DIRECTED READING PROGRAM

1. Information

1.1. **General information.** The Directed Reading Program (DRP) pairs undergraduate students with graduate students to undertake independent study projects. It is intended to help motivated students explore topics in more depth than possible in a classroom setting.

Each project is for the duration of one academic semester, which is roughly thirteen weeks. Undergraduates can apply for DRP positions in the beginning of each term and those who are selected will be paired with mentors according to their mathematical interests and availability. The projects are based around the self-paced reading of a particular book or article with substantial guidance from the mentor, with the specific topic arrived upon by discussion of common interests between the mentor and the mentee.

At the end of the semester all mentors and mentees will come together for a day of presentations, here everyone will have a chance to share what they have learned and have a free lunch. This will be scheduled around capstone presentations and final exams. The program will first run in the 2025 spring semester with organization led by Aaron Huntley (axh1127@case.edu).

1.2. **What's expected of the undergraduate student? (Mentee).**

- meet with their supervisor for 1 hour each week; work on the project for an agreed upon number of hours between these meetings (including: reading, problem solving, presentation preparation);
- give a final presentation towards the end of the term;
- Students will not receive course credits for their projects, which on the bright side means: no exams, no grades.

1.3. **Benefits for the undergraduate student.**

- Study an interesting topic without the stress of a usual course;
- Pursue a topic outside of the undergraduate curriculum;
- Develop independent study and oral communication skills;
- Connect with a graduate mentor and receive a good deal of personal attention.

1.4. **What's expected of the graduate student? (Mentor).**

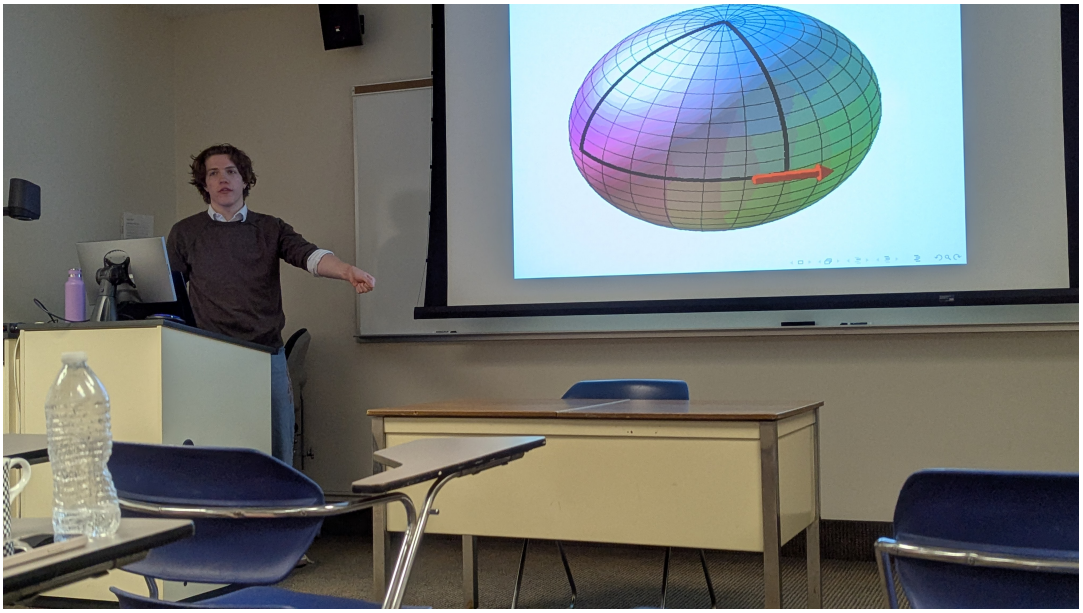
- Come up with a selection of project ideas with suitable references which could be investigated within one semester;

- Guide their mentee, meeting at least 1 hour each week to discuss material and help answer questions;
- Help the mentee prepare and practice a final presentation.

1.5. **Benefits for the graduate student.**

- Practice their one on one teaching skills;
- Gain a deeper understanding of familiar material;
- Improve organizational skills.

2. Spring 2025 Projects



Here is a list of projects, mentees and mentors which took place in Spring 2025:

Mentee	**Mentor**	**Project**
Max Seay	Aaron Huntley	**Exploring Fractal Dimension**
Karel Stryczek	Reeve Johnson	**Introduction to Category Theory**
James-Lucius Okenwa	Andrew Edwards	**The Mathematics of Quantum Mechanics**
Carly Schwartz	Reeve Johnson	**"The Cube" in Category Theory**
Avi Chetlin	Andrew Edwards	**Notes on the Implications of Gravity in a Curved Spacetime**
Dounia Ouzidane	Joseph Dominic	**Building to the Urysohn Lemma**

Mentee	**Mentor**	**Project**
Nara Kaibara	Andrew Edwards	**Minimal Surfaces**
Adam Hutchings	Joseph Dominic	**The Galois Connection: Polynomials and Covering Spaces**
Atri Banerjee	William Bernardoni	**Nevada Semirings & Delay-Tolerant Networking**
Shane Redmond	Aaron Huntley	**Introduction to Categorical Homotopy**
Augustus Kaufmann	William Bernardoni	**An Algebraic and Automata-Theoretic Approach to the Rubik's Cube**
Nicolas Bliss-Carrascosa	Johnathon Taylor	**Compact Hausdorff Spaces are Algebras**
Ritwika Ghosh	Maxwell Kreider	**Insights into epileptic dynamics: phase-dependent sensitivity to perturbations in a Morris-Lecar neuron?**
Aadhav Bharadwaj	Andrew Edwards	**The light cone and causal structure, with special reference to the metric tensor**
Ryan Pitasky	William Bernardoni	**Algebraic Geometry in Robotics**
Haley Quan	Brandon Oliva	**Riemann and Darboux Integration**
Leonora Lipson	Rachel Boedicker	**Introduction to Signal Processing**
Lucas Maciel Bueno da Silva	Brandon Oliva	**Functional Analysis and Applications to ODEs**
Shreeya Chugh	William Bernardoni	**Semirings in Generative AI for Language**
Jerry Zhang	Brandon Oliva	**Existence and Uniqueness Theorem**
Binayek Tiwari	Nirosh/Manuri Thilakarathne	**Calculus and ODE's**