eigenvalue decomposition (EVD)

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Abstract

An eigenvalue decomposition (EVD) is a factorization of a square matrix of the form $\mathbf{A} = \mathbf{V}\mathbf{\Lambda}\mathbf{V}^{-1}$. The columns of the matrix $\mathbf{V}$ are eigenvectors of $\mathbf{A}$. The diagonal matrix $\mathbf{\Lambda}$ contains the eigenvalues corresponding to these eigenvectors. A matrix that admits an EVD is referred to as diagonalizable.

Definition

An EVD for a square matrix $\mathbf{A} \in \mathbb{R}^{d \times d}$ is a factorization of the form

$$\mathbf{A} = \mathbf{V}\mathbf{\Lambda}\mathbf{V}^{-1}.$$

The columns of the matrix $\mathbf{V} = \big(\mathbf{v}^{(1)}, \ldots, \mathbf{v}^{(d)}\big)$ are the eigenvectors of the matrix $\mathbf{A}$. The diagonal matrix $\mathbf{\Lambda} = \mathrm{diag}\big\{\lambda_1, \ldots, \lambda_d\big\}$ contains the eigenvalues λ_j corresponding to the eigenvectors $\mathbf{v}^{(j)}$. Matrices that allow for an EVD are referred to as diagonalizable.

Cross References

matrix, eigenvector, eigenvalue, diagonalizable

References

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