \rightarrow ONB

$Q = [q_1 \ q_2 \ q_3] \in \mathbb{R}^{3 \times 3}$

- $q_1 := \frac{a_1}{\|a_1\|}$
- $a_2 \leftarrow a_2 - \langle a_2, q_1 \rangle q_1$
- $q_2 := \frac{a_2}{\|a_2\|}$
- $a_3 \leftarrow a_3 - \langle a_3, q_1 \rangle q_1 - \langle a_3, q_2 \rangle q_2$
- $q_3 := \frac{a_3}{\|a_3\|}$
- $Q = [q_1 \ q_2 \ q_3]$

$R = \begin{bmatrix} \|a_1\| & \langle a_1, a_2 \rangle & \langle a_1, a_3 \rangle \\ 0 & \|a_2\| & \langle a_2, a_3 \rangle \\ 0 & 0 & \|a_3\| \end{bmatrix}$

Δ Cross Product

$\vec{v} \times \vec{w} = \text{area of } \triangle$

$\vec{v} \times \vec{w} = \det \begin{bmatrix} \vec{v}_1 & \vec{v}_2 \\ \vec{w}_1 & \vec{w}_2 \end{bmatrix}$

NOT THE CROSS PRODUCT

THIS IS THE PRODUCT

$\vec{v} \times \vec{w} = \det \begin{bmatrix} \vec{v}_1 & \vec{v}_2 & \vec{v}_3 \\ \vec{w}_1 & \vec{w}_2 & \vec{w}_3 \end{bmatrix}$

Δ Outer product

inner product

$u^T v$

outer product

$u \otimes v$