Summary

Research Interests

Harmonic Analysis, Geometric Measure Theory, Additive Combinatorics

Contact Information

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Github Profile: jdjake

Stack Overflow: jacob-denson

Website: https://jdjake.github.io/

Languages

English, Elementary German, Very Rusty Elementary Chinese

Python, Perl, C++, C, C#, Matlab, HTML, Javascript, Latex

(This resume is proof!)

Education

2017-Present

Master's in Mathematics, University of British Columbia.

2013-2017

Bachelors in Computing Science, University of Alberta.

I am an Honours student at the University of British Columbia, applying my strong and diverse foundation in mathematical knowledge to do research in the harmonic analysis research group, studying continuous variants of discrete configuration avoidance problems emerging from additive combinatorics. My previous work in theoretical computing science has given me a strong knowledge of the algorithmic viewpoint of problems, which gives me a fresh perspective on classical ideas in the field. I am currently working on the problem of finding high dimensional fractals avoiding patterns.

Talks[1]

2018CMS WINTER MEETING & MAAM 2018 — CMS & University of Virginia

Fractals Avoiding Fractal Sets

A twenty minute talk discussing my solution to a research problem constructing fractal sets of high Hausdorff dimension avoiding patterns. I emphasized the idea behind the switch from a continuous problem to a discrete analogue argument, as well as discussing the strategy of the hypergraph avoidance method at the single scale.

2018DIFFERENTIAL TOPOLOGY CLASS — University of British Columbia

Hodge Theory: Harmonic Analysis in Topology

An hour talk discussing how the eigenfunctions of the Laplacian on a Riemannian manifold reflect the topology of the underlying manifold. I introduced the inner product of differential forms, the Hodge star, and the Laplace-Beltrami operator, and how these eigenfunctions can be used to give almost trivial proofs of major results about De Rham cohomology.

2018MODULAR FORMS CLASS — University of British Columbia

Theta Functions

An hour long talk discussing how the theory of theta functions fits in with the general theory of modular forms once we introduce half weight forms and a modular symmetry with respect to a Dirichlet character. Using this theory, we prove Fermat's theorem on the sums of two squares, and Jacobi's theorem on the sums of four squares.

2018TOPICS IN HARMONIC ANALYSIS CLASS — University of British Columbia

Radon Transform and Exceptional Projections

An hour talk connecting the Marstrand projection problem in geometric measure theory to harmonic analysis using the Radon transform. Bounding variants of the Radon transform gives results about the dimension of the set of projections where Marstrand's theorem fails. Based on Daniel M. Oberlin's paper "Restricted Radon Transforms and Projections of Planar Sets".

[1] Notes for my talks can be found on my website: https://jdjake.github.io/