

Positive Definite Matrix Explained

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Explain positive definite for a matrix



A matrix is said to be **positive definite** if it meets the following conditions:

1. **Symmetry:** The matrix A must be symmetric. This means $A = A^T$, where A^T is the transpose of A .
2. **Positive Eigenvalues:** All the eigenvalues of the matrix A must be positive. An eigenvalue λ is positive if $\lambda > 0$.
3. **Quadratic Form:** For any non-zero vector x , the quadratic form $x^T A x$ must be positive, i.e., $x^T A x > 0$. Here, x^T is the transpose of the vector x .

In simpler terms, a positive definite matrix is one where the matrix, when applied to any non-zero vector, yields a positive value when the vector is multiplied by the matrix and then by its transpose. This property is crucial in various applications, particularly in optimization, numerical analysis, and statistics.

Does (3) imply (2)?



Yes, condition (3) implies condition (2). Here's why:

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