DSCI 369 LINEAR ALGEBRA FOR DATA SCIENCE

INSTRUCTOR INFORMATION

Instructor: Dongwei Chen, Room 212 in the Weber building.

Class Time and Location: MTWF, 3:00 pm-3:50 pm, Walnut Building 103 Room.
Email: dongwei.chen@colostate.edu
Office Hours: 4 pm- 5 pm Tuesday in Walnut 103, and 10 am-11am Wednesday in Weber 212.
Communication Policy: Emails will be responded within 48 hours in workdays.

PREREQUISITES FOR COURSE

MATH 157 and MATH 159 or MATH 155 or MATH 156 or MATH 160 or MATH 161

COURSE DESCRIPTION & OBJECTIVES

The overarching goal is to teach what linear algebra concepts are useful in data science applications and why one would use a particular technique versus another.

Upon the completion of this course, students will be able to:

- Recognize the definitions and properties of vectors (spaces), matrices, tensors, linear transformations, bases, projections, systems of linear equations, and other fundamental structures in linear algebra.
- Apply linear algebra techniques like convolution, change of basis, cosine similarity, eigendecomposition, and principal component analysis to different data science problems.
- Evaluate whether data in a particular application should be treated with linear algebra and which techniques would be informative.
- Synthesize multiple sources to deeply understand a particular application of linear algebra to data science.

TEXTBOOK / COURSE READINGS

The text is a free OER textbook entitled Linear Data written by the course developers, Emily J. King and James B. Wilson. Please check the following link for more information.

Linear Data

COURSE MATERIALS & EQUIPMENT

The labs require the use of Matlab or Python. The student may choose either.

If you are using Matlab, complete the following steps:

- Install Matlab using your CSU login. You can access the tool by selecting the following: Colorado State University: Mathworks
- Install the following toolboxes: Statistics and Machine Learning Toolbox, Signal Processing, Image Processing. There will be an option to choose toolboxes to install when installing Matlab through the link above.

If you are using Python, complete the following steps. Note: You are ONLY allowed to use Python in this class if you have not only experience with Python but also with terminal / command line to perform all the following installations.

- Install Python on your computer: Python Download
- Install an environment for Jupyter: Jupyter Install or Visual Studio
- Install NumPy: NumPy Absolute Beginners
- Install MatplotLib: MatplotLib Install
- Install SciPy: SciPy Installation

Course Policies

Late submission for homework and lab activities will *not* be accepted except for excuses. The students need to discuss with the instructor in advance for exams making up. The students are expected to take the class in person and absence for the class needs excuses.

Grading Policy

Assignment	Grade Percentage
Attendance	5%
Homework (written assignments)	20%
Group Labs (Friday)	20%
Mid-Term Exam 1	25%
Mid-Term Exam 2	30%
Total:	100 %

LETTER GRADE

Grade	Range
A+	100% to 96.67%
A	<96.67% to 93.33%
A-	<93.33% to 90.0%
B+	<90.0% to 86.67%
B	<86.67% to 83.33%
B-	<83.33% to 80.0%
C+	<80.0% to 76.67%
C	<76.67% to 70.0%
D	<70.0% to 60.0%
F	<60.0% to 0.0%

ASSIGNMENT DESCRIPTIONS AND RUBRICS

HOMEWORK (20% FINAL GRADE)

- Homework 0 will serve as a practice assignment, covering important issues for the course without math. There might be one homework for each module. Since there are 11 modules and 15 weeks of class, the homework will be given weekly or biweekly.
- In addition to standard math questions, where you must work out an exact solution, there will also be a few problems which may be worked out on the computer. You may use Matlab/Matlab Live Script or Python/Jupyter with NumPy to work those problems.
- To get full credit, you must justify your answer/show your work. This also makes it easier for you to be given partial credit if your final answer is wrong, but your methods are correct. For the questions where you may use a computer, ``showing your work' means giving the commands used.
- Code submission for the HW and Lab activities must be a screenshot or photo (with legible text) that includes the code and output. You need to transform the screenshot or photos into the pdf format and submit it to Canvas. No other submission method will be accepted. You will receive 0 points if the screenshot is not visible.
- Each homework should be uploaded as a single PDF file to Canvas by the deadline.
- The lowest homework will be dropped if the course evaluation rate reaches 50%.

LABS (20% OF FINAL GRADE)

- There will be a group learning activity on Friday. The students are required to work in groups with maximum five people in each group, and the lowest grade of lab activities will be dropped if the course evaluation rate reaches 70%.

MID-TERM EXAM 1(25% OF FINAL GRADE)

The first mid-term exam is scheduled at 3:00 pm-3:50 pm on October 15, 2025. The testing location will be at our classroom (Walnut building 103 Room). You can take a formula sheet up to four pages in two sheets of papers for the first mid-term exam.

MID-TERM EXAM 2 (30% OF FINAL GRADE)

The second mid-term exam is scheduled at 3:00 pm-3:50 pm on December 12, 2025, which will coverage the remaining topics since Mid-term exam 1. The testing location will be at our classroom (Walnut building 103 Room). You can take a formula sheet up to four pages in two sheets of papers for the second mid-term exam.