



BITS Pilani
Pilani Campus

Social Media Analytics: Graph Essentials

Lecture:6
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Recap

Traversal Algorithms

- Depth-First Search (DFS)
- Breadth-First Search (BFS)

Shortest path algorithms

Dijkstra's Algorithm

MST

1. Kruskal's Algorithm

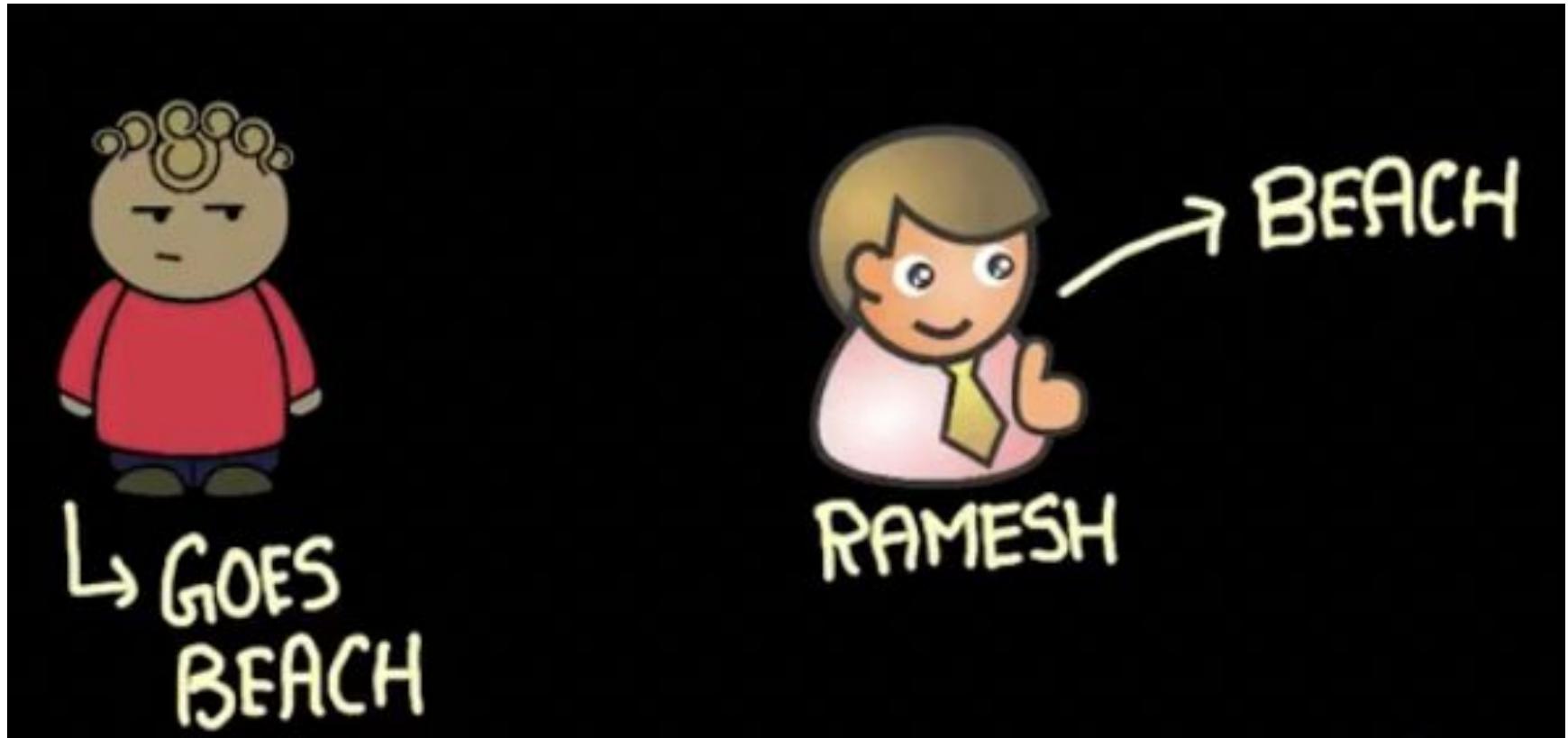
2. Prim's Algorithm

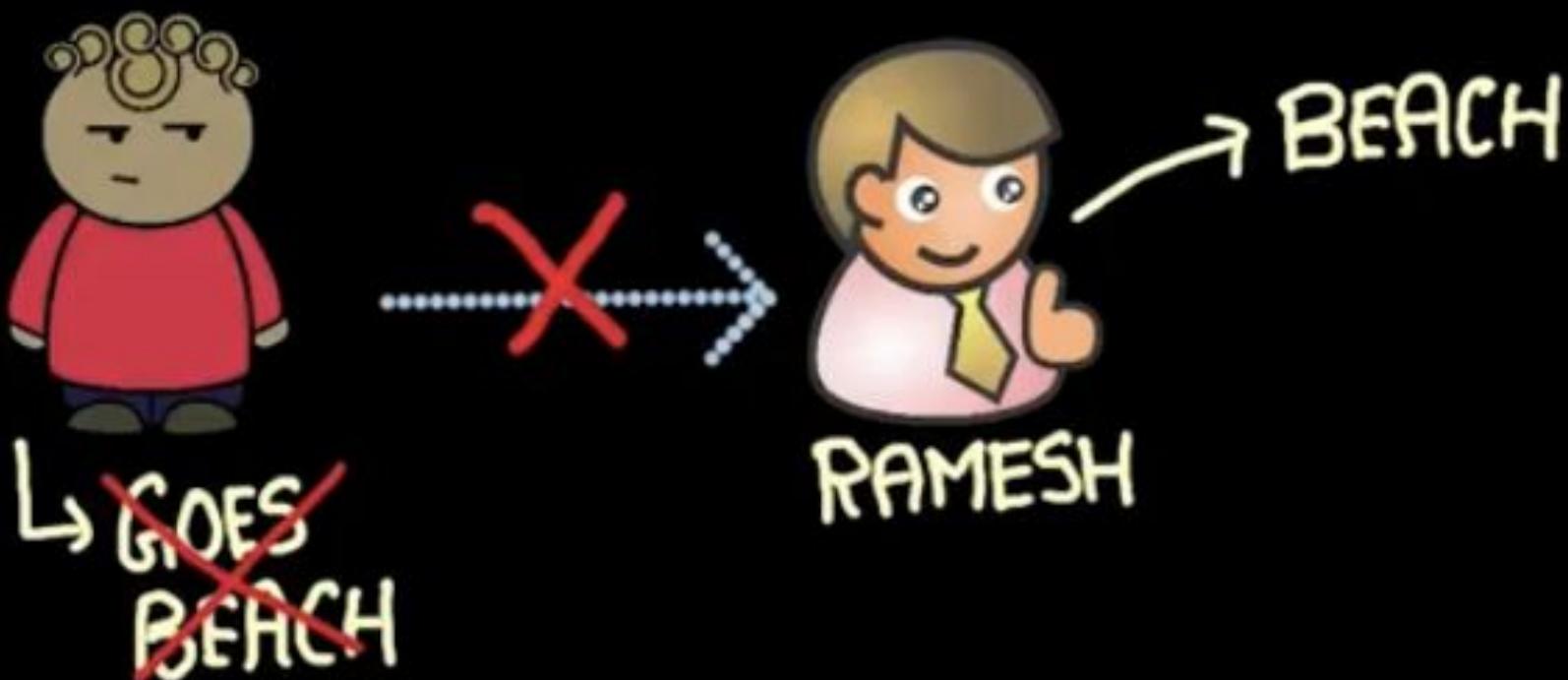
Clustering Coefficient

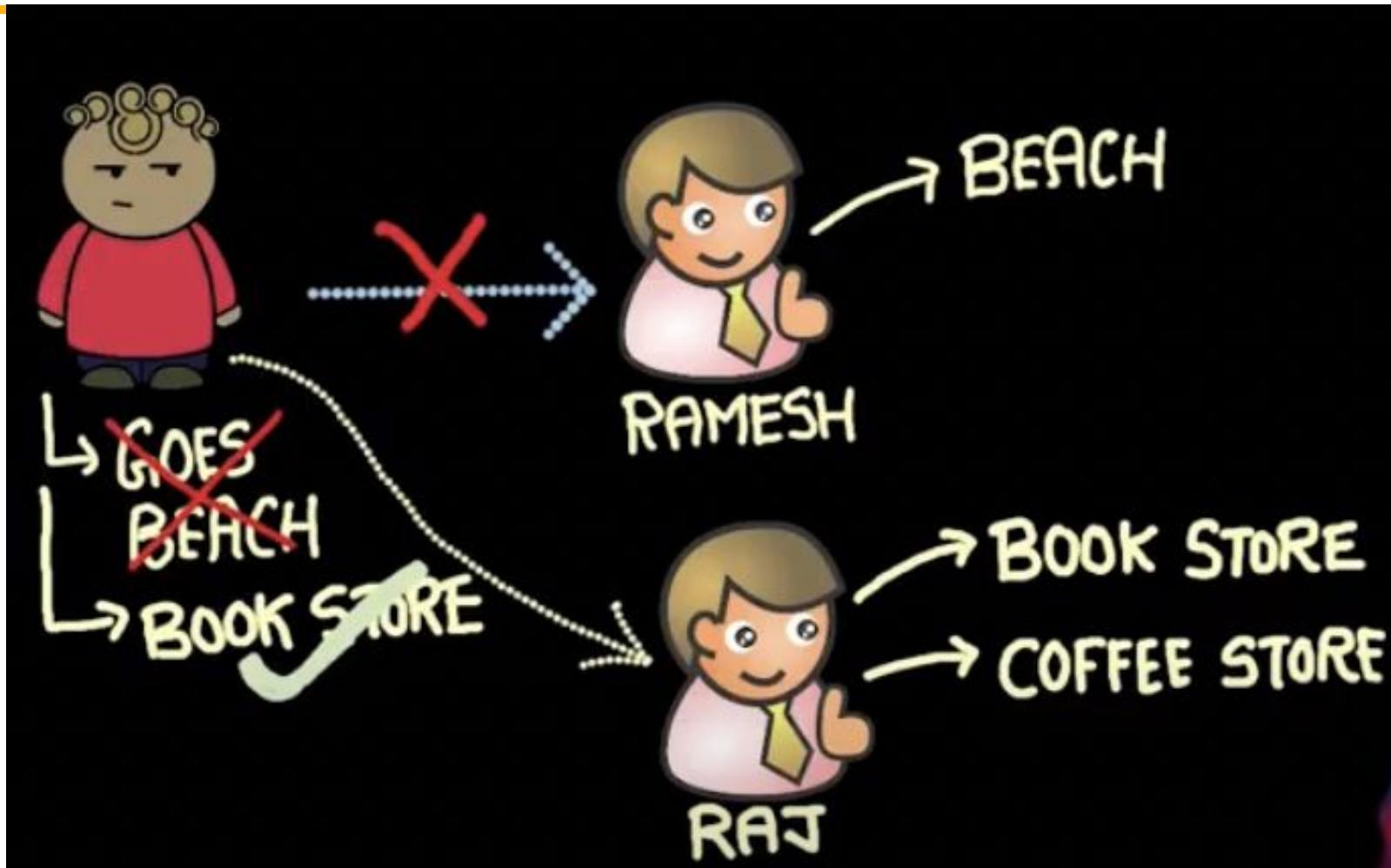
Centrality

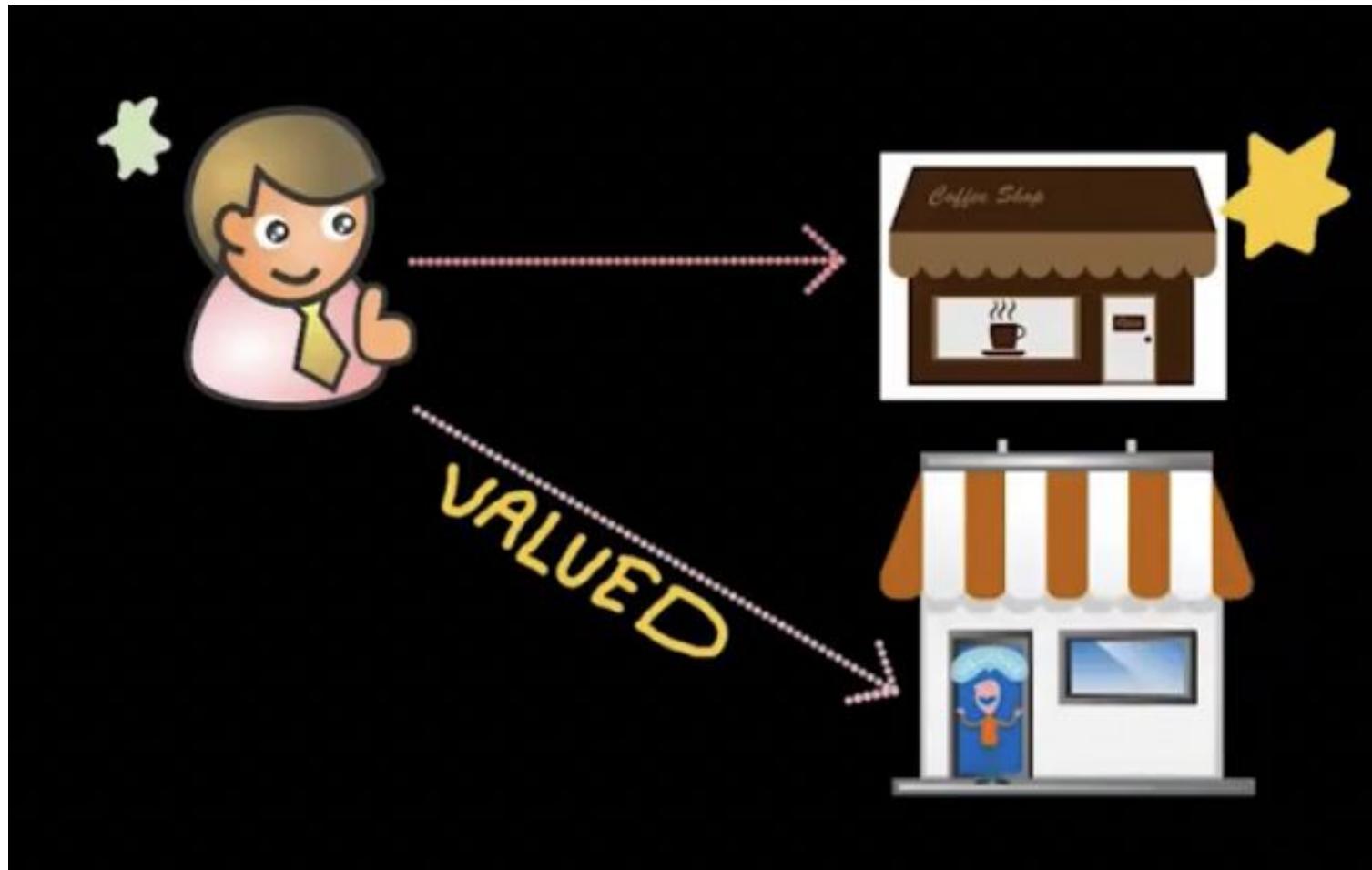
Example

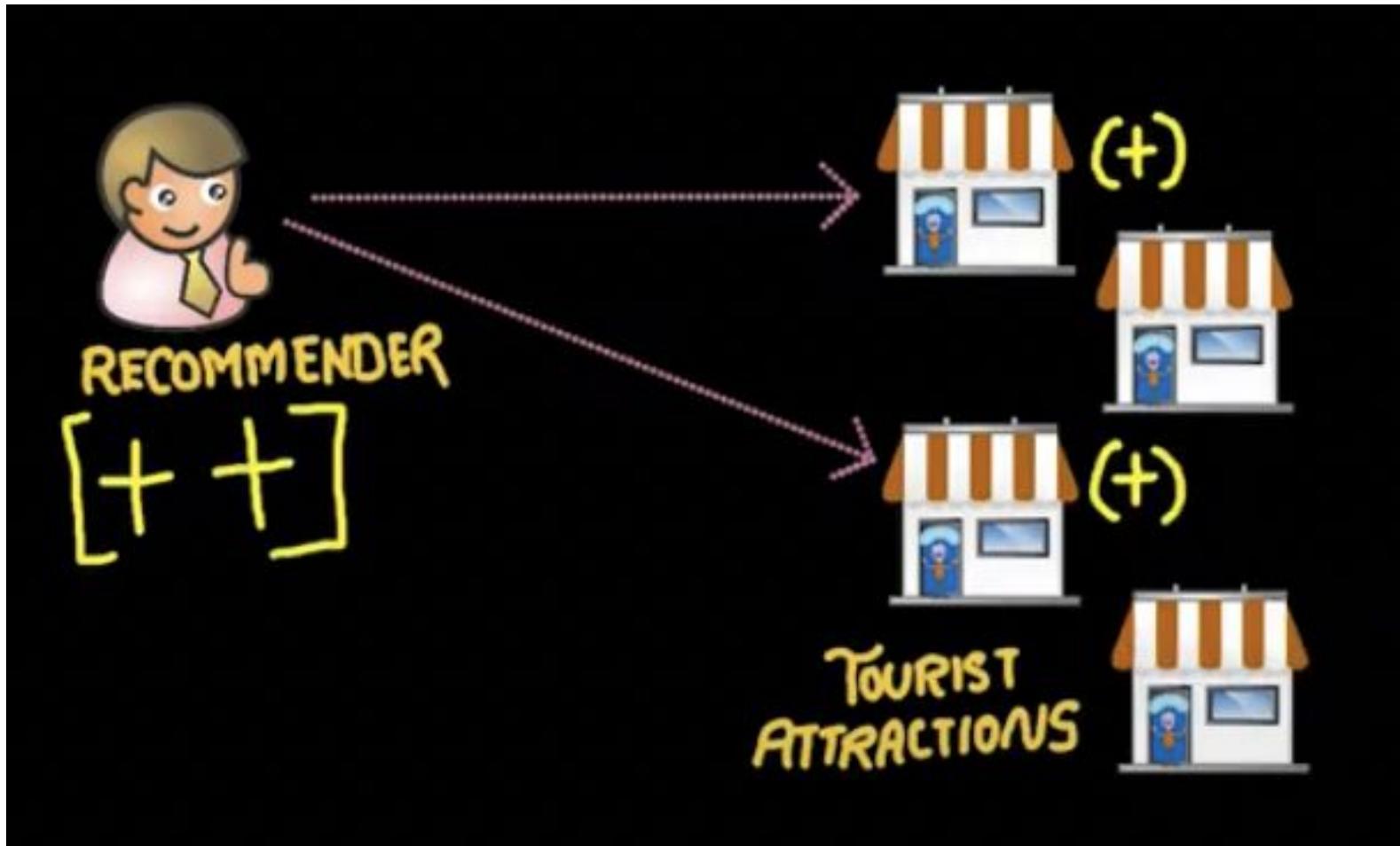








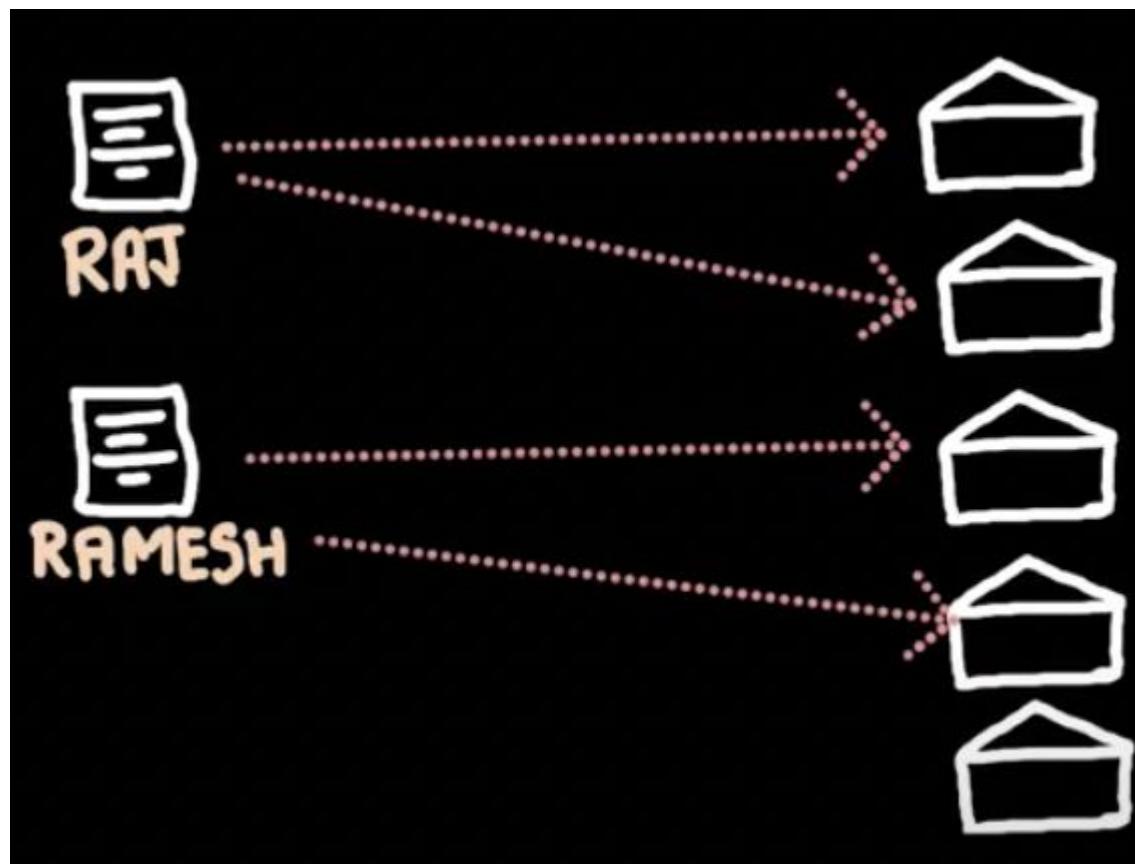




Another example of repreted improvemet

lab

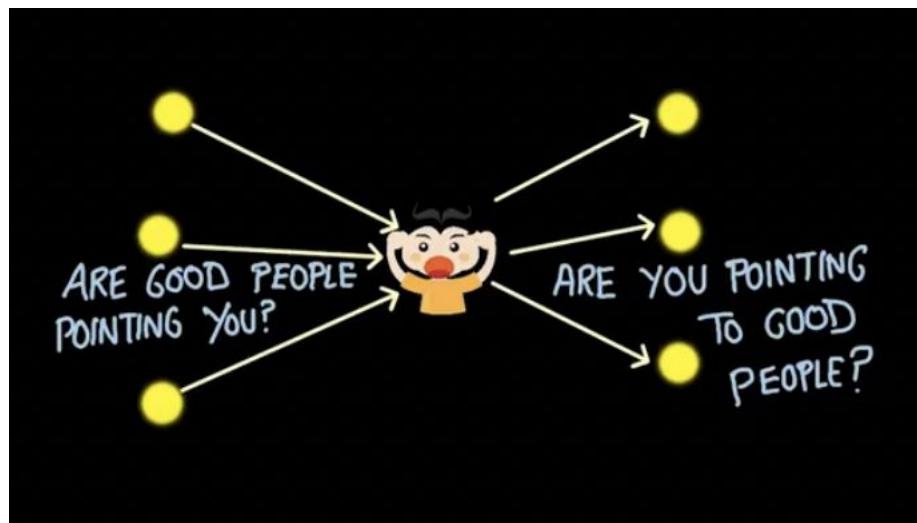
supervisor and student.





Principle of Repeated Improvement

- Hubs and Authorities
- A node can be given points as hubs and authorities
- A node is a good authority if it is pointed to by good hubs, and a node is a good hub if it points to good authorities.



Hubs

- **Links to popular nodes**
- Eg. In citation network the paper that refers to important papers like a good survey paper.
- **Hub Score is sum of authority scores of all the nodes Pointed out by HUB node**
- Hub score of node i

$$h_i = \sum_{i \rightarrow k} a_k$$

Authority

- These are the nodes that are themselves important.
- EG. Dijkstra algorithm
- Authority score is sum of all the hubscores of nodes pointing to authority node
- Authority score of node i

$$a_i = \sum_{j \rightarrow i} h_j$$

Matrix form

$$\mathbf{a} = A^T \mathbf{h}$$

$$\mathbf{h} = A\mathbf{a}$$

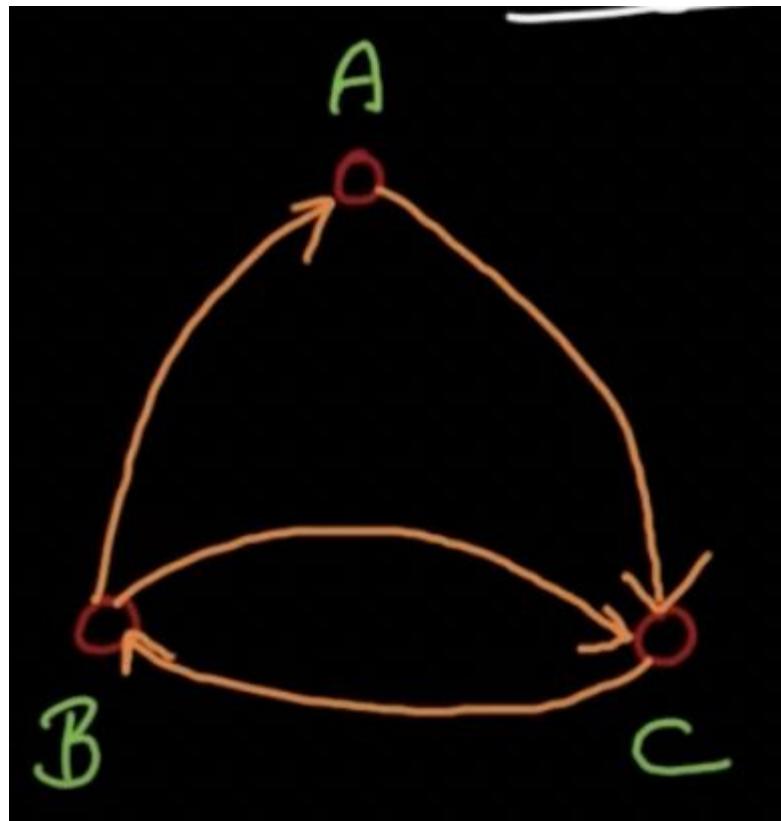
Hubs and Authorities

These two scores are **mutually dependent**:

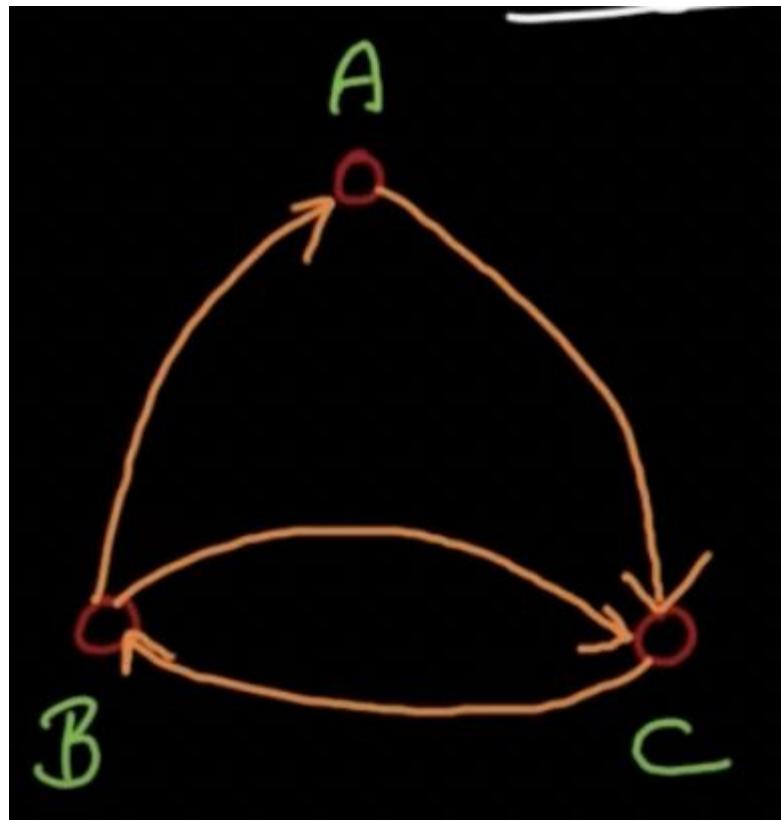
- A good hub points to good authorities
- A good authority is pointed by good hubs

The mathematical hub and authority scores always **converge** after repeated iterations of the HITS update equations.

Convergence



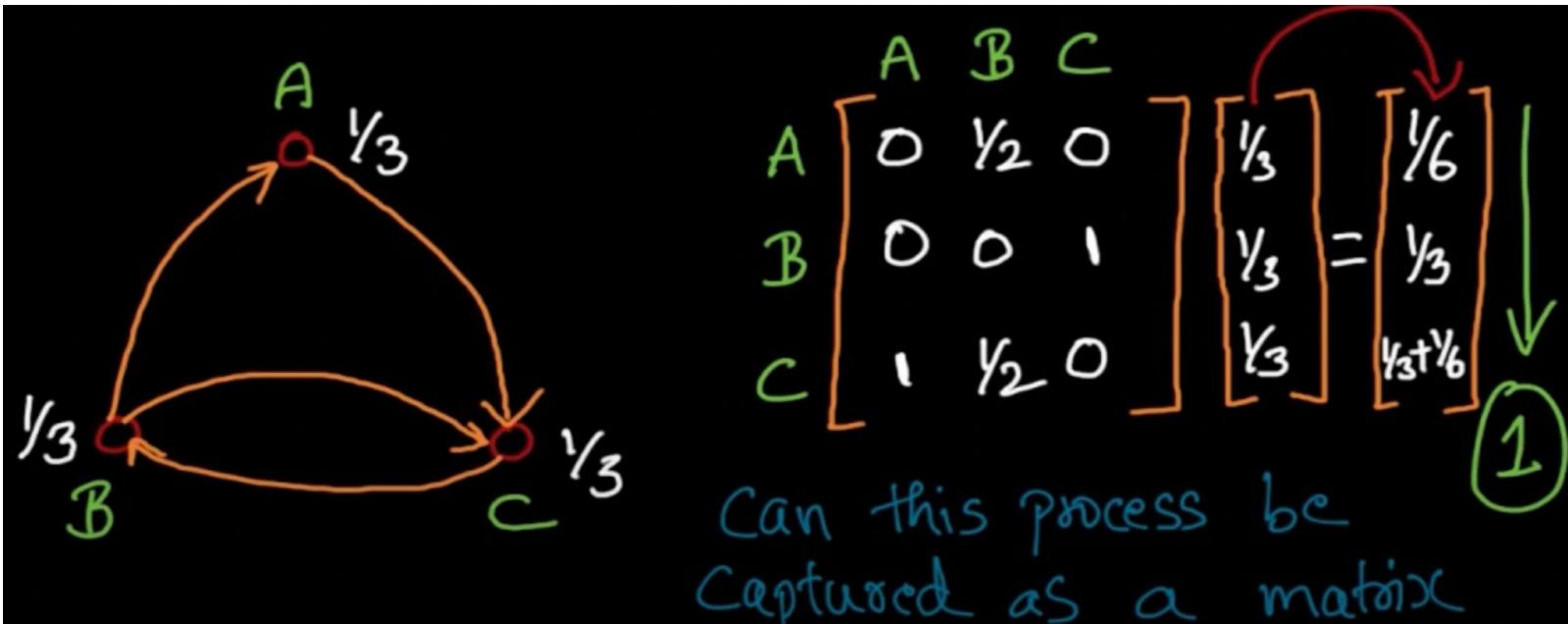
Convergence



A	B	C
$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$
$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{3} + \frac{1}{6}$

What will happen when this continues

	A	B	C
I	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$
II	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{2}$
III	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{6} + \frac{1}{6}$





Questions?

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