HW2 Graph Data

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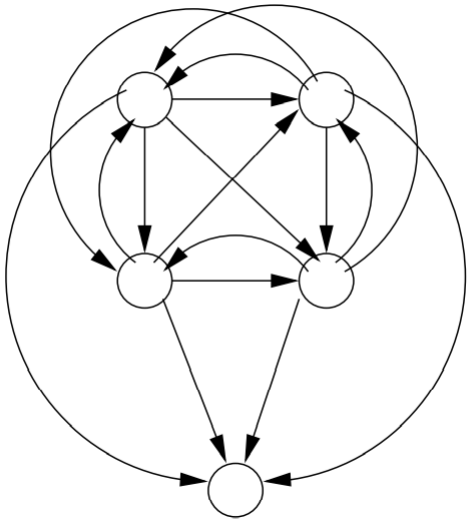
Concept questions

Attention: you should write your problem solving process clearly, if you only write the final answer, you cannot get any scores!

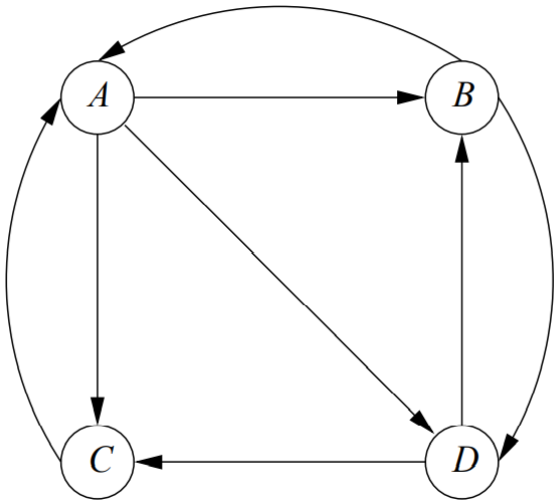
1. Suppose the Web consists of a $clique$ (set of nodes with all possible arcs from one to another) of n nodes and a single additional node that is the successor of each of the n nodes in the clique. The figure below shows this graph for the case $n = 4$. Determine the PageRank of each page, as a function of n and β.



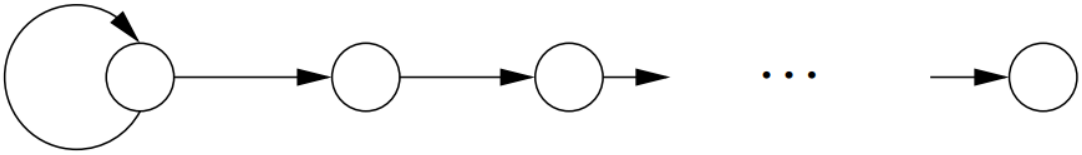
2. Compute the topic-specific PageRank for the graph below, assuming the teleport set is (suppose $\beta = 0.8$):

   (a) A only.

   (b) A and C.



3. Suppose our graph is chain of n nodes as suggested below. Compute the hubs and authorities vectors as a function of n.



4. Please prove the claim below: (Why power iteration works)

   Claim: Sequence $M \cdot r^{(0)}, M^2 \cdot r^{(0)}, \cdots M^k \cdot r^{(0)} \cdots$ approaches the principal eigenvector of M

Coding problems

1. Community detection (Both Louvain and PPR)
2. Link prediction (Node2Vec)

Please find the detail in the corresponding readme files.

Submission

You should submit a zip file named `[name]_[studentID]_hw2.zip` . It should contain exactly one folder that is named `[name]_[studentID]_hw2` .

This folder should contain one pdf file for concept questions and two project folders for coding problems.

```
│  concepts.pdf
│
├─community_detection
│
└─link_prediction
```