

Lecture 15: Eigenvalues and Eigenvectors
Obtaining the Eigenvalue

name: Rayleigh Quotient

the (normalized) power method gives an eigenvector
estimates eigenvalue and eigenvector e.g. why?

$$\lambda = \frac{(x^{(k)})^T A x^{(k)}}{(x^{(k)})^T x^{(k)}}$$

Find eigenvalue for $x^{(7)} = \begin{bmatrix} 0.7126 \\ -0.7016 \end{bmatrix}$ from Example 3

$$\lambda = \frac{(x^{(7)})^T A x^{(7)}}{(x^{(7)})^T x^{(7)}}$$

$$= \frac{\begin{bmatrix} 0.7126 & -0.7016 \end{bmatrix} \begin{bmatrix} 3 & -1 \\ -1 & 3 \end{bmatrix} \begin{bmatrix} 0.7126 \\ -0.7016 \end{bmatrix}}{\begin{bmatrix} 0.7126 & -0.7016 \end{bmatrix} \begin{bmatrix} 0.7126 \\ -0.7016 \end{bmatrix}}$$

$$= \frac{\begin{bmatrix} A & \end{bmatrix} \begin{bmatrix} B \end{bmatrix} \begin{bmatrix} c \end{bmatrix}}{\begin{bmatrix} A & \end{bmatrix} \begin{bmatrix} c \end{bmatrix}}$$

$$\approx \frac{4}{1}$$

$$\therefore \lambda = 4 \quad \#$$

(see Example 1)