

**Definition 10.1** A square matrix  $K$  is **symmetric** if  $K^\top = K$ .

**Definition 10.2** An  $n \times n$  matrix  $K$  is **positive definite** if

$$\mathbf{x}^\top K \mathbf{x} > 0$$

for all nonzero column  $n$ -vector  $\mathbf{x}$ , and is **positive semidefinite** if

$$\mathbf{x}^\top K \mathbf{x} \geq 0$$

for all column  $n$ -vector  $\mathbf{x}$ .

**Proposition 10.3** A covariance matrix is both symmetric and positive semidefinite.