Linnéuniversitetet
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Assignment 2 - Eigenvalues and Page Rank

Numerical methods 1MA930 2024

Examiner: Andreas Petersson 2024-04-22

- The hand-in deadline is **23.59 on May 5**.
- You are allowed to work in groups of 1 to 4 people. Recommended group size is 2 to 3.
- Write a short but descriptive report on Tasks 2-3 and 6-9 below and hand in **as a single pdf-file**.
- Carefully explain your solution and any struggle you had. Include all relevant code and figures.
- **Do not plagiarize other groups or use large language models** - this is considered cheating and may be reported.

Task 1. (Preparatory) Re-read Section 12.1.1.

Task 2. (Include in report) Solve problem 12.1.10 (by hand).

Task 3. (Include in report) Solve problem 12.2.4 under the assumption that all entries of the matrix are non-negative. There are several possible solutions, explain what you did in detail.

Task 4. (Preparatory) For some context, briefly familiarize yourself with Markov chains (Markovkedjor). Do this by, e.g., skimming the Wikipedia article on the topic. Check that you roughly understand what is meant by stationary distribution/probabilities (this is called steady-state probabilities in the book).

Task 5. (Preparatory) Read pages 549-551 (Reality Check 12) carefully.

Task 6. (Include in report) Do Activity 1 in Reality Check 12 by hand and include the proof in the report.

Task 7. (Include in report) Do Activity 2 in Reality Check 12 in MATLAB. As usual, include the code, but remember also to write out the matrix G in the report. The verification here is done by checking that the matrix-vector product Gp gives the expected result in MATLAB, or by checking that you find the same vector using the function `eig`.

Task 8. (Include in report) Do Activity 3 in Reality Check 12 in MATLAB (the function `eig` is useful here and below). Remember to reflect on and discuss your answer.

Task 9. (Include in report) Do Activities 4-5 in Reality Check 12 in MATLAB. The function `sort` is useful here. Discuss what you believe will happen and why, then compare to your answers.