

Eigenvalues & Eigenvectors:-

Let $A = [a_{ij}]_{n \times n}$ be any n rowed square matrix and λ an indeterminate. The matrix $A - \lambda I$ is called the characteristic matrix of A where I is the unit matrix of order n .

Also the determinant

$$|A - \lambda I| = \begin{vmatrix} a_{11} - \lambda & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} - \lambda & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} - \lambda \end{vmatrix}$$

which is an ordinary polynomial in λ of degree n , is called the characteristic polynomial of A . The equation

$$|A - \lambda I| = 0$$

is called the characteristic equation of A and the roots of this equation are called the characteristic roots or characteristic values or eigenvalues or latent roots or proper values of the matrix A .

The set of the eigenvalues of A is called the spectrum of A .

Characteristic Vectors

If λ is a characteristic root of $n \times n$ matrix A , then a non zero vector X such that

$$AX = \lambda X$$

is called a characteristic vector or eigenvector of A corresponding to the characteristic root λ .