340F24 PA2

Due date: Check the schedule table.
Submission: A single **zip file** must be submitted through eClass. Use filename in the format: **`pa2-[lastname].zip`**.
Total: 100

Implement the following algorithms to compute eigenvalues and eigenvectors:

1. Normalized power iteration
2. Inverse iteration
    - You can use Matlab's `\` operator to solve the linear system.
3. QR iteration
    - You can use Matlab's `qr` function for QR factorization.

Then complete the following tasks:

A. Use a square matrix with at least three rows to show that your implemented normalized power iteration algorithm finds the dominant eigenvalue and the corresponding eigenvector. Validate your answer by comparing it with the output of Matlab's default function `eig` for calculating eigenvalues and eigenvectors.

   Note that if **v** is an eigenvector of matrix **A**, then the corresponding eigenvalue can be found by the Rayleigh quotient:

$$\lambda = \frac{\mathbf{v}^\top \mathbf{A}\mathbf{v}}{\mathbf{v}^\top \mathbf{v}}.$$

B. Use a square matrix with at least three rows to show that your implemented inverse iteration algorithm finds the eigenvalue with the smallest magnitude and the corresponding eigenvector. Validate your answer by comparing it with the output of Matlab's default function `eig` for calculating eigenvalues and eigenvectors.

C. Use a square matrix with at least three rows to show that your implemented QR iteration algorithm finds all the eigenvalues and the corresponding eigenvectors. Validate your answer by comparing it with the output of Matlab's default function `eig` for calculating eigenvalues and eigenvectors.

It is perfectly fine to use the same matrix for all three above, but you can also use different matrices if you choose.