

Joshua Southerland

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Current position

Fourth Year Graduate Student, University of Washington, Seattle

Research Interests

My research interests center around translation surfaces and homogeneous dynamics, where I am beginning to investigate questions motivated by quantum mechanics. Luc Hillairet and others have explored defining a Laplacian for translation surfaces. I hope to understand this construction and look for ways to further the connection between the quantum realm (eigenfunctions of the Laplacian) and the classical mechanics realm (geodesics). I am currently learning about one particular instances of this quantum-classical correspondence on hyperbolic surfaces where Anke Pohl, Don Zagier and others have established a connection between eigenfunctions of the hyperbolic laplacian and geodesics on the surfaces. I also have an interest in representation theory, especially how it relates to the spectral properties of the Laplacian on the upper-half plane.

Education

2022	PhD in Mathematics, University of Washington (expected)
2019	MSc in Mathematics, University of Washington
2009	BSc in Mechanical Engineering, Minor in Music, Columbia University

Work Experience

2009-2016	Senior Mechanical Engineer, BuroHappold Consulting Engineers, New York
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Master's Thesis

2019	Southerland, Josh (2019), "The Laplacian: An Exploration and Historical Survey Tailored for Translation Surfaces"
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Talks

GRADUATE DYNAMICS SEMINAR, UNIVERSITY OF WASHINGTON

October 2019	<i>An Analytic Approach to Real Hodge Theory</i>
January 2019	<i>Complex Exponentials, Eigenfunctions, Algebra Homomorphisms and Invariant Subspaces of L^2G</i>
January 2019	<i>Fourier Analysis on R^n and the n-Torus</i>
October 2018	<i>Lie Algebras and Representation Theory: Engel's Theorem</i>
April 2018	<i>The Laplacian on a Graph</i>
January 2017	<i>Continued Fractions</i>

Teaching

Fall 2019	Pre-Doctoral Instructor, Linear Algebra
Summer 2019	Pre-Doctoral Instructor, Linear Algebra
Spring 2019	Pre-Doctoral Instructor, Multivariable Calculus
Winter 2019	Pre-Doctoral Instructor, Multivariable Calculus
Fall 2018	Teaching Assistant, Topology
Summer 2018	Pre-Doctoral Instructor, Multivariable Calculus
Spring 2018	Teaching Assistant, Precalculus
Winter 2018	Teaching Assistant, Introductory Multivariable
Fall 2017	Teaching Assistant, Differential Calculus
Summer 2017	Teaching Assistant, Introductory Real Analysis
Spring 2017	Teaching Assistant, Introductory Multivariable
Winter 2017	Teaching Assistant, Differential Calculus
Fall 2016	Teaching Assistant, Integral Calculus

Professional Activities

2019 - 2020	Co-Director, Washington Directed Reading Program, sites.uw.edu/wdrp
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Graduate Coursework

Real Analysis, Complex Analysis, Algebra, Topological Manifolds, Smooth Manifolds, Differential Topology, Riemannian Geometry, Complex Manifolds, Ergodic Theory (Reading Course), Lie Algebras and Representation Theory (Reading Course), Laplacian on a Riemannian Manifold (Reading Course), Fuchsian Groups (Reading Course)

References

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Last updated: October 15, 2019