

Last updated: September 13, 2026

CONTACT INFORMATION	Email: jsung1@arizona.edu LinkedIn: linkedin.com/in/ejsung/ Citizenship: USA	Website: https://ejsung.github.io/ Location: Tucson, AZ
EDUCATION	University of Arizona, Tucson, AZ Doctor of Philosophy, Applied Mathematics Advisor: Dr. Charles A. Stafford Tulane University, New Orleans, LA Master of Science, Applied Mathematics Master's Thesis: <i>Mathematics and Applications of Feynman Diagrams</i> Advisor: Dr. Victor H. Moll Tulane University, New Orleans, LA Bachelor of Science, Mathematics Minor: Geology	Expected May 2028 May 2021 May 2020
PUBLICATIONS	[1] E. J. Sung , A. G. Campos, H. Abele, and D. I. Bondar, “Decoherence-free entropic gravity for a Dirac fermion”, <i>Physical Review D</i> 108 , 104036 (2023).	
UNDER REVIEW	[1] E. J. Sung and C. A. Stafford, <i>Decoherence and the Reemergence of Coherence From a Superconducting “Horizon”</i> , Mar. 2026, arXiv:2603.16765 [quant-ph] . [2] E. J. Sung , B. Koch, T. Jenke, H. Abele, and D. I. Bondar, <i>Generalized Boundary Conditions for the qBounce Experiment</i> , Oct. 2025, arXiv:2510.15341 [quant-ph] .	
PRESENTATIONS	[1] C. A. Stafford and E. J. Sung , “Decoherence from a superconducting “horizon””, in APS Meetings Archive , APS Global Physics Summit 2026, Abstract W32.00011 (American Physical Society, Mar. 2026). [2] J. Sung , B. Crooke, D. Carstens, C. Woock, R. Amer, and A. Kolker, “Sentinel-1A InSAR Time Series Analysis for Monitoring of Surface Subsidence in Coastal Louisiana”, in AGU Fall Meeting Abstracts, Vol. 2018 (Dec. 2018), G21C–0571.	
CONFERENCES AND WORKSHOPS	2026 MSTIC Summer Symposium Sandia National Laboratories, Albuquerque, NM - Quantum Thermodynamics & Decoherence (QTD) Symposium 2026 (Poster) University of Rochester, Rochester, NY - American Physical Society Global Physics Summit 2026 (Talk) Denver, CO - Math for All in New Orleans Tulane University, New Orleans, LA - Clifford Lectures Tulane University, New Orleans, LA - American Geophysical Union (Poster) Washington, DC	Aug 2026 Jun 2026 Mar 2026 Mar 2020 Oct 2019 Dec 2018
AWARDS AND HONORS	- Best Graduate Summer Student Presentation, Sandia National Laboratories - QTD Symposium Entropy Whisperer Poster Award (100 USD) - QTD Symposium Travel Award (1000 USD) Herbert E. Carter Travel Award (600 USD), Graduate College UArizona - Sigma Xi, The Scientific Research Honor Society, Full Member - University of Arizona Graduate College Fellowship	Aug 2026 Jun 2026 Jun 2026 Jan 2026 Dec 2025–Present Aug 2023
RESEARCH EXPERIENCE	Sandia National Laboratories, Albuquerque, NM <i>Year-Round Graduate Intern</i> <i>R&D Graduate Summer Intern</i> University of Arizona, Department of Physics, Tucson, AZ <i>Graduate Research Assistant</i> Developing a superconducting analog of black hole physics using non-equilibrium Green's functions (NEGFs) with Prof. Charles A. Stafford	August 2026–Present May 2026–August 2026 Dec 2024–Present

- Calculating NEGF transmission spectra for superconductor–normal devices (Landauer–Büttiker conductance) via simulations on Python and developing dephasing–probe extensions to estimate electronic phase-coherence time
- Implementing grid search algorithms on UA’s high-performance computing cluster to optimize superconducting parameters to increase transmission and phase coherence time
- Discovered solid-state analog of horizon-induced decoherence and novel reemergence of coherence
- [First-author paper](#) preprint submitted

University of Arizona, Department of Mathematics, Tucson, AZ

Graduate Research Assistant

May 2024–May 2025

- Implemented reinforcement learning algorithms using PyTorch to design optimal control strategies for particle accelerators under Prof. [Michael Chertkov](#)
- Developed a differentiable neural ODE surrogate of the accelerator beamline using training data generated with LANL’s HPSim, enabling rapid emulator-based testing of control ideas
- Designed and optimized particle accelerator simulations on UA’s high-performance computing cluster using CUDA for efficient parallel computations

Independent Studies Researcher

Sep 2023–Dec 2024

- Investigated quantum trajectories and decoherence of Schrödinger cat states under Prof. Janek Wehr
- Designed quantum Monte Carlo simulations of Schrödinger cat states in optical cavities using QuTiP on Python (see [GitHub repo](#))
- Worked on formulating Weierstrass-Enneper representations of the Dirac equation with Prof. Patrick Shipman, discovered a general symmetry theorem

Army Educational Outreach Program Undergraduate Internship, Tulane University, Department of Physics, New Orleans, LA

Research Intern

May 2023–Aug 2023

- Collaborated with Prof. [Denys I. Bondar](#) and the Institut Laue-Langevin to investigate standard gravity discrepancies of free-falling neutrons observed in the 2023 qBounce experiment
- Discovered, via open quantum systems simulations using QuTiP on Python and Mathematica, that the experimental boundary conditions were responsible for the discrepancy
- [First-author paper](#) preprint submitted

Tulane University, Department of Physics, New Orleans, LA

Research Assistant

May 2021–Aug 2023

- Conducted research with Prof. [Denys I. Bondar](#) on entropic gravitational effects on Dirac fermions in an open quantum systems framework
- Formulated a Lindblad master equation for free-falling Dirac fermions, demonstrating coherence under strong gravitational coupling and aligning with experimental results
- Discovered a novel zitterbewegung gravitational effect via open quantum systems simulations using Python and Mathematica; published findings in [first-author paper](#) in Physical Review D

Tulane University, Department of Mathematics, New Orleans, LA

Master’s Research

Aug 2020–May 2021

- Conducted master’s thesis research, under Prof. [Victor H. Moll](#), on the Feynman diagrams and quantum field theory (QFT) along with their applications
- Developed proficiency in the application of QFT, scattering theory, electrodynamics, and Lie theory
- Successfully defended thesis to thesis committee and submitted written [master’s thesis](#) to Tulane University Thesis & Dissertations Archive

Tulane University, Department of Physics, New Orleans, LA

Research Assistant

May 2020–Aug 2020

- Investigated the accuracy and applications of the Equations of Motion (EOM) method under Prof. [George Rosensteel](#)

- Designed and implemented EOM method using Python to the Morse potential, calculating excitation energies in higher dimensions with high precision
- Gained proficiency in Python and computational physics

Tulane University, Department of Mathematics, New Orleans, LA

Senior Seminar Research

Aug 2019–May 2020

- Conducted year-long research under Prof. [Lisa J. Fauci](#) investigating the collective phase of *Bacillus subtilis* bacteria in viscous flows
- Implemented regularization algorithms on Python and MATLAB to compute forces and velocities of bacterial motion to determine the origin of collective phase
- Completed an expository paper, *Mathematical Fluid Dynamics of Microorganisms*, and gave a presentation of results to Senior Seminar class

Tulane University, Department of Earth & Environmental Sciences, New Orleans, LA

Research Assistant

Jun 2018–Dec 2018

- Investigated land subsidence in Golden Meadows, Coastal Louisiana, under Prof. [Reda Amer](#)
- Collected and analyzed over 100 Real-Time Kinematic GPS elevation points and Sentinel-1A satellite InSAR remote sensing data
- Implemented interpolation and image classification algorithms on ArcGIS and ENVI, discovering a 2.91% land reduction (90 km²) from 1985–2017 at 0.2–1.64 cm/year
- Presented findings as a first-author poster at the Fall 2018 American Geophysical Union in Washington D.C.

PROJECTS

Predicting Grant Success: A Multimethod Approach Using TDA, NLP, and Bibliometric Analysis

[Paper](#), [GitHub Repo](#)

Oct 2024–Dec 2024

- Developed and implemented machine learning models (Logistic Regression, Random Forest, and Gradient Boosting) using R and Python's scikit-learn to predict Department of Defense grant approval rates based on bibliometric data
- Enhanced prediction accuracy by fine-tuning hyperparameters for Random Forest and Gradient Boosting models, achieving a Test AUC-ROC of 0.743 and improving overall classification accuracy to 71.3%
- Analyzed feature importance and identified i10-index and total citations as the most influential predictors, providing actionable insights into grant success factors for academic researchers

Numerical Solutions to Reaction Diffusion Equations

[Paper](#)

Oct 2020–Dec 2020

- Investigated long-time dynamics and pattern formation in 1D/2D reaction–diffusion PDEs under varied boundary conditions
- Built MATLAB finite-difference solvers using Crank–Nicolson (diffusion), ADI (2D), and explicit multistep updates for nonlinear reaction terms
- Implemented Dirichlet, Neumann (ghost-node), and periodic BCs with efficient tridiagonal/LU linear solves to ensure stable, scalable time-stepping
- Reproduced Gray–Scott two-species pattern regimes; generated heatmaps/cross-sections and documented parameter sensitivity and emergent structures in a formal report

TEACHING

University of Arizona, Department of Mathematics, Tucson, AZ

Graduate Teaching Assistant

Aug 2023–Present

- Solo instructor for Math 112 College Algebra
- Graduate teaching assistant for Math 186J College Algebra Supplemental Instruction Seminar, Math 196V Vector Calculus Supplemental Instruction Seminar, and Math 468 Applied Stochastic Processes
- Hosted weekly office hours, graded homework assignments, and proctored exams

Walter L. Cohen High School, New Orleans, LA

Tutor

Aug 2016–Dec 2016

- Taught math, general sciences, English, and history at Walter L. Cohen High School

- Collaborated with other teachers in designing and implementing new teaching methods and problem sets

LEADERSHIP AND OUTREACH	Tulane University Earth Science Club, New Orleans, LA <i>President</i>	May 2018–Dec 2018
	• Established and led a student earth science club, growing membership to 40 students • Secured up to \$1000 in funding through successful grant proposals to the undergraduate student government for supporting club activities • Organized and coordinated events, including hiking trips, camping excursions, and networking workshops	
SKILLS	Programming/Software: Python (pandas, NumPy, SciPy, SymPy, Scikit-learn, TensorFlow, PyTorch, QuTiP), Julia, R, Mathematica, CUDA, MATLAB, C++, SQL, HTML, CSS, JavaScript, Git, Microsoft Office, ArcGIS, ENVI, Jupyter, LaTeX Languages: Korean (Elementary), Spanish (Elementary)	
PROFESSIONAL SOCIETIES	American Physical Society (APS) Society for Industrial and Applied Mathematics (SIAM) American Mathematical Society (AMS)	Aug 2024–Present Jan 2022–Present Jan 2024–Present