First Course Handout

Title

Introduction to Linear Algebra (EE951)

Objective

This is an introductory linear algebra course that aims to provide students with a solid foundation in mathematical concepts and techniques relevant to machine learning. This course covers basic linear algebra topics such as vectors and matrices, singular value and other decompositions, solving systems of equation, linear independence, eigenvalue decomposition, and positive definite matrices.

Contents

1. Vectors, vector operations, vector spaces, matrices, basic matrix operations, matrix multiplication
2. Inner products, norms, linear functions
3. Linear systems, LU and QR factorization
4. Singular Value Decomposition, Spaces associated with a matrix,
5. Linear independence, Basis and Dimension,
6. Solving Ax=b, Determinant,
7. Eigenvalues, Eigenvalue decomposition, Positive Definite Matrices
8. Matrix calculus

Mode

1. Recorded lectures released in the prior week (roughly 1.5-2 hours)
2. Live interaction session as per schedule

Evaluation

1. Attendance in live sessions: 10%
2. Quizzes in week 4 and 5: 15% (best 1 out of 2)
3. Assignments (to be submitted): 20%
4. Endsem exam: 55%

Missed policy

1. If the quiz is missed due to a valid reason (with supporting documents), then a make-up quiz will be arranged at the time of end-sem exam.
2. We will utilize a “best N-1 out of N” policy for evaluating assignments, where N is the total number of assignments handed out.
3. If endsem exam is missed due to any reason, the students will receive an I grade. The I grade can be converted into a regular grade by appearing for exam when the course is offered next.

References

1. Detailed notes will be provided along with the videos every week.
2. Additionally, students may refer to any of the following books:
    a. Strang, Gilbert. Linear algebra for everyone. Wellesley, MA, USA: Wellesley-Cambridge Press, 2020.
    b. Boyd, Stephen, and Lieven Vandenberghe. Introduction to applied linear algebra: vectors, matrices, and least squares. Cambridge university press, 2018.