Thursday, October 19, 2017 12:09 PM

Lab 8

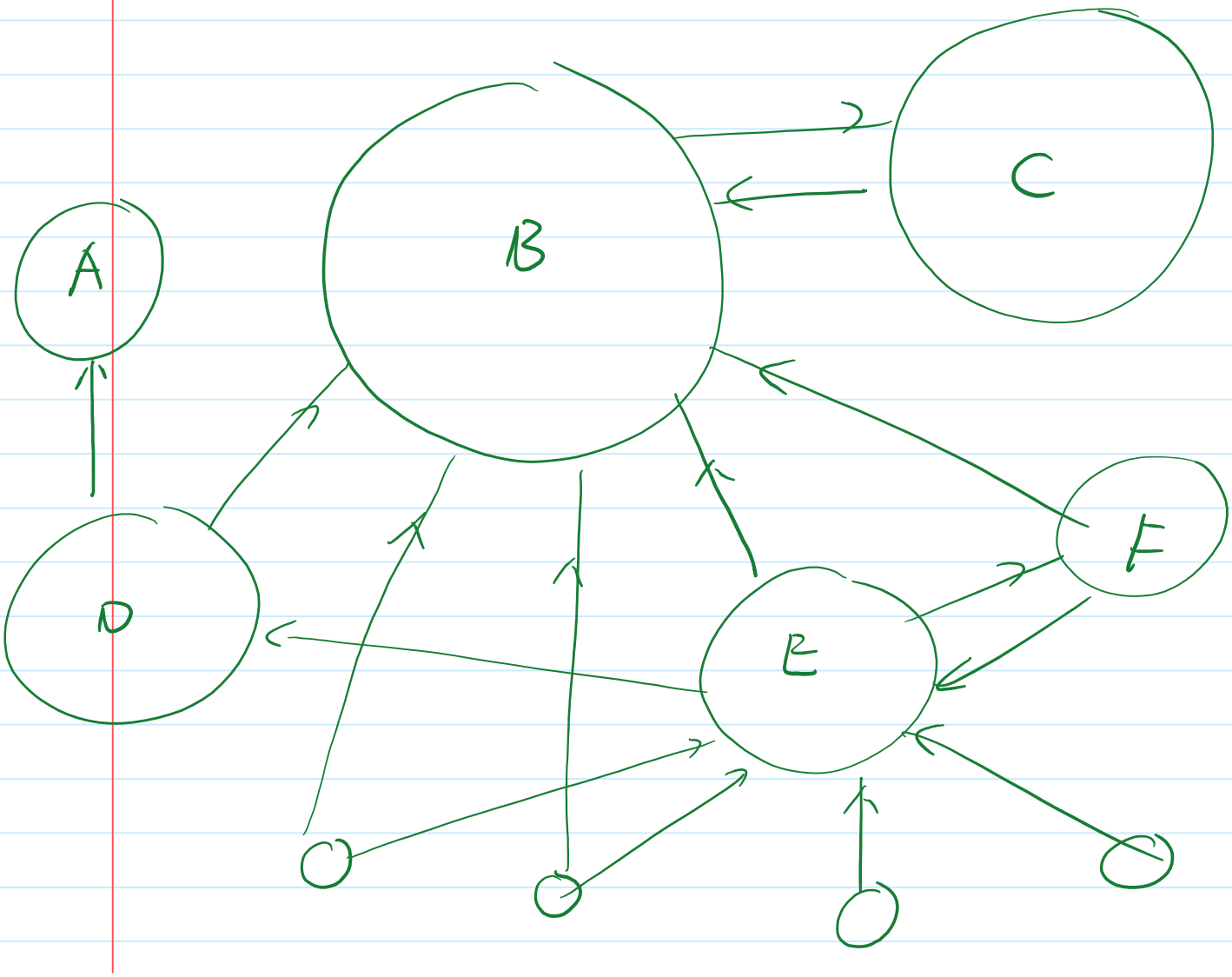
In this Lab: applications of Markov chains and graphs

- The PageRank algo
- Statistical inference (with a Markov model)
- Cache replacement.

Page Rank

(review Markov chain)

Purpose: given a graph of websites and hyperlinks, produce a ranking of the websites that reflects the importance/popularity/relevance of the websites.



- state space : set of websites (total # = n)
- transition probability :

$$p_{ij} = d \cdot \frac{A_{ij}}{\text{out\_degree}(j)} + (1-d) \cdot \frac{1}{n}.$$

$$A_{ij} = \begin{cases} 1 & \text{if } i \to j \\ 0 & \text{else} \end{cases}$$

- find the equilibrium distribution (can find it by a reasonbly large # of iterations)

Estimate the transition prob. matrix for a Markov chain

- $S = \{1, 2, 3, 4\}$.

Sample path:

1 3 1 2 4 4 1 1 2 4 3 2 1 3 2 1 4

$$\hat{p}_{1,3} = \frac{2}{6}$$

Cache Replacement Policy

n: # of elements in memory

K: size of cache

Question: what elements should I keep in the cache?

Goal: maximize the hit probability.

E.g. Least Recently Used (LRU)

element sequence: A → B → C → D → B → D → F

K = 4

Most Recently Used Least Recently Used