

Linear Algebra and Its Applications

Fall 2023– Term Project

1. Select a topic from the suggested topics listed below.
2. Collect relevant information, material and literature about the selected topic in addition to the class material.
3. Study the collected information/materials.
4. Follow the specifications below to deliver a **hard copy** of term project report to 國青大樓 111 and an **electronic copy in pdf or Microsoft Word onto the COOL** by **29 December 2023**.
 - a. The report should summarize your study of the selected topic **in your own words and composition**. (Plagiarism will be checked using Turnitin LTI. Duplication rate is an important grading criterion. Reports with duplication of more than 30% will be rejected.)
 - b. Number of pages for I~VI ≤ 10
 - c. Font size ≤ 12
 - d. Line space ≤ 1.5
 - e. Language: 中文 or English
 - f. The report should consist of
 - I. **Rationale**, i.e., why the topic is chosen
 - II. **Problem background** including the problem difficulties/challenges
 - III. **Solutions with linear algebra theories and techniques**,
 - IV. **Examples/applications**
 - V. **Discussions** including remaining/new questions, and
 - VI. **References**.
 - VII. **Attachment: In addition, you should use ChatGPT and/or bard to optimize your report and submit the optimized report as an attachment.**

List of topics

Students from Engineering/EE-CS College (not including Industrial Engineering students):

- [1] Circuit design and analysis
- [2] The Fast Fourier Transform and its applications
- [3] The Singular Value Decomposition and its applications
- [4] The Jordan Form and its applications
- [5] The Finite Element Method and its applications
- [6] Numerical Computation Algorithms for solving $Ax=b$, $Ax=\lambda x$ and SVD
- [7] Linear Programming and its engineering optimization applications
- [8] The pseudo-inverse (Moore-Penrose pseudoinverse) and its engineering applications
- [9] Signal processing/classification and pattern recognition
- [10] Any applications of PCA to engineering problems
- [11] Any Linear Algebra applications to Engineering Data Sciences and Machine Learning
- [12] Any other applications of Linear Algebra to engineering problems (you may discuss with me)

Students of Industrial Engineering and Students from other colleges:

- [1] Fourier Transform and its applications
- [2] The Singular Value Decomposition and its applications
- [3] Numerical Computation algorithms for $Ax=b$ and $Ax=\lambda x$
- [4] Any Linear Algebra applications to economic models and theories (e.g. von Neumann's Expanding model, Leontief's input-output matrix etc.)
- [5] Optimization theories (e.g. Interior-point method) and applications
- [6] Duality and Game theories and their applications
- [7] The pseudo-inverse (Moore-Penrose pseudoinverse) and applications
- [8] Any Linear Algebra applications to classification (machine learning) problems
- [9] Any Linear Algebra applications to Multivariate Analysis, such as PCA, FLS, etc.
- [10] Any Linear Algebra applications to Statistical theories.
- [11] Any Linear Algebra applications to Machine Learning and Data Sciences
- [12] Any other Linear Algebra related applications (you may discuss with me)