Math 689 : Linear Algebra with Data Applications : Fall 2020

- **Instructor:** Tyrus Berry, tberry@gmu.edu, http://math.gmu.edu/~berry/

- **Office:** Blackboard Collaborate

- **Office hours:** TBA

- **Course Website:** Blackboard, https://mymasonportal.gmu.edu/

- **Book:** Linear Algebra in Action (Second Edition) by Harry Dym

- **Classroom:** Asynchronous online

Overview

The course will cover the most important facts, factorizations, and decompositions from linear algebra including QR factorization, Jordan Decomposition, the spectral theorem, Singular Value Decomposition (SVD), Riesz representation theorem, psuedo-inverses, matrix square roots, matrix exponentials, Krylov subspaces, and matrix equations (such as Riccati). The goal is to develop the mathematical theory and then connect it to applications through computational projects. Applications will include Fourier analysis (and FFT), dynamical systems, Markov processes, state estimation, optimal control, graph/network analysis, dimensionality reduction, data visualization, and feature identification.

Office Hours

Office hours will all be held online via Blackboard Collaborate and will alternate every other week between required individual 15 minute meetings and optional group office hours. Surveys will be emailed out at the beginning of the semester to schedule times.

Weekly Plan

Your week should be split up into three study periods (on three different days) each consisting of:

1. Viewing a short lecture video on Blackboard.

2. Working a quick problem on Blackboard (unlimited attempts).

3. Reading a section or two in the book.

4. Working out details or exercises from the book (your choice).

Details and exercises worked from the book should be maintained in a journal that will be collected periodically.

The remaining time will be devoted to projects. Most projects will have a computational aspect and Matlab/Octave/FreeMat are highly recommended but alternatives may be acceptable, please discuss in advance if you would like to use an alternative.

Grading

Grades will be based on three components (in order of significance):

1. Projects

2. Journal of exercises and details worked out from the book

3. Blackboard quizzes

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