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Foundations of Data Science

Exercise sheet 7

Exercise 4

a)

For m_1 the result of the power iteration after 5 steps is:

$$y = \begin{pmatrix} 1 \\ 0.3357 \end{pmatrix} \quad , \lambda = -2.0278$$

For m_2 the result of the power iteration after 5 steps is:

$$y = \begin{pmatrix} 0.5017 \\ 0.4949 \\ 1 \end{pmatrix} \quad , \lambda = 2.9886$$

b)

$$y_1 = \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix} \quad y_2 = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \quad y_3 = \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix} \quad y_4 = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

The algorithm fails to converge.

c)

In each update step we now calculate $y = A^{-1}x$. This give us the eigenvalue $\lambda = -1$ and the eigenvector $y = \begin{pmatrix} 1 \\ 0.25 \end{pmatrix}$

d)

For M_4 the algorithm needs 4 iterations. For M_5 68 iterations are needed.