POSTER PROJECT

Objective. The goal of this project is to give you chance to explore a topic of your interest that has some connection to linear algebra, and to share what you learn with your peers.

Description. On the last day of class, we'll have a poster session. In groups of 2–4, you'll prepare a handout and a poster about a topic of your choice related to linear algebra.

- The handout should be one typewritten page (front and back). It should give an introduction to the topic, and incorporate a detailed and substantial proof and/or example (at the level of a difficult homework problem or harder). It need not be original, but it should be fully explained *in your own words.* If you can incorporate computer calculations, that would be awesome! The handout should also include a list of works that you referenced, so that someone who wants to learn more about your topic knows where to start.
- The poster should convey the main ideas of your topic and some insightful examples. Pictures are always nice, if at all possible![1] All of the details do not need to appear on the poster (that's what the handout is for). The poster should be clearly legible from about 3 feet away (dimensions of about 3 feet by 4 feet should work).

Keep in mind that the intended audience is one of your classmates: someone who knows something about linear algebra broadly speaking (specifically, the topics we've discussed in our class), but may not know anything specific about your topic.

Please make sure that everyone in your group understands everything on your group's poster and handout!

Poster session. The day of the poster session, we'll all wander around looking at the each other's posters, reading each other's handouts, and asking each other questions about anything we need help understanding. You should be prepared to explain your poster, and to answer any questions people might have about it.

Groups and topics. Your group and topic will need to be approved by me before 11:59pm on the third Tuesday (10/9). One person in each proposed group should send me an email letting me know who you'll be working with and what you'll be working on.

Grading. Your project score will be based on the following criteria.

- Content (out of 4 points). There should be correct and substantial mathematical content in your poster and/or handout.
- Clarity (out of 3 points). The topic should be clearly explained and logically organized, in a way that is appropriate for the intended audience.
- Participation (out of 3 points). The day of the poster session, each of you will be asked to explain your group's poster to some number of people outside of your group, and also to have some number of people outside of your group explain their group's poster to you.

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[1]Remember that, if you don't make a picture yourself, you have to attribute it to whoever did.

Possible Topics. Here are some possibilities for topics for your poster project. If you have another idea that's not on this list, let's discuss it!

If you like art...

- Projective geometry and/or perspective and/or computer graphics.
  Possible references. [Hef17, Chapter Four, "Topic: Projective Geometry"], [LLM16, Section 2.7], [Hug+95, Chapters 4–5].

If you like physics, engineering...

- Electrical networks.
  Possible references. [Hef17, Chapter One, "Topic: Analyzing Networks"], [LLM16, Sections 1.10, 5.7].
- Coupled oscillators.
  Possible references. [Hef17, Chapter Five, "Topic: Coupled Oscillators"].

If you like computers...

- Accuracy of computations.
  Possible references. [Hef17, Chapter One, "Topic: Accuracy of computations"]
- Linear algebra and computational complexity.
  Possible references. [Hef17, Chapter Four, "Topic: Speed of Calculating Determinants"]. Alternatively, you might also look into algorithms for matrix multiplication (Wikipedia may be a good starting point), or into algorithms for Gaussian elimination.
- Page ranking.
  Possible references. [Hef17, Chapter Five, "Topic: Page Ranking"], [LLM16, Section 10.2], [LM12].

If you like economics...

- Leontief Input-Output Model.
  Possible references. [LLM16, Section 2.6].

If you like statistics, demographics, sociology...

- Voting paradoxes.
  Possible references. [Hef17, Chapter Two, "Topic: Voting Paradoxes"].
- Lines of best fit.
  Possible references. [Hef17, Chapter Three, "Topic: Line of Best Fit"], [LLM16, Section 6.5].
- Population modeling.
  Possible references. [Hef17, Chapter Five, "Topic: Stable Populations"], [LLM16, Section 5.6].

If you really love math...

- Markov chains.
  Possible references. [Hef17, Chapter Three, "Topic: Markov Chains"], [LLM16, Section 4.9, Chapter 10].
- Jordan form.
  Possible references. [Hef17, Chapter Five], [Axl15, Chapter 8].

References

[Axl15]   Sheldon Axler. *Linear Algebra Done Right.* 3rd ed. 2015.

[Hef17]   Jim Hefferon. *Linear Algebra.* 3rd ed. 2017. URL: http : / / joshua . smcvt . edu / linearalgebra/.

[Hug+95]   John F. Hughes et al. *Computer Graphics: Principles and Practice.* 2nd ed. 1995.

[LLM16]   David C. Lay, Steven R. Lay, and Judi J. McDonald. *Linear Algbera and its Applications.* 5th ed. 2016.

[LM12]   Amy N. Langville and Carl D. Meyer. *Who's #1?: The Science of Rating and Ranking.* 2012.