Chairing #Definition

A positive definite matrix P is a symmetric matrix where, for any non-zero vector $\mathbf{x}$, the quadratic form $\mathbf{x}^T P\mathbf{x}$ is strictly positive. Mathematically, this can be expressed as:

$$\mathbf{x}^T P\mathbf{x} > 0, \forall \mathbf{x} \neq 0$$

A **symmetric matrix** P is positive definite if all its eigenvalues are positive. If λ is an eigenvalue of P, then $\lambda > 0$.

A **symmetric matrix** P is positive definite if there exists a lower triangular matrix L such that $P = LL^T$.

A **symmetric matrix** P is positive definite if all the leading principal minors (determinants of the top-left $k \times k$ submatrices for $k = 1, 2, ..., n$ are positive.