IT-309
EXPERIMENT 5 REPORT

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Group-1

Contents

0.1 Experiment -5 : Implementation of Google's PageRank Algorithm

- In this experiment, we run Google's page rank Algorithm
- This involves the computation of the Google matrix Given by -

$$G = \alpha S + (1-\alpha)(1/n)ee^T \tag{1}$$

where-

  - G is the Google Matrix
  - S is stochastically adjusted Hyperlink Matrix, H that prevents Any random surfer stuck at a dangling page go to any other page randomly.
  - α is the probability with which a random surfer will follow the hyperlinks and $(1-\alpha)$ is the probability with which he will randomly teleport to a new web page.
  - n is the number of web pages and e is a $1xn$ vector with all it's entries 1.
  - This makes $(1/n)ee^T$ a teleportation matrix.

- G is stochastic, aperiodic and irreducible.
- After calculating G the next step is to solve the following eigen vector problem -

$$\pi^T = \pi^T G \tag{2}$$

and

$$\pi^T e = 1 \tag{3}$$

- This is solved through the power method.
- We have used the Python library to perform the Page Ranking Algorithm on the given data source.
- Since G is stochastic, and primitive, it takes only about 50 power iterations to converge to a eigen-vector.

- The convergence rate depends on the rate at which $|\lambda_2/\lambda_1|^k \to 0$ where λ_1 and λ_2 are the highest and the second highest eigen values of G. Since G is Stochastic, $\lambda_1 = 1$ and $\lambda_1 \leq 1$