

MAS3114 Computer Assignment 4

In lecture we discussed the technique known as the Power Method for determining the eigenvalue of greatest magnitude for a given matrix. For your project, you will write a computer program which performs the Power Method on an arbitrary $n \times n$ matrix. Your program should incorporate the following:

i.) the program should handle a square matrix, A , of any size; this matrix can be defined directly in the code

ii.) the initial vector for the technique can also be defined directly in the code as well as the number of iterations

iii.) the program should output the final calculated value for λ_1 as well as a graph of the value of λ_1 at each iteration

iv.) using MATLAB's **EIG** command, the program should also output the eigenvalues and eigenvectors for the given matrix

You should turn in a copy of your code as well as the output (including graphs) for each of the matrices defined below. Also briefly describe the convergence results (for example, why are fewer iterations required for some matrices; why is there no convergence for one of the matrices).

$$A_1 = \begin{bmatrix} 4 & -1 & 6 \\ 2 & 1 & 6 \\ 2 & -1 & 8 \end{bmatrix}, \quad \mathbf{x}_0 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \quad n = 10$$

$$A_2 = \begin{bmatrix} 4 & 6 & 8 \\ 0 & 3.7 & -9 \\ 0 & 0 & -3.9 \end{bmatrix}, \quad \mathbf{x}_0 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \quad n = 250$$

$$A_3 = \begin{bmatrix} 2 & -3 & 0 & 0 \\ 3 & 2 & 0 & 0 \\ 0 & 0 & 4 & -7 \\ 0 & 0 & 7 & 4 \end{bmatrix}, \quad \mathbf{x}_0 = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \quad n = 200$$