Jackson C. Turner

Applied Math PhD | Columbia 2026

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Education

Columbia University — New York, NY
Ph.D., Applied Mathematics — 3.97 GPA — Sep 2021 – May 2026
M.S., Applied Mathematics — 3.89 GPA — Feb 2023

University of Utah — Salt Lake City, UT
Honors B.S., Applied Mathematics & Physics — 3.95 GPA — May 2021

Experience

Columbia University, APAM Department — New York, NY
Graduate Research Assistant — May 2022 – Present

- Connected quantum scattering theory to nonlinear bifurcation theory, establishing how resonances in linear wave operators generate nonlinear bound states; paper under review at *Nonlinearity*
- Developed perturbative orbital stability criteria for Hamiltonian systems; manuscript in preparation
- Built numerical solvers for scattering, bifurcation, and dynamical systems problems with $< 10^{-8}$ tolerances
- Invited talk, Simons Collaboration on Extreme Wave Phenomena; Best Poster, Joint Alabama–Florida Conference (2025)

Zap Energy, Theory & Modeling Division — Everett, WA
Research Intern — Jun – Aug 2025

- Achieved 720× speedup (4 hours → 20 seconds) building eigenvalue solver in Julia for MHD linear stability analysis; used predictor-corrector continuation with arclength parameterization to track embedded eigenvalues through bifurcations
- Performed spectral analysis of axisymmetric ideal MHD equilibria; studied onset of Kelvin–Helmholtz and shear-driven Mack-mode instabilities via bifurcation theory and complex analysis
- Identified novel plasma instability mechanism in sheared-flow Z-pinch configurations; manuscript in preparation

"The project not only met our expectations but exceeded them... Your research will continue to be developed and serve as a useful tool going forward. I plan to stay engaged, which speaks to the solid foundation you've established." — Uri Shumlak, Chief Scientist & Co-Founder, Zap Energy

University of Utah, Department of Mathematics — Salt Lake City, UT
Undergraduate Research Assistant — Sep 2019 – May 2021

- Solved 12-d eigenvalue optimization with Gurobi; derived and verified stationarity conditions (*SIAM J. Appl. Alg. Geom.*)
- Implemented PDE eigensolvers for Laplace-Beltrami operator on manifolds; proved spectral convergence

Volunteer Program Leader — Hong Kong
Full-time Service — 2015 – 2017

- Led teams of 10–20 volunteers across multiple districts; managed goal-setting and performance reviews
- Trained new volunteers on communication and cultural adaptation; fluent in Cantonese

Technical Skills

Plasma & Stability MHD linear stability analysis, spectral analysis of shear flows, Kelvin–Helmholtz and Mack-mode instability characterization, equilibrium modeling, Hamiltonian stability theory

Solvers & Algorithms Eigenvalue solvers, parameter continuation and bifurcation tracing (AUTO, BifurcationKit.jl), optimization methods, spectral methods, ML algorithms

Programming Julia, Python (NumPy, SciPy), MATLAB; familiar with Fortran, PyTorch, JAX

Mathematics Spectral theory, scattering theory, bifurcation theory, perturbation methods, variational calculus, constrained optimization, complex analysis, Hamiltonian mechanics

Publications

Turner, J. C. & D. Crews. "Linear Stability Analysis of Ideal MHD in Cylindrical Shear Flows." In preparation.

Turner, J. C. & M. I. Weinstein. "Resonance-induced nonlinear bound states." Under review, *Nonlinearity*; arXiv.

Kao, C.-Y., B. Osting & J. C. Turner. "Flat Tori with Large Laplacian Eigenvalues." *SIAM J. Appl. Alg. Geom.* (2023).

Turner, J. C., E. Cherkaev & D. Wang. "Expansion Method for Laplace-Beltrami Eigenfunctions." arXiv.