Dot product

The **dot product** is defined as

$$\boldsymbol{x}^\top \boldsymbol{y} = \sum_{d=1}^{D} x_d y_d \,, \quad \boldsymbol{x}, \boldsymbol{y} \in \mathbb{R}^D \,.$$

- The **length** of $\boldsymbol{x}$ is then

$$\|\boldsymbol{x}\| = \sqrt{\boldsymbol{x}^\top \boldsymbol{x}} \,.$$

- The **angle** ω between two vectors $\boldsymbol{x}, \boldsymbol{y}$ can be computed using

$$\cos \omega = \frac{\boldsymbol{x}^\top \boldsymbol{y}}{\|\boldsymbol{x}\| \, \|\boldsymbol{y}\|}$$