Course Syllabus
Randomized Numerical Linear Algebra (MATH6950)

Instructor: F. M. Faulstich (faulsfh@rpi.edu), Office: Amos Eaton 329

Office hours: Tuesday, 1-2 p.m. & Thursday 4-5 p.m.

Class web page: https://fabianfaulstich.github.io/MATH6950_2024/
RPI LMS page: https://lms.rpi.edu/ultra/institution-page
Piazza web page: https://piazza.com/rpi/spring2024/math6590
Gradescope web page: https://www.gradescope.com/courses/694374

Course Content & Goals:
This course covers probabilistic algorithms for linear algebra computations, such as factorizing matrices and solving linear systems. It focuses on techniques that have a proven track record for real-world problems.

The course treats both the theoretical foundations of the subject and practical computational issues. Topics include norm estimation; matrix approximation by sampling; structured and unstructured random embeddings; linear regression problems; low-rank approximation; subspace iteration and Krylov methods; error estimation and adaptivity; interpolatory and CUR factorizations; Nyström approximation of positive semidefinite matrices; single-view ("streaming") algorithms; full rank-revealing factorizations; solvers for linear systems

In Lieu of Textbook:

1. P.G. Martinsson and J. A. Tropp. "Randomized numerical linear algebra: Foundations and algorithms." Acta Numerica 29 (2020): 403-572.

Logistical structure of the class:

- **Piazza**: Piazza will be the main forum for all communication outside of classroom and office hours, and this will include the announcements.

- **Questions in Addition to Office Hours**: If it is not class time or office hour and you want an answer more or less right away, please ask the question on Piazza. You can use the "private question" mode on Piazza if necessary. In case of an emergency (that does not include homework questions), we may be able to set up a WebEx appointment in my personal room.

- **Homework**: A few problems will be assigned and graded on a mostly weekly. This will be the only means of assessment of your work, so you should put a real effort into it. I encourage collaboration on the homework. However, copying is forbidden. In other words, you can exchange ideas as much as you want, but, in the end, you must write your work up on your own without looking at anybody else's work. Copying off the internet is also forbidden as is using AI helpers such as ChatGPT.

- **Gradescope**: Please submit your homework through Gradescope. You should submit a typeset .pdf file. Place different problems on different (sets of) pages, and connect the pages to the corresponding problems in Gradescope. Please submit the homework on time. Late homework will not be accepted without prior arrangements.

Academic Integrity:

Copying the homework from anybody or anywhere is forbidden. This includes fellow students, the internet, recycled solutions from previous versions of the class, or ChatGPT. Violating this policy will result in a score of zero for the problem. A second violation will result in a score of zero for the entire assignment. A third violation will result in a referral to the dean of students. Penalties for repeat offenses can be quite harsh; you should check the Academic Integrity Policy page provided by the Dean of Students Office for more information about this: https://info.rpi.edu/dean-students/05/29/2020/notice-student-rights-and-responsibilities

Grade Appeals:

All appeals must be made within one week of the date when the item was returned to the class. You can do this through a regrade request on Gradescope.

Disability Services:

Rensselaer Polytechnic Institute is committed to providing equal access to our educational programs and services for students with disabilities. If you anticipate or experience academic barriers due to a disability, please get in touch with the Office of Disability Services for Students (DSS) (dss@rpi.edu; 518-276-8197) to establish reasonable accommodations. Once you have been approved for accommodations, please provide me your Faculty Memorandum (a letter provided to students by DSS).