Assignment 8 *

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1 Finding q_*

A

matrix power: [0.048320115956059354, 0.017580395018094563, 0.0413631191788259, 0.0666276805977734, 0.0586013167269819, 0.14650329181745467, 0.23502244448763823, 0.059024175029120274, 0.05616315975366952, 0.2707943014344319]
state propagation: [0.04832284310257513, 0.017583243408045818, 0.04136656418380869, 0.06662498929957618, 0.058604633242770744, 0.14650399785958368, 0.2350162070800875, 0.059028182391892725, 0.05616016201321722 0.27078917741844233]
random walk: [0.04443359375, 0.01611328125, 0.037109375, 0.0751953125, 0.0615234375, 0.13671875, 0.24609375, 0.06982421875, 0.05517578125, 0.2578125]
Eigen-Analysis: [0.04832, 0.1758, 0.04136, 0.0666, 0.058601, 0.146503,0.235022, 0.590241, 0.05616, 0.27079]

B

matrix power: [0.048323324525000017, 0.017569403990400002, 0.04135927198660001, 0.06681673540580002, 0.058487863205600024, 0.14627717403820004, 0.2347979921986001, 0.05911767767280002, 0.056373035601200015, 0.2708775213758001]
state propagation: [0.048323324525000017, 0.017569403990400002, 0.04135927198660002, 0.06681673540580003, 0.058487863205600024, 0.14627717403820004, 0.2347979921986001, 0.05911767767280002, 0.05637303560120002, 0.2708775213758001]

These values were rec'd in just t=12 iterations

If we take only 3 decimal places, even t=5 gives good results.

C

Matrix Power:
Pro: Simple/easy to implement
Cons: High time space complexity for large matrices
State Propagation:
Pro: Uses less space than Matrix power

*CS 6140 Data Mining; Spring 2022 Instructor: Qingyao Ai, University of Utah

Cons: Very high time complexity/inefficient for large matrices
Random Walk:
Pro: Converges faster than above mentioned algorithms
Cons: Has a chance of being stuck in a loop
Eigen Decomposition:
Pro: Deterministic approach Cons: A nuisance to calculate for high dimensional matrix

D

Yes, the chain is ergodic because there are no

1. absorbing state
2. disconnected nodes
3. no cycles with 0 exit probability
4. the chain converges

*E We can reach C=2 (P=0.1), D=3 (P=0.1), E=4 (P=0.4), and J=9 (P=0.4)