

Geometric Algorithms Fall 2021

Course Description

This course will introduce you to linear algebra from an algorithmic standpoint. Linear algebra is such a useful tool that it is crucially important to a number of areas in Computer Science. For example, if you study optimization, the starting point is linear algebra. If you study computer graphics, the language you use every day is linear algebra. If you study the performance of computer systems, you need linear algebra. If you study algorithms especially graph algorithms you will absolutely need linear algebra. If you study data mining, you will use linear algebra all the time.

The dominance of linear algebra arises because it is so fundamental, and in some ways, very simple. It deals with objects that almost always can be interpreted geometrically. So often we can use linear algebra in a very intuitive manner so much so that many times it is actually the best way to think about geometric problems. But it is also rigorous and so captures situations that sometimes we would overlook if we were proceeding purely intuitively. This is because it is also about solving equations, and finding solutions to various kinds of problems. So the advantage of being basic and fundamental is that it can be used and applied in so many ways.

Required background

CS111 and MA123 recommended.

Course Information and Schedule

Instructor	Dr. Abbas Attarwala	Lecture, Section 1	T/Th	2 pm to 3:15 pm
		Lecture, Section 2	T/Th	3:30 pm to 4:45 pm
		Labs	MON	SeeOnline

Office Hours	Time TBA
Email	attarwal@bu.edu
Web site	CS132 Geometric Algorithms in https://learn.bu.edu

Text Books

- There is a required textbook: The textbook for the course is David C. Lay, Linear Algebra and Its Applications (LAA), 5th edition.

Required Software

We will use MATLAB throughout the term for CS 132. You can get MATLAB on your computer, by following the instructions listed here <http://www.bu.edu/tech/services/cccs/desktop/distribution/mathsci/matlab/>.

Lectures

- I expect students to come to class, and come on time. Attendance is mandatory. While the class is large, class participation and questions will be encouraged. Also, while our textbook will be very helpful, they are on occasion an imperfect substitute for in-class learning, which is the fastest (and easiest) way to learn the material. If you miss a class, please get the notes and work through the material from a fellow student.

Grading Scheme and Policies

Assignments	30%	Schedule below
Quizzes	30%	Schedule below
Final Exam	40%	See Final Exam section of this handout for more details

Homeworks (done individually)	Due Date (tentative due dates)
Assignment 1	September 17th, 11:59pm
Assignment 2	October 1st, 11:59pm
Assignment 3	October 19th, 11:59pm
Assignment 4	November 5th, 11:59pm
Assignment 5	November 19th, 11:59pm
Assignment 6	December 8th, 11:59pm

Quizzes (individual and group)	Date and Location
Quiz 1	September 20th in discussion
Quiz 2	October 4th in discussion
Quiz 3	October 25th in discussion
Quiz 4	November 15th in discussion
Quiz 5	December 6th in discussion

Assignments

There are six assignments. All assignments are to be done individually. You will submit your assignment on Gradescope. DO NOT EMAIL YOUR assignment TO the instructor or TF. All due dates and times (mentioned in assignment handout) are firm. The due dates on the assignment handout will closely match with the due dates on this course syllabus, however, in the event if they differ then we will follow the due dates on the assignment handout. Solutions to assignment will be made available the next day after due date. Your lowest assignment mark will be dropped.

Quizzes

You will write your quiz during discussion unless otherwise mentioned. I hope that the assignment and coming regularly to lecture will help you prepare well for the quiz. Some quizzes may have a group component. I will explain in lecture on how the group component of the quizzes will work during the semester.

Re-marks

If a piece of work has been mis-marked or if you believe the rubric used to evaluate the work is not appropriate, you may request a re-mark. For a re-mark to succeed, you must clearly and concisely express what you believe was mis-marked or unfairly marked. Every remark request must be sent to us via Gradescope. No remark requests will be accepted via email or Piazza. Be prepared for the entire work to be re-evaluated and for the mark to be adjusted up *or* down after the re-evaluation. Remark request MUST be made in 5 days time after the grade has been made available. All remark requests links will be disabled after 5 days time. No remark request will be accepted after 5 school days.

Discussion

Quizzes will take place during discussion. We will also use discussion to discuss assignments and provide tips and hints that may be useful in completing the assignments. Please make sure to use the discussion to your advantage.

Final Exam

The final exam is comprehensive, and you must obtain a mark of at least 40%; otherwise, a grade F will be assigned. More details about the final exam (i.e. day, time and location) are listed on this link. <https://www.bu.edu/reg/calendars/final-exams/> The final examination will be given during the final exam period. It is YOUR RESPONSIBILITY to check the for the date, time and place of the final exam. Since the exam schedule can change, do not make plans to travel during the examination period. If you miss an examination without a valid excuse, you will receive a zero grade for that examination. No make-up examinations will be available without a valid excuse. You must bring a valid form of picture ID with you to each examination.

Late policy

There are no grace days; all due dates are firm. In case of illness, please provide a doctor note. For other emergencies, be prepared for us to request some kind of documentation. If you submit a assignment late or miss a midterm test due to illness or personal issue, first contact the instructor as soon as possible.

Collaboration Policy

You are strongly encouraged to collaborate with one another in studying the lecture materials and preparing for quizzes and exams. You may discuss ideas and approaches to the assignments with others (provided that you acknowledge doing so in your solution), but such discussions should be kept at a high level, and should not involve actual details of the code or of other types of answers. You must complete the actual solutions on your own.

Academic Misconduct

We will assume that you understand BUs Academic Conduct Code: <http://www.bu.edu/academics/policies/academic-conduct-code> Prohibited behaviors include:

- copying all or part of someone else's work, even if you subsequently modify it; this includes cases in which someone tells you what you should write for your solution
- viewing all or part of someone else's work
- showing all or part of your work to another student
- consulting solutions from past semesters, or those found online or in books
- posting your work where others can view it (e.g., online).

Incidents of academic misconduct will be reported to the Academic Conduct Committee (ACC). The ACC may suspend/expel students found guilty of misconduct. At a minimum, students who engage in misconduct will have their final grade reduced by one letter grade (e.g., from a B to a C).

Accessibility Needs

Boston University is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom or course materials, please contact Accessibility Services as soon as possible: access@bu.edu or <http://www.bu.edu/disability/>.

Rough Weekly Plan

Note that the following table is a *rough plan only!* This may change. Please check on Blackboard for the actual weekly schedule. Changes to the schedule will be announced in class as well.

Nos#	High level Topics
(1)	Linear Equations in Linear Algebra
(2)	Matrix Algebra
(3)	Determinants
(4)	Vector Spaces
(5)	EigenValues and EigenVectors and Principal Component Analysis
(6)	Least Squares and Orthogonality