

Education

Massachusetts Institute of Technology; Cambridge, MA

2019–Expected 2023

Anticipated BS in Computer Science & Engineering (Course 6-3) and Math (Course 18), GPA 4.8/5.0

Ithaca High School; Ithaca, NY

2015–2019

Regents Diploma with Advanced Designation in Math and Science, GPA: 4.23/4.33

Research

Signed Distance Field Repair

Summer 2021–Present

University of Toronto Dynamic Graphics Project

Supervisor: Alec Jacobson

Signed distance fields have seen a resurgence in recent years as a way to represent shapes that is well-tailored to machine learning. However, many elementary operations on SDFs, such as unions, yield a function that is no longer a valid SDF. In this project, we explore a differentiable way to recover a true SDF from various types of malformed SDFs, and explore the space of valid SDFs.

Sum-of-Squares Geometry Processing

Spring 2020–Present

MIT Geometric Data Processing Group

Supervisor: Justin Solomon

This project provides a framework for applying the techniques of SOS relaxation in order to find an exact solution to a wide variety of problems involving high degree patches. This includes identifying intersections in, calculating elliptical bounding boxes of, and finding collisions between elements such as NURBS and tensor product patches. With solutions to these problems, higher degree patches become applicable in many problems that traditionally are only tractable on linear elements.

Publication: Marschner, Zoë, Paul Zhang, David Palmer, and Justin Solomon. “Sum-of-Squares Geometry Processing”. *SIGGRAPH Asia 2021*, provisionally accepted.

Hexahedral Mesh Repair via Sum-of-Squares Relaxation

Winter–Spring 2020

MIT Geometric Data Processing Group

Supervisor: Justin Solomon

In this paper, we offer a robust method for evaluating the validity of hexahedral elements using the machinery of SOS relaxation, novel to the field of geometry processing, and presents an iterative method to repair an invalid hex mesh that results in a certifiably valid mesh.

Publication: Marschner, Zoë, David Palmer, Paul Zhang, and Justin Solomon, (2020), “Hexahedral Mesh Repair via Sum-of-Squares Relaxation”. *Computer Graphics Forum*, 39: 133-147. doi:10.1111/cgf.14074.

Experience

University of Toronto Dynamic Graphics Project; Visiting Undergrad Researcher

Summer 2021

MIT Geometric Data Processing Group; Undergrad Researcher

Winter 2020–Fall 2021

MIT 6.009; Lab Assistant

Spring 2020–Fall 2020

Helped students during office hours in MIT’s Fundamentals of Programming class

<u>Salesforce</u> ; Software Engineering Intern	Summer 2020
Worked on real-time analytics tool for Salesforce Philanthropy Cloud	
<u>Women in Computing at Cornell</u> ; iOS App Development	2017–2019
Designed and built an iOS app to help WICC organize their events	

Honors

Outstanding UROP Award—School of Engineering	2021
CRA Undergraduate Researcher Award Honorable Mention	2020
Anna Pogonyants UROP Award	2020
Cornell University Department of Computer Science Award	2019
Hans Bethe Prize in Physics (awarded by Cornell University)	2019
1st Place in Cornell Girls High School Programming Contest	2019
RIT Computing Medal	2018

Involvement

<u>Symposium on Geometry Processing 2021</u> ; Student Volunteer	Summer 2021
Performed various tasks during the conference to ensure everything ran smoothly	
<u>HackMIT</u> ; Member of Dev Team	2019–2020
Designed open-source software for use in HackMIT 2019, Blueprint 2020, and HackMIT 2020, including 3D graphics for the virtual world developed for HackMIT 2020. Some of this software is now used by other hackathons around the world.	
<u>MIT Battlecode</u> ; Web Developer	2019
Member of Tech team for Battlecode 2020, MIT's AI-based programming competition, where I helped design the web interface that facilitates the competition	
<u>Ithaca High School/Cornell University Math Seminar</u>	2018–2019
Implemented results from knot theory computationally with mentoring from a Cornell grad student	
<u>Ithaca Sciencenter</u>	2018–2019
Volunteered at science museum teaching kids about science concepts	