

- A **symmetric matrix**  $K$  can be diagonalized as

$$K = Q\Lambda Q^\top$$

where  $\Lambda$  is a **diagonal matrix** and  $Q$  (also  $Q^\top$ ) is an **orthogonal matrix**, i.e.,

$$Q^{-1} = Q^\top.$$

- $|Q| = |Q^\top| = \pm 1$ .
- Let  $\lambda_i = i$ th diagonal element of  $\Lambda$  and  $\mathbf{q}_i = i$ th column of  $Q$ .
- Then  $KQ = (Q\Lambda Q^\top)Q = Q\Lambda(Q^\top Q) = Q\Lambda$ , or

$$K\mathbf{q}_i = \lambda_i\mathbf{q}_i.$$

- That is,  $\mathbf{q}_i$  is an **eigenvector** of  $K$  with **eigenvalue**  $\lambda_i$ .