CSE/MATH-6644
Iterative Methods for Systems of Equations

Instructor information

Lectures: T Th 2:00-3:15pm
Location: TBD

Instructor: Qi Tang
Email: qtang@gatech.edu
Office Hours: TBD or zoom

TA1: TBD
Email: TBD
Office Hours: TBD

Course description

This class covers a wide range of iterative methods for solving linear and nonlinear systems of equations. Among the topics covered are fixed-point iterations, splitting methods, Krylov subspace methods, (multigrid) preconditioners, and Newton-type methods. The class will present the mathematical underpinnings of these methods and use them, together with numerical experimentation, to study their properties. Some programming exercises will be assigned, and students may use any programming language of their choice.

Prerequisites

- MATH 2406, MATH 4305 and MATH 4640
- CSE/MATH 6643 is not required but strongly recommended

Grading

The weights for the course grade are as follows. Students must pass the final exam to pass the course.

Category	%
Homework	80%
Final project	20%

The final course grade will be assigned based on the following scale.

Grade	%
A	90-100%
B	80-89%

Grade	%
C	70-79%
D	60-69%
F	0-59%

Pass/Fail and Audit

For pass/fail, the passing grade is 50% and you are strongly encouraged to attend class regularly. If you wish to take the course for audit credit, the audit credit is given for a grade of at least 20% and you are strongly encouraged to attend class regularly.

Textbooks

- Iterative Methods for Sparse Linear Systems, Youssef Saad
- Numerical Methods for Unconstrained Optimization and Nonlinear Equations, Dennis and Schnabel
- Solving Nonlinear Equations with Newton's Method, Kelley
- Matrix computations, Golub and Van Loan

Additional references:

- The Matrix Cookbook, Petersen and Pedersen. *This online book contains many important identities and is incredibly useful.*

Homework Policy

All homework is due by the EOD (11:59pm). Homework is penalized by 20% for each day it is late (this applies additively, meaning that no credit is gained after five late days). We strongly encourage the use of LaTeX for your submission. Unreadable handwriting is subject to zero credit.

Class management

We will use Canvas to deliver course materials and announcements.

Final Project

The final project will allow you to focus more on a topic of particular interest in groups of two to three students. You are encouraged to be creative and develop your own questions to investigate. For instance, you could propose and study a new modification for an existing algorithm, explore an interesting application of an existing algorithm, or explore an aspect that was not covered during class.

Course policies, expectations & guidelines

Plagiarism & academic integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For more information on the Honor Code, please

visit the OSI website.

We encourage you to discuss course content and homework problems with your classmates. However, all answers and codes should be prepared independently. If you refer to any material, it should be properly cited. Needless to say: you are not allowed to use solutions to homework problems that you may find online. If you discussed homework problems with your classmates, indicate which problems you discussed with whom.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, which will investigate the incident and identify the appropriate penalty for violations.

Role of AI assistants

The use of LLMs like ChatGPT and Gemini will be treated like a human collaborator: You have to indicate their use, what you used them for, and you may only use them to get ideas in trying to figure out the solution of a problem or resolve places where you might have gotten stuck. Like a human collaborator, you should not use the LLMs when preparing your solutions or code. For instance, directly copying the output of a chatbot is strictly forbidden

Accommodations for individuals with disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404) 894-2563 or website, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also email me as soon as possible in order to set up a time to discuss your learning needs.

Student-faculty expectations

The Georgia Tech community believes that it is important to continually strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. Therefore, we herein endeavors to enumerate the specific expectations of each side. See here for more details.