Numerical Linear Algebra
CSCI 5646
Fall 2025

Instructor:
Rebecca Morrison
ECOT 820
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Class details:
Class meetings: Tu/Th 2:00 – 3:15, ECEE 283
Office hours: Tu 3:30 – 4:30

Materials:
Numerical Linear Algebra by Trefethen and Bau
Lecture notes (R. Morrison)
Canvas for announcements and grading

Course description
This course will cover the fundamental ideas of numerical linear algebra, which, as Trefethen and Bau point out in their preface, is "really *applied* linear algebra." They go further: "Numerical linear algebra is really functional analysis, but with the emphasis always on practical algorithmic ideas rather than mathematical technicalities." In this class, we will develop some of the theory and get lots of practice with examples. Topics include the basics (matrix operations, norms, and the SVD), QR factorization and least squares, conditioning and stability, systems of equations, eigenvalues, and, time permitting, iterative methods.

Course objectives
In this course, students will learn to:

- Perform common matrix operations, compute and manipulate norms, and become comfortable with complex matrices and vectors
- Compute the SVD by hand for small matrices, and implement the SVD on a computer
- Leverage the QR factorization for many further purposes
- Compute and compare conditioning and stability of various modern and historical algorithms
- Solve systems of equations
- Find eigenvalues
- Begin to analyze common iterative methods
- Appreciate numerical linear algebra for the "beautiful and fundamental" subject that it is!

Course work and grading
Grades will be determined based on quizzes (40%), a midterm (30%), and a final exam (30%).

- **Homework:** Homework will be assigned every week, but **will not** be graded.
- **Quizzes:** There will be a 10-minute quiz most weeks on Thursday. The quiz problem(s) will be taken from the previous homework. Usually the quiz will be individual (graded); sometimes it will be a group quiz/activity (graded for completion). The lowest three grades will be dropped.
  If you need extra time, please come see me right away and we will set something up!
- **Exams:** There will be a midterm on Tuesday, October 14 during class and a final exam (time/day TBD).