

Since we haven't learned a lot of linear algebra yet, because the semester is still kind of fresh, this first project is more about researching ways that linear algebra can be used and reporting on two of the following topics that seem interesting to you.

Instructions:

General--

- **Due date:** You need to upload your completed project to the corresponding assignment in **Canvas by 11:59 pm on Sunday, September 22nd.**
- You are strongly encouraged to work in groups. But each student must turn in their own project.
- Submit your own work, in your own words.

Specific--

1. Choose two of the following list of topics to do a research report on.

- Ranking in search engines
- Linear Programming
- Error correcting codes
- Signal Analysis
- Computer Graphics
- Facial recognition
- Prediction
- Community detection
- Greedy Algorithms
- Quantum computing
- Cryptography
- Electrical Networks
- Markov Chains
- Population Growth
- Game Theory
- Random Walks
- Optimal Portfolio allocation

2. For each of the two topics you chose from the above list, address the following questions in your research.

(a) Research what that topic is all about and how it involves linear algebra. You can research this on the internet, in the library (i.e. reading through books), from reading research papers on this topic, interview people in the appropriate industry, interview faculty members, etc. But find the information somehow, from reliable sources. You should cite at least three sources, to do some level of triangulation that will ensure you're getting somewhat accurate information.

Remember to cite your sources. This is a preliminary research paper on subjects you don't know much about so there should be lots of citing of sources. That's fine. The point is to learn something new on your own (or within a group, but I mean outside the context of a formal classroom setting).

(b) Why did you choose this topic to research, i.e. why did it sound interesting or intriguing to you? How will this application of linear algebra be useful or related to the kind of work you might do one day?

(c) Give one mathematical example of this topic/application. This could be something you find during your research, and you may not understand all the details mathematically. But present what you can of the problem and explain as much as you can, intuitively or with precise mathematical notation. Also, of course, cite your source(s) for the example that you choose. The point of this part is to grow mathematically from wherever you are in your current understanding of linear algebra and an example is a compelling way to achieve this goal.

Format options for your report:

A. You can write your report. All the written responses (that are not mathematical symbols) need to be typed, 12-point font, 1.5 lines spacing. All mathematical work can be hand-written but needs to be neat and organized. If you choose this option, please follow these additional guidelines.

(i) For 2(a) write 3-5 paragraphs (about 1-2 pages) per chosen topic. Remember to cite all your sources.

(ii) For 2(b), write a few paragraphs (0.5-1 page) per chosen topic.

(iii) For 2(c), write as much as it takes to get your mathematical point across here (remember that this can be hand-written if it's math).

When you upload your written work, you need to be sure it's one pdf file with all pages in order and right-side up in order for it to receive full credit.

B. You can do a video presentation of your report for parts 2(a) and 2(b). Part 2(c) still needs to be written according to the 2(c) instructions in format option A.

(i) For 2(a), you will still need to cite all your sources, in the video. The video for this part, per topic, should be about 4-8 minutes in length.

(ii) For 2(b), your video explanation should take about 2-5 minutes per topic.

(iii) For 2(c), write as much as it takes to get your mathematical point across here (remember that this can be hand-written if it's math).

For this format option, you will need to upload one video file (for 2a&b) AND your one pdf file (for 2c). In the video, be sure to make it clear when you're covering 2a and then 2b for each topic (i.e. find some way to "label" those sections in your video, somehow analogous to how you'd do that labeling in writing). The pdf file of written work needs to have all pages in order, right-side up to receive full credit.