

ICS 6N – Computational Linear Algebra

10-Week Summer Session - 2023

Class Meeting Day(s), Time and Location: Tuesday and Thursday 11:00-12:20

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Location: Rowland Hall 108

Course Description

Many complex problem settings can be framed as systems of linear equations; the study of how to solve these problems is called linear algebra. This area of mathematics is foundational to many disciplines, including the sciences, economics/logistics, engineering, statistics, and computer science. In this course, we will learn the fundamentals of linear algebra and explore how they can be applied to topics within ICS.

Prerequisites

ICS 31 (Introduction to Programming) or ICS 32A (Python Programming and Libraries).
Overlaps with Math 3A (Introduction to Linear Algebra)

Grading

Overall course grades will be assigned as follows: 30% weekly homework assignments, 30% for the midterm exam, and 40% for the final exam. There are 7 total homework assignments, as no homework is due week 1, week 6 (the week of the midterm exam) or week 10. To determine overall homework score, we will drop your lowest homework score and weight the remaining 6 homeworks equally.

Course Plan

- **Week 1:** Vectors and Matrices
- **Week 2:** Determinants, Inverses, Spans and Bases
- **Week 3:** Solving Systems of Linear Equations
- **Week 4:** Column, Row, and Null Spaces
- **Week 5:** Change of bases, *Application: Graphics*
- **Week 6:** Midterm Exam, Inconsistent systems of linear equation

- **Week 7:** Eigenvalues and Eigenvectors
 - **Week 8:** Orthogonalization and Gram-Schmidt, *Application: Optimization*
 - **Week 9:** Singular Value Decomposition, *Application: Principal Component Analysis*
 - **Week 10:** *Applications: Linear Regression and Final Exam*
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Suggested Reading

Linear Algebra and Its Applications (5th Edition) by David Lay, Steven Lay, Judi McDonald is **Suggested** by not required. It is available at the Bookstore.