Assignment 2

Numerical Computations

25.07.2024

1. Using appropriate matrix packages in R, illustrate with examples on how to conduct the followings operations in R:

   - Backward substitution
   - Forward substitution
   - Singular Value Decomposition (SVD)
   - QR factorization
   - Eigen decomposition and Matrix diagonalization

2. Explain the importance of SVD and QR factorizations. Support your answers with real life applications (at most one for each) where these techniques are used and illustrate with R codes)

3. Explain, with a numerical example, the relationship between Principle Component Analysis and Eigen decomposition. (Your explanation should be supported with R codes)

4. Several matrix methods can be used to solve system of linear equations. Using flop count and system.time and the random generator functions, justify which method you would adopt (Support your answer with a numerical example using the random generator).

$[10 + 8 + 8 + 14 = 40$ marks]

1 Instructions

1. Use the Microsoft Word or Tex.

2. Clearly indicate the sections and for each section, include a respective appendix for your R codes and outputs

3. Include references.

4. Missing any important details may result in loss of marks

5. Present your solutions in a clear manner

6. This is **NOT** a grouped assignment and the deadline to submit is within 3 weeks from the date the assignment was sent. (Expected date: 15 August 2024)