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6, 2025

$$\vec{x}^T = [x_0 \ x_1 \ \dots \ x_{n-1}]$$

inner product

$$\vec{x}^T \vec{x} = \sum_{i=0}^{n-1} x_i^2$$

outer product is a matrix

$$\vec{x} \vec{x}^T \quad \vec{x}^T = [x_0 \ x_1]$$

$$\vec{x} \vec{x}^T = \begin{bmatrix} x_0 x_0 & x_0 x_1 \\ x_1 x_0 & x_1 x_1 \end{bmatrix}$$

Hadamard product

$$x^T = [x_0 \ x_1 \ x_2]$$

$$y^T = [y_0 \ y_1 \ y_2]$$

$$x \odot y = \begin{bmatrix} x_0 \\ x_1 \\ x_2 \end{bmatrix} \begin{bmatrix} y_0 \\ y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} x_0 y_0 \\ x_1 y_1 \\ x_2 y_2 \end{bmatrix}$$

Python

$$x.T @ x \quad | \quad x * x = \text{Hadamard}$$