

## Aislinn E. Smith

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### EDUCATION

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

Overall GPA: 3.87/4.00

Bachelor's – Mathematics (Honors Track)

Certificate Program - Scientific Computation and Data Science

Master's (MA) - Mathematics (Current Degree Program)

### RESEARCH/ PROJECTS

**Mathematics MA Thesis:** “*The Nielsen-Realization Problem in Dimensions 3.5*” *Fall 2025*

**Max Planck Institute for Math in the Natural Sciences - Guest Researcher** *June 2023 - July 2024*

- Led 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.
- Attended summer lecture series on ergodic theory and character varieties/geometry seminar

**Mathematics BSc Thesis:** “*Minimal surfaces in hyperbolic manifolds and link complements*” *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 Karen Uhlenbeck and William Thurston on closed geodesics within hyperbolic 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 and PDEs 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.

## ACADEMIC AWARDS

|   |                                |
|---|--------------------------------|
| <b>2023 NSF Graduate Fellowship – Topology</b>                          | <i>Fall 2023 - Spring 2028</i> |
| <b>UT Austin Dean’s Strategic Fellowship</b>                            | <i>Fall 2023 - Spring 2028</i> |
| <b>Nancy Francis and William Arnold McMinn Presidential Scholarship</b> | <i>Fall 2021 - Spring 2022</i> |
| <b>NSF Undergraduate Research Training Grant</b>                        | <i>Fall 2020 - Spring 2021</i> |

## TALKS/CONFERENCES

|   |                    |
|---|--------------------|
| <b>Combinatorial and gauge theoretical methods in low dim-topology - CRM De Giorgi</b>  | <i>Summer 2024</i> |
| <b>Homology Growth in Topology and Group Theory - MPIM Bonn</b>   | <i>Summer 2024</i> |
| <b>CIRM Research School - Renormalization and Visualization for Packing, Billiards, and Surfaces</b>  | <i>Summer 2023</i> |
| <ul style="list-style-type: none"><li>• Research school participant</li></ul>   |                    |
| <b>Joint Mathematics Meeting (JMM)</b>  | <i>Winter 2023</i> |
| <ul style="list-style-type: none"><li>• Presentation: <i>Low dimensional topology and combinatorial hyperbolic geometry</i></li><li>• Presented on Yale REU research @ Pi Mu Epsilon undergraduate research forum</li></ul>   |                    |
| <b>The Young Mathematicians Conference @ Ohio State University</b>  | <i>Summer 2022</i> |
| <ul style="list-style-type: none"><li>• Presentation: <i>Finding the Minimal Splitting Surface of the Ideal Regular Octahedron in the Poincare Ball</i></li></ul>   |                    |
| <b>GROW (Graduate Research Opportunities for Women) @ Duke University</b>   | <i>Fall 2022</i>   |
| <b>Texas Undergraduate Mathematicians Conference</b>  | <i>Fall 2022</i>   |
| <ul style="list-style-type: none"><li>• Presented on Yale REU research and hyperbolic geometry for early undergraduates, and spoke on panel on undergraduate research opportunities</li><li>• Presentation: <i>Finding the Minimal Splitting Surface of the Ideal Regular Octahedron in the Poincare Ball</i></li></ul> |                    |
| <b>UT Math Directed Reading Project Presentation</b>  | <i>Spring 2021</i> |
| <ul style="list-style-type: none"><li>• Presented on the computation of homology groups of piecewise linear manifolds</li></ul>   |                    |
| <b>UT Austin College of Natural Sciences Research Forum</b>   | <i>Spring 2021</i> |
| <ul style="list-style-type: none"><li>• Poster presentation on work/reading done on the Fractional Laplacian during year-long fellowship with the UT Analysis and PDEs RTG</li></ul>  |                    |

## TEACHING/ WORK EXPERIENCE/SKILLS

|   |                                    |
|---|------------------------------------|
| <b>Graduate Teaching Assistant - UT Austin Department of Mathematics</b>        | <i>Spring 2023</i>                 |
| <b>College Math and Physics tutor - UT Austin Sanger Learning Center –</b>      | <i>Summer 2019 – Fall 2021</i>     |
| <b>Math and Physics Instructor/Tutor - The Liberal Arts and Science Academy</b> | <i>Fall 2020 – Spring 2021</i>     |
| <b>Undergraduate Learning Assistant - UT Austin Department of Physics</b>       | <i>Fall 2020 &amp; Winter 2021</i> |
| Coding Experience – Fortran, C++, Python (Scipy, Numpy), MATLAB, Magma          |                                    |

## 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>