

SEAN GRATE

TheGrateSalmon.github.io

300 Quinton Court Apartment 21-102, Lexington KY 40509

(859) 753-7189 ♦ sean.grate@uky.edu

EDUCATION

University of Kentucky, Lexington

August 2016 - Present

Bachelor of Science in Mathematics, minors in History, Classics, and Computer Science.

RESEARCH

Resampling Point Clouds

August 2019-current

Used machine learning and geometric approaches to develop methods to resample point clouds. This allows for finer or coarser resolutions of the point cloud from any arbitrary view angle. Implemented with PyTorch. Joint work with Hunter Blanton and Nathan Jacobs.

Estimating Flight Lines

July 2019-current

Used machine learning to estimate the flight path a plane capturing LiDAR data took. Implemented with PyTorch. Working under the direction of Nathan Jacobs.

Noncommutative Polytopes of the Heisenberg Group

August 2018-current

Studied the polytopes generated by the Heisenberg group in \mathbb{Z}^3 . Used Python for computations and generating STL files for 3D models of the polytopes. Investigated under the direction of Christopher Manon.

TA Assignments

August 2019-current

Given a set of graduate students that must be matched to a class as a TA, is there a way to find a good matching? Can we add additional constraints like time availability or the seniority of a graduate student? Investigated under the direction of Kate Ponto.

Visualizing Algebraic Surfaces

August 2018-current

Created 3D-printed interactive representations of common surfaces and objects encountered in a Calculus III course. Moved on to generating more complex surfaces such as the Clebsch cubic surface. Used Python, Tinkercad, Mathematica, and Blender to generate STL files. Joint work with Nathan Fieldsteel.

Generating Minecraft Worlds

September 2019-current

Is it possible to generate “nice” looking point clouds that resemble Minecraft worlds? Using tools available in machine learning and borrowing persistent homology from computational topology, this can be done with a generative adversarial network.

TECHNICAL STRENGTHS

Software & Tools

Python, PyTorch, C++

RELEVANT WORK EXPERIENCE

Expanding Your Horizons

April 21st, 2019

Workshop Mentor

- Ran a workshop with two fellow undergraduates that taught middle school girls the basics of rockets and propulsion. We built bottle rockets with vinegar and baking soda and then launched them outside.

Computer Vision REU

May-August 2019

Undergraduate Researcher

- REU in computer vision under the guidance of Dr. Nathan Jacobs at the University of Kentucky. Used machine learning to estimate the flight paths of planes capturing LiDAR data across all of Kentucky.

UK Department of Computer Science

August 2019-current

Undergraduate Research Assistant

- Continued researching the topics looked at in the 2019 Computer Vision REU, e.g. estimating flight routes, point cloud resampling, etc.

ACADEMIC ACHIEVEMENTS AND AWARDS

Best presentation

2019 Computer Vision REU

Dean's List

August 2016 - Present

Student of Good Standing

August 2016 - Present

University of Kentucky Provost Scholarship

*\$1,500 per year***SERVICE**

University of Kentucky Math Club

University of Kentucky Math Lab

National Society for Collegiate Scholars

Tau chapter of the Eta Sigma Phi Classics honorary at the University of Kentucky