

# Exercises on Block3: Link Analysis – PageRank Advertising Recommender Systems

Advanced Search Techniques for Large Scale Data Analytics

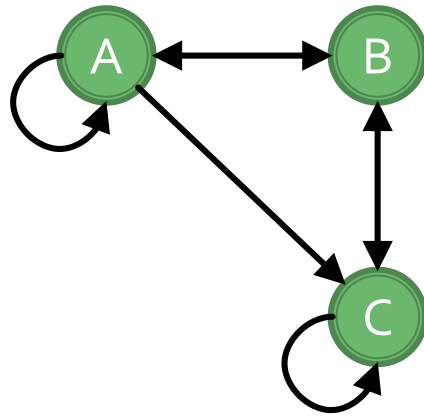
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# PageRank (1) – 10min

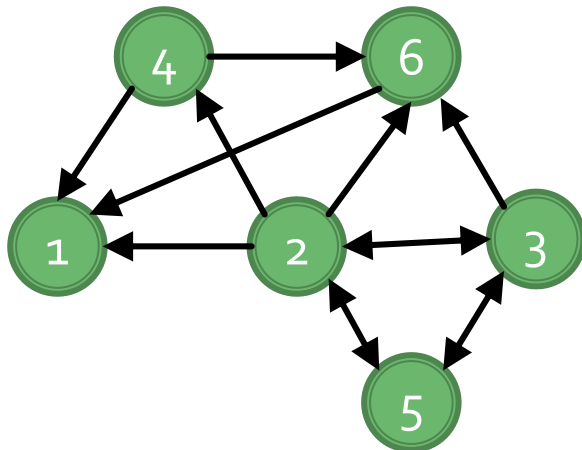
- For the following graph



- Compute the PageRank of each page, assuming no taxation

# PageRank (2) – 20min

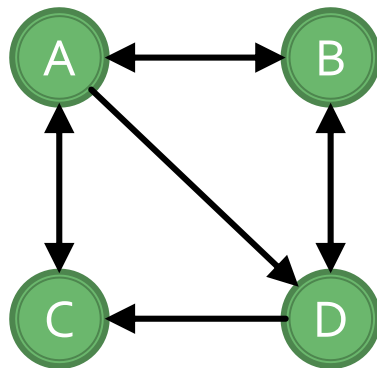
- For the following graph



- 1) Set up the PageRank equations, assuming  $\beta = 0.8$
- 2) Order nodes by PageRank, from lowest to highest

# PageRank (3) – 20min

- For the following graph



- Assuming  $\beta = 0.8$ , compute the topic-sensitive PageRank for the following teleport sets:
  - 1) {A}
  - 2) {A, C}

# Advertising (1) – 20min

- Suppose the BALANCE algorithm with bids of 0 or 1 only, to a situation where advertiser
  - A bids on query words x and y
  - B bids on query words x and z
  - Both have a budget of \$2. Decide whether the following sequences of queries are certainly handled optimally by the algorithm:
    - 1) yzyy
    - 2) xyyz
    - 3) xyzx

# Recomm. Systems (1) – 5min

- Bookstore has enough ratings to use a more advanced recommendation system
  - Suppose the mean rating of books is 3.4 stars
  - Alice has rated 350 books and her average rating is 0.4 stars higher than average users' ratings
  - Animals Farm, is a book title in the bookstore with 250,000 ratings whose average rating is 0.7 higher than global average
  - What is a baseline estimate of Alice's rating for Animals Farms?

# Recomm. Systems (2) – 10min

- Computers A, B and C have the following features:

Feature	A	B	C
Processor speed	3.06	2.68	2.92
Disk size	500	320	640
Main-memory size	6	4	6

- Assuming features as a vector for each computer, e.g., A's vector is  $[3.06, 500, 6]$ , we can compute the cosine distance between any two vectors
- Scaling dimensions can prefer some components
- Assume 1 as the scale factor for processor speed,  $\alpha$  for the disk size, and  $\beta$  for the main memory size and compute:
  - The cosines of angles between pairs of vectors (in terms of  $\alpha$  and  $\beta$ )
  - The angles between the vectors if  $\alpha = \beta = 1$

# Recomm. Systems (3) – 15min

- A user has rated the three computers as follows:
  - A: 4 stars, B: 2 stars, C: 5 stars
- Tasks:
  - 1) Normalize the ratings for this user
  - 2) Compute a user profile for the user, with the following features

Feature	A	B	C
Processor speed	3.06	2.68	2.92
Disk size	500	320	640
Main-memory size	6	4	6