

# Sabrina Hetzel

[shetzel@smu.edu](mailto:shetzel@smu.edu) | (254) 760-2768

---

## **EDUCATION**

**Pursuing PhD in Applied and Computational Mathematics**, Anticipated May 2024  
Southern Methodist University, Dallas, TX

**Master of Science in Applied and Computational Mathematics**, May 2021  
Southern Methodist University, Dallas, TX

**Bachelor of Science in Mathematics**, May 2019  
Tarleton State University, Stephenville, TX

**Bachelor of Science in Economics**, May 2019  
Tarleton State University, Stephenville, TX

## **PROGRAMMING EXPERIENCE**

- MATLAB, Python, Mathematica, R, C

## **WORK EXPERIENCE**

**Lecturer**, Southern Methodist University, Dallas, TX, January 2023 – May 2023

- Provide educational instruction to undergraduate students taking the class Calculus 1
- Develop material to assist students in learning such as homework, labs, and exams
- Give feedback on assignments and assist outside of class to further aid in students' understanding

**Research Training Group (RTG) Fellow**, Southern Methodist University, Dallas, TX, August 2020 – August 2023

- Maintain good progress in academic studies and in conducting research towards the dissertation
- Collaborate with peers to discuss alike interests pertaining to ongoing research
- Mentor undergraduate students through the summer research experience for undergraduate (REU) programs

**Graduate Teaching Assistant**, Southern Methodist University, Dallas, TX, August 2019 – May 2020

- Assist students in their understanding of mathematical concepts by explaining theoretical ideas behind the concepts and then applying them to problems related to business and economics
- Monitored assessments for students taking Business Calculus
- Responsible for grading quizzes and managing quiz grades online via Canvas

**Math Tutor and Grader**, Tarleton State University, Stephenville, TX, September 2016 – May 2019

- Tutor students weekly in mathematical concepts which include Plane Trigonometry, Pre-Calculus, Business Calculus, Calculus 1, 2, and 3, and Statistics

- Provide guidance with instructional material to aid students in their studies and provide a better foundation for note taking and learning
- Accountable for grading homework in a range of classes including Calculus and Applied Matrix Algebra

**Private Math Tutor**, November 2016 – May 2019

- Tutor homeschool students by working through math curriculum provided by Math-U-See
- Test student's knowledge with weekly tests over past material
- Teach students new concepts to be able to work through exercises and apply to real world scenarios

**RESEARCH EXPERIENCE**

**Mathematical Modeling in Nonlinear Optics**, Southern Methodist University, Dallas, TX,  
August 2021 – Present

- Conduct mathematical analysis to study the effects of higher order dispersion on localized states in the Lugiato-Lefever equation
- Perform numerical simulations of quartic dispersion engineered solitons in novel laser designs
- Collaborate with experimentalists to test and verify our mathematical analysis and numerical simulations

**Selected to attend Siegman International School on Lasers**, University of Warsaw, Chęciny, Poland, June 2022 – July 2022

- Attended a week-long program to learn in-depth about lasers and their applications from internationally recognized academic and industry leaders in the field
- Gained valuable experience in collaborating with colleagues from around the world

**Invited to collaborate at Ultrafast Laser Technique laboratory of the Institute of Physical Chemistry PAS**, Warsaw, Poland, June 2022

- Improved my research skills through hands-on training in an experimental lab setting
- Assisted in scientific discussions on topics related to laser dynamics

**Epidemiology Modeling**, Southern Methodist University, Dallas, TX, August 2020 – May 2021

- Developed and examined an age-based COVID-19 model to see how the death rates for the elderly are disproportionately affected
- Modeled and explored the viral spread of COVID-19 in a university setting
- Analyzed three policies and their effects on the infected population: (i) initial mass testing of the student body at the start of the semester, (ii) continual testing of the student body throughout the semester, and (iii) movement of infected individuals across campus.

**AIM Summer School on Dynamics and data in the COVID-19 pandemic**, American Institute of Mathematics, Virtual, June 2020 – July 2020

- Learned the mathematical epidemiology underlying the models used in studying COVID-19
- Used data and models together to consider how different strategies have impacted the disease's progression and what this means for future planning and decision making

- Created a mathematical framework to locate where to place pop-up testing sites to ensure they serve the maximum number of infected people

**Neuroscience Research**, Southern Methodist University, Dallas, TX, January 2020 – May 2020

- Replicated findings from a paper to understand integrate and fire models and spike-timing dependent synaptic plasticity (STDP)
- Created a one-dimensional simulation of the firing of place cells as an animal moves along a track
- Explored the effects of theta phase precession/procession on STDP

**Undergraduate Research Assistantship**, Tarleton State University, Stephenville, TX, August 2018 – May 2019

- Implemented formulas for the continuous random walk case and apply to a behavioral standpoint
- Create mathematical models based on a binary numerical decision task
- Apply these models to related areas in the behavioral sciences to predict how people make decisions regarding numbers for a binary task

**Study Abroad Research**, Tarleton State University, Stephenville, TX, May 2018 – October 2018

- Encryption during World War II – Recreated the Enigma machine the Germans used to send messages during the war using Python and modern computers
- Mathematical educational learning board game – Created a board game that walks through each year of the war and developed math and science-based problems centered on battles from each year

**First Year Research Experience Intern**, Tarleton State University, Stephenville, TX, May 2017 – August 2017

- Computed formulas for marginal choice probabilities and distributions of decision times for discrete random walks using elementary matrix algebra and complex variables
- Created a mathematical model for decision times that can be applied to two-choice decision tasks
- Designed and applied programs, using Python, to implement the model with a basic number comparison experiment

**CONFERENCES PRESENTED**

**Annual SIAM Meeting Texas-Louisiana Section** – 2020, 2022

**Trends in Soliton Dynamics and Singularity Formation for Nonlinear Dispersive PDEs Workshop** – 2022

**Siegman International School on Lasers** - 2022

**Southern Methodist University Research Day** – 2022, 2023

**DFW Virtual Poster Competition in Mathematics** – 2021

**NSF Student Conference on COVID-19 Modeling** – 2021

**Texas Undergraduate Mathematics Conference (TUMC)** – 2017, 2018

**Texas/Oklahoma Regional Undergraduate Symposium** – 2018, 2019

**Mathematical Association of America Annual Meeting Texas Section** – 2018, 2019

**Tarleton State University Student Research Symposium** – 2018

## **ACTIVITIES AND HONORS**

**First place in graduate poster session**, SMU Research Symposium, March 2022

**Member of Graduate Student Seminar**, SMU Math Graduate Student club, August 2019 – Present

**Member of Alpha Chi**, National Honor Society, Spring 2018 - Present

**First place in graduate poster presentation**, Tarleton Student Research Symposium, Fall 2018

**Member of Delta Mu Delta**, Business Honor Society, Summer 2018 – May 2019

**Member of National Society of Collegiate Scholars**, National Honor Society, August 2017 – May 2019

**Member of Math Club**, Tarleton State University, August 2017 – May 2019

**Member of Computer Science Club**, Tarleton State University, August 2017 – May 2018

**Dean's List**, Tarleton State University, August 2016 – May 2019

## **FUNDING**

**Haberman Dissertation Fellowship**, Department of Mathematics at Southern Methodist University, August 2023 – May 2024

- Provides support to Ph.D. mathematics students in the final year of their dissertation

**Dean's Dissertation Fellowship**, Moody School of Graduate and Advanced Studies at Southern Methodist University, August 2023 – May 2024

- Provides support to Ph.D. students in the dissertation-writing phase of their degrees

**Research Training Group (RTG) fellow**, National Science Foundation, August 2020 – August 2023

- RTG: Modeling and Computations for Complex Systems at Southern Methodist University

## **PUBLICATIONS**

Sabrina Hetzel, Ross Parker, Alejandro Aceves, "Interaction and generation of soliton-like pulses under the presence of quartic dispersion", (In progress)

P. Parra-Rivas et al., "Bright and Dark Solitons in Pure Quartic Kerr Resonators," 2023 Conference on Lasers and Electro-Optics Europe & European Quantum Electronics Conference (CLEO/Europe-EQEC), Munich, Germany, 2023, pp. 1-1, doi: 10.1109/CLEO/Europe-EQEC57999.2023.10231524.

Pedro Parra-Rivas, Sabrina Hetzel, Yaroslav V. Kartashov, Pedro Fernández de Córdoba, J. Alberto Conejero, Alejandro Aceves, and Carles Milián, "Quartic Kerr cavity combs: bright and dark solitons," Opt. Lett. 47, 2438-2441 (2022)