Diagonalisation

Writing A as PDP inverse, and when that is not possible.

Mathematics

$A = PDP^{-1}$ turns matrix powers into scalar powers.

1. **Find all the eigenvalues**
   Roots of det(A − λI) = 0, listed with their multiplicities.

2. **Find n independent vectors**
   A basis of each eigenspace. Diagonalisable only if you reach n.

3. **Build P**
   The columns of P are those eigenvectors, in a fixed order.

4. **Build D**
   The diagonal entries are the eigenvalues, matching P column for column.

5. **Use it**
   $A^k = P D^k P^{-1}$, and D^k just raises each diagonal entry to the k.

A real symmetric matrix is always diagonalisable, by an orthogonal P. A matrix with a repeated eigenvalue may not be.