ABRAHAM RABINOWITZ, PHD

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EDUCATION

Mathematics Ph.D., Northwestern University 06/2022
Thesis: Scaling Asymptotics of Szego Kernels and Concentration of Husimi Distributions on Grauert Tubes
Advised by Steven M. Zelditch (Slides about my research for a general audience Talk Here)
B.S. Applied Mathematics & Statistics, Mathematics, Stony Brook University 05/2016

SKILLS

Languages+	Python, SQL/MySQL, Git, Unix/Bash, Apache Spark, AWS, Databricks, C++(Beginner)
Libraries	NumPy, Pandas, PyTorch, Sklearn, Matplotlib, Seaborn, Bs4, PySpark, Qiskit, PyTest
Mathematics	Partial Differential Equations, Differential Geometry, Fourier Analysis, Probability, Optimization, Variational Calculus
Mathematical Physics	Quantum Mechanics, Classical Mechanics, Relativity, Geometric Heat Flows
Machine Learning	Regression & Classification (Linear, Logistic, Random Forests, GBM), Clustering (K-Means, GMM), Neural Networks (CNN, LSTM, GAN, Transformers), Dimensionality Reduction (PCA, UMAP, t-SNE)
Data Science	Data Cleaning & Preprocessing, Data Visualization, Feature Engineering, Hypothesis Testing

RESEARCH AND TEACHING EXPERIENCE

Mathematics Department, Northwestern University

- Graduate Researcher 09/2016-06/2022
  - Led a research program developing a theory of phase space quantum mechanics on manifolds. Obtained sharp bounds on the asymptotic growth of phase space distributions of quantum states of the free Schrodinger equation on curved spaces.
  - Published research in peer reviewed journals and presented results to both technical and non-technical audiences. Attended interdisciplinary conferences.
  - Conducted self-initiated research and maintained a routine of continuous learning in order to keep pace with the technical literature in a rapidly evolving field.
- Teaching Assistant 09/2017-12/2021
  - Assisted instruction of 10 math courses including linear algebra, multivariate calculus, Fourier Series, combinatorics, and optimization.
  - Designed coursework, delivered lectures, and directly mentored students coming from diverse backgrounds including mathematics, computer science, social sciences, and natural sciences.
  - Ranked in the **top 20%** of all graduate TAs according to average student feedback scores from 2017-2021

Mathematics Department, University of California Berkeley

- Undergraduate Researcher 06/2015-08/2015
  - Presented an expository report on the application of a geometric heat flow to proving the isoperimetric inequality and tennis ball theorem.

Applied Mathematics and Computer Science Department, Stony Brook University

- Teaching Assistant 09/2014-12/2014
  - Facilitated weekly discussions for an upper division course in computational geometry. Taught concepts such as triangulation and convex hull algorithms, Voronoi diagrams, Delaunay triangulations, and point-line duality.

PUBLICATIONS

- Chang, R., **Rabinowitz, A.**, 2022. *Szego Kernel asymptotics and concentration of Husimi Distributions of eigenfunctions* (Arxiv preprint submitted to Communications in Analysis and Geometry)
- Chang, R., **Rabinowitz, A.**, 2022. *Scaling asymptotics for Szego Kernels on Grauert Tubes.* (Published in *The Journal of Geometric Analysis*)

WORKSHOPS AND INDEPENDENT PROJECTS

Cellular Attention Network Implementation (Tutorial Available Here)

- Implemented a topological deep learning research paper as an open source contribution to the topomodelX library intended for use by interdisciplinary researchers in machine learning and neuroscience to perform data analysis on cellular complexes.
- Provided unit tests, documentation and a Jupyter Notebook demonstrating the layer on the SHREC16 dataset in collaboration with package maintainers on github.

Erdos Institute - Explainable Housing Price Predictions (Report Available Here) 09/2022-12/2022

- Studied essential data visualization, data scraping, and statistical modeling techniques involved in tackling data analysis problems.
- Presented exploratory data analysis, data visualizations, and modeling techniques to provide accurate and explainable housing price predictions.

Stanford CS231N Deep Learning Course Solutions (Solutions Available Here)

- Provided NumPy and Pytorch implementations of deep learning architectures, such as CNN, RNN and GAN in a repository for homework solutions to Stanford's course in Deep Learning for Computer Vision.

IBM Quantum Challenge - Spring 2022 (Certificate Available Here)

- Solved a collection of exercises intended to get participants familiar with the Qiskit quantum computation framework for the simulation of many-body and fermionic systems.

LEADERSHIP & AWARDS

Mathematics Department, Northwestern University

- Organized a seminar on complex analytic techniques in microlocal analysis.
- Awarded *NSF RTG Fellowship* in Geometric Analysis

Stony Brook University

- Kugh Sah Memorial Award for Outstanding Performance in Mathematics
- Chairman's Award for Oustanding Performance in Computer Science
- First place Team at 2014 Garden State Undergraduate Mathematics Competition
- Awarded 4-year full tuition Presidential Scholarship

Stuyvesant High School

- USA Physics Olympiad National Semifinalist
- American Invitational Mathematics Exam Qualifier