# Eigenvalues, Eigenvectors & Diagonalisation

## Eigenvalues & Eigenvectors

Let $A$ be a square matrix of order $n$.

A non-zero column vector $u \in \mathbb{R}^n$ is called an eigenvector of $A$ if $Au = \lambda u$ for some scalar $\lambda$.

The scalar $\lambda$ is called an eigenvalue of $A$ and $u$ is said to be an eigenvector of $A$ associated with the eigenvalue $\lambda$.

## Basic Properties

Let $A$ be a square matrix.

1. If $\lambda$ is an eigenvalue of $A$, $\lambda^n$ is an eigenvalue of $A^n$.
2. If $\lambda$ is an eigenvalue of $A$, $\frac{1}{\lambda}$ is an eigenvalue of $A^{-1}$.
3. $A$ and $A^T$ have the same eigenvalues.