

FMN011 Exercises Chapter 12

The problems are based on the designated problem from Sauer's book, but may not be identical.

- 12.1 E5 Assume that A is a 3×3 matrix with the given eigenvalues. Decide to which eigenvalue Power Iteration will converge, and determine the convergence rate constant. (a) $\{3, 1, 4\}$, (b) $\{3, 1, -4\}$, (c) $\{-1, 2, 4\}$, (d) $\{1, 9, 10\}$.
- 12.1 C1 Using Power Iteration, find the dominant eigenvector of A , and estimate the dominant eigenvalue by calculating a Rayleigh quotient. Compare your conclusions with the previous exercise.

$$\begin{array}{ll} (a) \begin{pmatrix} 10 & -12 & -6 \\ 5 & -5 & -4 \\ -1 & 0 & 3 \end{pmatrix} & (b) \begin{pmatrix} -14 & 20 & 10 \\ -19 & 27 & 12 \\ 23 & -32 & -13 \end{pmatrix} \\ (c) \begin{pmatrix} 8 & -8 & -4 \\ 12 & -15 & -7 \\ -18 & 26 & 12 \end{pmatrix} & (d) \begin{pmatrix} 12 & -4 & -2 \\ 19 & -19 & -10 \\ -35 & 52 & 27 \end{pmatrix} \end{array}$$

12.2 C Find all eigenvalues and eigenvectors of the matrices above.

12.4 C Find the best rank-1 and rank-2 approximations to the matrices below.

$$\begin{array}{ll} (a) \begin{pmatrix} 10 & -12 & -6 \\ 5 & -5 & -4 \\ -1 & 0 & 3 \end{pmatrix} & (b) \begin{pmatrix} -14 & 20 & 10 \\ -19 & 27 & 12 \\ 23 & -32 & -13 \end{pmatrix} \\ (c) \begin{pmatrix} 8 & -8 & -4 \\ 12 & -15 & -7 \\ -18 & 26 & 12 \end{pmatrix} & (d) \begin{pmatrix} 12 & -4 & -2 \\ 19 & -19 & -10 \\ -35 & 52 & 27 \end{pmatrix} \end{array}$$

- 12.4 C8 Import a black and white photo, using Matlab's `imread` command. Use the SVD to create 8:1, 4:1, and 2:1 compressed versions of the photo.