

# SPPU-BE-COMP-CONTENT - KSKA Git

Q1. → What is a Page Rank Algorithm. Explain with an Example.

ANS. The Page-Rank Algorithm is a method used by Google to rank Web-pages based on their importance.

It was developed by Larry Page and Sergey Brin (the founders of Google) in 1996 while they were PhD students at Stanford University.

⇒ Core concepts in the Page Rank Algorithm.

(1) Link as a Vote

- Each link pointing to a page is considered a 'Vote' for that page.

(2) Link structure

- Page rank is based on the hyper-link structure of the web. If Page A links to page B, it's seen as a recommendation from Page A to Page B.

(3) Damping Factor

- In Reality, not every link is a valid "Vote". So, PageRank includes a Damping Factor, typically set to 0.85.

⇒ FORMULA:- 
$$PR(A) = \frac{1-d}{N} + d \sum \left( \frac{PR(B)}{L(B)} \right)$$

where,

- $PR(A)$  is the Page-Rank of Page A.
- $d$  is the Damping Factor (usually set to 0.85)
- $N$  is the total Number of Pages on the Web.
- $PR(B)$  is the PageRank of Page B (a page linking to A)
- $L(B)$  is the number of Links on page B
- The sum run over all pages B that link to page A.

→ For Example:- Consider 3 pages : A, B, C.

link between them, 1) Page A links to Page B

2) Page B links to Page C

3) Page A links to Page C



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→ [1] Assume all pages start with the same page rank.

[2] First Iteration:

Calculate the Page-Rank For each and every page.

After the 1<sup>st</sup> Iteration, let's set the Factor  $d = 3$

$$\textcircled{1} PR(A) = \frac{1 - 0.85}{3} + 0.85 \times \left[ \frac{PR(C)}{1} \right]$$

$$\textcircled{2} PR(B) = \frac{1 - 0.85}{3} + 0.85 \times \left[ \frac{PR(C)}{1} \right]$$

$$\textcircled{3} PR(C) = \frac{1 - 0.85}{3} + 0.85 \times \left[ \frac{PR(B)}{1} \right]$$

[3] Plugin the values:-

$$PR(A) = 0.9$$

$$PR(B) = 0.9$$

$$PR(C) = 0.9$$

[4] Second Iteration, After applying the Formulating repeatedly, the values of PageRank will continue to Adjust until they stabilize.

As the iterations progress, the values will stabilize and pages with more incoming links from importing pages tend to have higher Page-Rank values.

# CONCLUSION:- Hence,

⇒ We have successfully implemented the Page Ranking Algorithm.