



UPPSALA  
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Assignment 2  
Script Programming  
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In this assignment, three different approaches used to compute the power method.

### **Flow fo the program:**

For computing three different approaches. Taking input from the user. After that, a four-loop is executed according to the number of matrix sizes we have. All 3 approaches methods are inside this for loop and at the end, plotting the matrix size with respect to it's performance time for all 3 approaches.

### **Approach1 :**

#### **Power method with the for Loops**

For computing, this part of a method by the name of approach1 is used, and four different methods are used to compute the arithmetic operation on matrices. Inside the main, for-loop a random function is used to create the initial eigenvector with respect to the size of the matrix ( $N \times N$ ).

Then the time starts to perform the calculation inside the Approach1 method using the following method:

- \* dot product of matrix and vector inside the **VectorProduct()**
- \* Calculation of L2norm inside the **L2Norm()**
- \* Calculating of new eigenvector by **ScalarDivision()**
- \* Calculating the difference between old and new eigenvector by **VectorSubtract()**

This main while loop will terminate if the condition will become false. if-else conditions to check the tolerance and upper iteration limit for calculations related to each matrix.

### **Approach2 :**

#### **Power method with Numpy functions**

For this approach, we will use the random list the same as approach 1 to get the exact performance results. The steps are the same for computing the eigenvalues as done in approach 1.

### Approach3 :

#### Numpy Implementation

By using eig() method from the linear algebra package solving the eigenvalues and eigenvectors. In previous approaches used the power method to compute the biggest eigenvalue and corresponding eigenvector. Used the array of boolean to confirm from approach 2 if it's true print the biggest eigenvalue otherwise in False case it will provide the L2-Norm of all approaches with real numbers.

