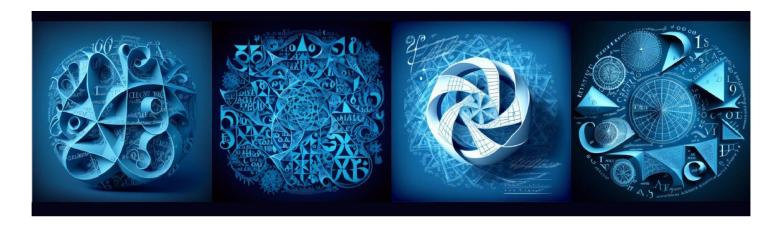# ECE 594N: Special Topics in Pattern Recognition

Equivariant, Geometric & Topological Deep Learning

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Deep learning has been remarkably successful at solving a massive set of problems on data types including images and text documents. This success drove the extension of this approach to more complex geometric data types, such as graphs, meshes, shape deformations, and more, that arise in real-world data. The goal of this course is to introduce students to the extensions of deep learning that cover these cases: equivariant deep learning, geometric deep learning and topological deep learning.

Topics we cover in this course are divided into 3 modules:

- **Module 1:** Equivariant Deep Learning
- **Module 2:** Geometric Deep Learning
- **Module 3:** Topological Deep Learning

You will read, present and discuss a curated set of papers on these topics. In each class, there will be a presentation and discussion of ~2 papers/articles. You will submit and present a final project leveraging the concepts learned in class.

Prerequisites: Knowledge of machine learning and deep learning is required. In particular, students are expected to have adequate knowledge of probability, statistics, linear algebra, optimization, and programming skills as it pertains to standard ML and DL topics. Students should have experience in Python programming.

Evaluation

- Everyone has to attend the class and actively participate in the discussions. (10%)
- Everyone has to present a paper at least once. (45%)
- There will be a final project, with a final presentation & report. (45%)