Special Problems Course

Course Information

- **Instructor:** Amirali Aghazadeh (aaghazadeh3@gatech.edu)
- **Course Prefix and Number:** ECE 6257 Q
- **Term:** Fall 2026

Course Description

This course covers the design, foundations, and applications of generative and geometric deep learning models. Topics include probabilistic generative models, latent variable methods, diffusion and score-based models, symmetry and equivariance, graph neural networks, transformers, and learning on non-Euclidean domains. The course emphasizes both theoretical understanding and practical implementation. A semester-long project will focus on discrete diffusion models and the mechanistic understanding of large language models.

Course Learning Outcome

By the end of this course, students will understand the core principles of generative and geometric deep learning, including probabilistic modeling, latent variable methods, and symmetry-aware learning. Students will be able to analyze and implement modern deep learning models using Python and PyTorch, read and evaluate research papers in the area, and develop a final project at the level of a short conference-style paper.

Required Course Materials

No textbooks or materials are required. Resources for research are determined in consultation with the instructor.

Grading Policy

This course is graded on a letter grade basis. The grade will be assigned based on agreed-upon objectives commensurate with the difficulty and scope of the project, the number of credit hours, and the technical proficiency of the student. It is the joint responsibility of the instructor and the student to discuss expectations and how meeting or not meeting the expectations affects the final grade. The grading process will be clearly articulated to the student to allow reasonable prediction of progress toward the final grade throughout the semester.

Attendance Policy

This course does not include scheduled class meetings. The frequency and format of student–faculty contact are determined by mutual agreement and are consistent with the number of credit hours for which the student is enrolled.

Academic and Research Honesty/Integrity Statement

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. Review the Student Code of Conduct and the Academic Honor Code, especially Appendix A: Graduate Addendum to the Academic Honor Code.

Students are expected to perform research in an ethical and responsible manner. All Doctoral and Master's Thesis students are required to take the Responsible Conduct of Research training, and it is expected that students abide by the principles taught in that training while performing research.

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

Allegations of scientific or scholarly misconduct are handled in accordance with the procedures outlined by the Policy for Responding to Allegations of Scientific or Other Scholarly Misconduct.

Core IMPACTS

Not applicable.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services 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

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulates some basic expectations that you can have of me and that I have of you. Additional information for research-related work is given in The Expectations of Advisors and Advisees. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.