

## **EDUCATION**

**University of Texas at Austin** – College of Natural Sciences | Class of 2022

Overall GPA: 3.87/4.00

Bachelor's – Mathematics (Honors Track)

**Mathematics Honors Thesis:** “*Minimal surfaces in hyperbolic manifolds and link complements*”

**2023 NSF Graduate Fellowship – Topology**

**UT Austin Dean's Strategic Fellowship** - Awarded Fall 2023

## **RESEARCH/ PROJECTS**

**Max Planck Institute for Math in the Natural Sciences - Guest Researcher** Summer 2023 - Present

- Currently leading a remote inquiry-based reading course focused on Riemann surfaces and complex algebraic curves with a survey of other topics in Lie group theory, symplectic geometry, and mapping class groups.

**Mathematics Honors Thesis** Fall 2022

- Advised by Prof. John Luecke
- The project is motivated by REU research, specifically on the topic of geodesics formed by horocyclic edges within minimal surfaces of hyperbolic manifolds with parabolic cusps.

**SUMRY REU – Yale University** Summer 2022

- Undergraduate NSF funded research in low dimensional topology and combinatorial hyperbolic geometry mentored by Dr. Franco Vargas-Pallete
- Project was motivated by the converging interests of closed geodesics of hyperbolic surfaces within surfaces of constant mean curvature.
- One of my contributions was the development of a finite element method that could simulate mean curvature flow such that it was compatible with a hyperbolic metric.

**Moncrief Internship w/ The UT ODEN Institute for Computational Sciences** Summer 2021 - Spring 2022

- Developed mathematical models/algorithms using principles of stochastic path integral control to aid automated vehicles in avoiding obstacles with a degree of randomized motion and varying levels of allowed risk under advisement of Dr. Takashi Tanaka
- Compared the computational complexity and success of two different models of diffusion-based optimal control. One of which used reinforcement learning and a weighted average of randomly sampled trajectories, while the second method numerically found solutions to the Hamilton-Jacobi-Bellman differential equation.

**NSF RTG Undergraduate fellowship w/ UT Analysis of PDE's group** Fall 2020 – Spring 2022

- Independent research project guided by Dr. Stefania Patrizi on the topic non-local diffusion operators/the Fractional Laplacian
- Studied derivation and applications of harmonic extension of Laplacian to model energy minimization of crystal dislocations
- Took a series of three independent study courses on various topics in harmonic analysis and complex analysis following the completion of the year-long fellowship.

**Complex Systems REU– University of Minnesota** Summer 2020

- Undergraduate NSF-funded research in nonlinear fluid dynamics led by Dr. Arnd Scheel
- Researched the stability and resonances of non-linear Fischer KPP reaction-diffusion equations.
- The goal of this project was to use heteroclinic bifurcation analysis to explain and characterize a strange resonance pattern that occurred at the threshold of absolute and convective instability in the control parameter of the non-linear ODE.

## **TALKS/CONFERENCES**

CIRM Research School - Renormalization and Visualization for Packing, Billiards, and Surfaces	Summer 2023
<ul style="list-style-type: none"><li>• Research school participant</li></ul>	
Joint Mathematics Meeting (JMM)	Winter 2023
<ul style="list-style-type: none"><li>• Presented on REU research/honors thesis project as an undergraduate speaker</li></ul>	
The Young Mathematicians Conference @ Ohio State University	Summer 2022
<ul style="list-style-type: none"><li>• Presented on Yale REU research</li></ul>	
GROW (Graduate Research Opportunities for Women) @ Duke University	Fall 2022
Texas Undergraduate Mathematicians Conference	Fall 2022
<ul style="list-style-type: none"><li>• Presented on Yale REU research and spoke on panel advising on undergraduate research</li></ul>	
UT Math Directed Reading Project Presentation	Spring 2021
<ul style="list-style-type: none"><li>• Presented on the computation of homology groups of piecewise linear manifolds</li></ul>	
UT Austin College of Natural Sciences Research Forum	Spring 2021
<ul style="list-style-type: none"><li>• Poster presentation on work done during Fellowship with Analysis and PDEs RTG</li></ul>	

## **TEACHING/ WORK EXPERIENCE/SKILLS**

Teaching Assistant – UT Austin Department of Mathematics	Spring 2023
UT Austin Sanger Learning Center – College Math and Physics tutor	Summer 2019 – Fall 2021
Math and Physics Instructor/Tutor @ The Liberal Arts and Science Academy	Fall 2020 – Spring 2021
<ul style="list-style-type: none"><li>• Tutored AP Physics afterschool</li><li>• Instructed inquiry-based pre-calculus course for accelerated high school students</li></ul>	
UT Austin Undergraduate Learning Assistant	Fall 2020 & Winter 2021
<ul style="list-style-type: none"><li>• Undergraduate TA for Engineering Physics (Electricity and Magnetism)</li></ul>	
Coding Knowledge – Fortran, C++, Python (Scipy, Pyvista), MATLAB	
<ul style="list-style-type: none"><li>• Computational Fluid Dynamics/ Finite Elements/Numerical Analysis</li><li>• Geometric modeling and surface reconstruction</li></ul>	

## **ACADEMIC ORGANIZATIONS/ AWARDS**

Nancy Francis and William Arnold McMinn Presidential Scholarship	Fall 2021 - Spring 2022
<ul style="list-style-type: none"><li>• 3.5 k College of Natural Sciences departmental scholarship</li></ul>	
NSF Research Training Grant	Fall 2020 - Spring 2021
<ul style="list-style-type: none"><li>• 1k research fellowship awarded through PDE's RTG</li></ul>	
UT Dean's Scholars Honors Program	Spring 2019 - Fall 2022

## **PUBLICATIONS:**

- [1] Avery, M., Dedina, C., Smith, A., Scheel, A. (2021). Instability in large bounded domains—branched versus unbranched resonances. *Nonlinearity*, 34(11), 7916–7937. <https://doi.org/10.1088/1361-6544/ac2a15>
- [2] Patil, A., Duarte, A., Smith, A., Tanaka, T., & Bisetti, F. (2022). Chance-Constrained Stochastic Optimal Control via Path Integral and Finite Difference Methods. *arXiv*. <https://doi.org/10.48550/arXiv.2205.00628>