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## Kyle Hambrook

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### EDUCATION

- Ph.D. Mathematics, University of British Columbia (2015)  
Thesis: Restriction Theorems and Salem Sets. Supervisor: Izabella Łaba
- M.Sc. Mathematics, University of British Columbia (2011)  
Thesis: Implementation of a Thue-Mahler Equation Solver. Supervisor: Michael Bennett
- B.Sc. Physics and Mathematics (*With Great Distinction*), University of Lethbridge (2009)

### EMPLOYMENT

- Assistant Professor, San Jose State University (2018-present)
- NSERC Fellow and Visiting Assistant Professor, University of Rochester (2015-2018)

### ARTICLES: PUBLISHED OR ACCEPTED

- **K. Hambrook**, K. Taylor, *Measure and dimension of sums and products*, Proceedings of the American Mathematical Society, 149 (2021), 3765-3780.
- J. Dhaliwal, **K. Hambrook**, *Compressive Recovery Defense: Defending Neural Networks Against  $\ell_2$ ,  $\ell_\infty$ , and  $\ell_0$  Norm Attacks*, 2020 International Joint Conference on Neural Networks (IJCNN), Glasgow, UK, 2020, pp. 1-8.
- R. Fraser, **K. Hambrook**, *Explicit Salem sets, Fourier restriction, and metric Diophantine approximation in the  $p$ -adic numbers*, Proceedings of the Royal Society of Edinburgh, Section A: Mathematics 150 (2020), no. 3, 1265-1288.
- **K. Hambrook**, *Explicit Salem sets and applications to metrical Diophantine approximation*, Transactions of the American Mathematical Society, 371 (2019), no. 6, 4353-4376.
- **K. Hambrook**, *Explicit Salem Sets in  $\mathbb{R}^2$* , Advances in Mathematics 311 (2017), 634-648.
- **K. Hambrook**, I. Łaba, *Sharpness of the Mockenhaupt-Mitsis-Bak-Seeger restriction theorem in higher dimensions*, Bulletin of the London Mathematical Society 48 (2016), 757-770.
- A. Akbary, **K. Hambrook**, *A variant of the Bombieri-Vinogradov theorem with explicit constants and applications*, Mathematics of Computation 84 (2015), 1901-1932
- **K. Hambrook**, I. Łaba, *On the sharpness of Mockenhaupt's restriction theorem*, Geometric and Functional Analysis 23 (2013), no. 4, 1262-1277.
- **K. Hambrook**, S. L. Wismath, *Minimal characteristic algebras for rectangular  $k$ -normal identities*, Algebra Colloquium 18 (2011), no. 4, 611-628.
- A. Predoi-Cross, **K. Hambrook**, R. Keller, C. Povey, I. Schofield, D. Hurtmans, H. Over, G. Mellau, *Spectroscopic lineshape study of the self-perturbed oxygen A-Band*, Journal of Molecular Spectroscopy 248 (2008), 85-110.
- A. Predoi-Cross, **K. Hambrook**, S. Brawley-Tremblay, J.-P. Bouanich, V.M. Devi, M.A.H. Smith, *Room-temperature broadening and pressure-shift coefficients in the 2 band of CH<sub>3</sub>D-O<sub>2</sub>: measurements and semi-classical calculations*, Journal of Molecular Spectroscopy 236 (2006), 75-90.
- A. Predoi-Cross, **K. Hambrook**, M. Brawley-Tremblay, J.-P. Bouanich, M.A.H. Smith, *Measurements and theoretical calculations of N<sub>2</sub>-broadening and N<sub>2</sub>-shift coefficients in the 2 band of CH<sub>3</sub>D*, Journal of Molecular Spectroscopy 235 (2006), 35-53.
- A. Predoi-Cross, **K. Hambrook**, M. Brawley-Tremblay, J.-P. Bouanich, V.M. Devi, D.C. Benner, L.R. Brown, *Measurements and theoretical calculations of self-broadening and self-shift coefficients in the*

### ARTICLES: SUBMITTED

- **Kyle Hambrook**, Han Yu, *Non-Salem sets in metric Diophantine approximation*, <https://arxiv.org/abs/2109.11332>
- R. Fraser, **K. Hambrook**, *Explicit Salem sets in  $\mathbb{R}^n$* , <https://arxiv.org/abs/1909.04581>
- J. Dhaliwal, **K. Hambrook**, *DAEs for Linear Inverse Problems: Improved Recovery with Provable Guarantees*, <https://arxiv.org/abs/2101.05130>

### ARTICLES: IN PREPARATION

- **K. Hambrook**, H. Yu, *Fourier decay and restriction for fractal measure on curves*.
- M. Carnovale, **K. Hambrook**, *Roth's theorem for fractals*.
- **K. Hambrook**, A. Iosevich, A. Rice, *Group actions and a multi-parameter Falconer distance problem*
- **K. Hambrook**, Chun-Kit Lai, *Fourier restriction under general hypotheses*
- **K. Hambrook**, B. Murphy, *Sharpness of  $L^2$  restriction theorems in intermediate dimensions*.
- **K. Hambrook**, *The logical equivalence of l'Hospital's rule and the least upper bound property*.

### STUDENTS SUPERVISED

- Trent Osland, Graduate Student, San Jose State University, Research Project: The Uniqueness Problem For Trigonometric Series and Fourier Decay of Measures (June 2020 - present)
- Jasjeet Dhaliwal, Graduate Student, San Jose State University, Research Project: Compressed Sensing in Adversarial Machine Learning (Feb 2018 - present)
- Albert Guo, Undergraduate Student, University of Rochester, Independent Study: Portfolio Management (Sep 2017 - Dec 2017).
- Huijun Yu, Undergraduate Student, University of Rochester, Research Project: Fourier Decay and Restriction for Fractal Measures on Curves (Oct 2016 - Apr 2017).

### TEACHING: COURSES

- Average Evaluation Score:**4.0/5**
- Department of Mathematics and Statistics, San Jose State University
  - Spring 2021: Math 231B Functional Analysis; Math 108 Introduction to Proof and Abstract Mathematics; Math 275A Topology
  - Fall 2020: Math 231A Real Analysis; Math 108 Introduction to Proof and Abstract Mathematics; Math 132 Advanced Calculus
  - Spring 2020: Math 231A Real Analysis; Math 108 Introduction to Proof and Abstract Mathematics
  - Fall 2019: None (Parental Leave)
  - Spring 2019: MATH 32 Calculus III; MATH 231A Real Analysis
  - Fall 2018: MATH 123 Differential Equations and Linear Algebra; MATH 231B Functional Analysis
- Department of Mathematics, University of Rochester
  - Fall 2017: MTH 161 Calculus IA (Head Instructor and Workshop Coordinator); MTH 210 Introduction to Financial Mathematics; MTH 391W Portfolio Management (Independent Study)
  - Fall 2016: MTH 142 Calculus II; MTH 210 Introduction to Financial Mathematics
  - Fall 2015: MTH 161 Calculus IA; MTH 201 Introduction to Probability
- Department of Mathematics, University of British Columbia
  - Spring 2015: MATH 152 Linear Systems
  - Fall 2014: MATH 104 Differential Calculus with Applications to Commerce and Social Sciences
  - Spring 2013: MATH 105 Integral Calculus with Applications to Commerce and Social Sciences

– Spring 2011: MATH 101 Integral Calculus with Applications to Physical Sciences and Engineering

### **TEACHING: OTHER ACTIVITIES**

- Workshop Coordinator for MTH 161 Calculus IA, UR (Sep - Dec 2017)  
Description: Design workshops; run weekly training and coordination meetings with TAs.
- Course Development for MTH 210 Introduction to Financial Mathematics, UR (Sep - Dec 2016)  
Description: Complete redesign at request of UR Simon Business School. LaTeX-ed lecture notes, homeworks, textbook to be basis of course in future.
- Head TA of Math Learning Centre, UBC (Jan - Dec 2012)  
Description: Managing the Math Learning Centre, which includes training, scheduling, and managing the approximately 50 teaching assistants who staff it each term.
- Teaching Assistant, Department of Mathematics, UBC (Sep 2009 - Aug 2015)  
Description: Activities include workshop facilitation, tutoring, marking, and exam invigilation.

### **PROFESSIONAL SERVICE**

- Reviewer: Transactions of the American Mathematical Society, Proceedings of the American Mathematical Society, Canadian Journal of Mathematics, Mathematical Association of America Book Reviews, Involve, and Mathematics of Computation.
- Organizer - Special Session “Analysis, Combinatorics, and Geometry of Fractals” - American Mathematical Society Spring Western Sectional Meeting, Virtual (Formerly: San Francisco State University, San Francisco, CA), May 1-2, 2021.
- Organizer - Scientific Session “Harmonic Analysis and its Connections to Geometric Measure Theory and Combinatorics” - 2018 Canadian Mathematical Society Winter Meeting, University of British Columbia, Vancouver, BC, December 7-10, 2018.
- Organizer - Special Session “Analysis and Geometry of Fractals” - American Mathematical Society Fall Western Sectional Meeting, San Francisco State University, San Francisco, CA, October 27-28, 2018.
- Organizer - 11th PIMS Young Researchers Conference in Mathematics and Statistics, Jun 2 - 4, 2014
- President of American Mathematical Society UBC Student Chapter (Oct 2013 - Oct 2014)

### **UNIVERSITY AND DEPARTMENT SERVICE**

- Department Committee Service (San Jose State University): Graduate Curriculum, MA Mathematics, Analysis, Logic, Number Theory, Calculus (Fall 2018 - present)
- University Committee Service (San Jose State University): Student Fairness
- Faculty-In-Residence Program (University Housing Services, San Jose State University, Fall 2018 - present).
- President of UBC Math Graduate Committee (Oct 2011 - Oct 2013)
- Executive Committee, UBC Teaching Assistants Union (CUPE 2278) (Sep 2012 - Dec 2012)
- Head Selection Committee Graduate Student Representative - UBC Department of Mathematics (2011)
- Student Representative - University of Lethbridge, Department of Mathematics and Computer Science (2008-2009)
- Math Mania Program Volunteer - University of British Columbia (Summer 2010)
- University of Lethbridge Lego Robot and Scratch Programming Summer Camps (Summer 2007-2009)

### **PROFESSIONAL DEVELOPMENT**

- Teaching Assistant Accreditation Program (Jan 2014 - Apr 2014)
- Math Instructional Skills Workshop (Apr 24-27, 2012)

## AWARDS

- NSERC Postdoctoral Fellowship (2015-2017) - \$90,000
- Statistical Society of Canada Case Study Competition - First Prize (2014) - \$500
- NSERC Canada Graduate Scholarship Doctoral Level (2011-2014) - \$105,000
- Four Year Doctoral Fellowship - University of British Columbia (2011-2015) - \$72,000
- Li Tze Fong Memorial Fellowship - University of British Columbia (2010) - \$25,000
- NSERC Canada Graduate Scholarship Masters Level (2009) - \$17,500
- Governor General's Academic Medal (2009)
- Chinook Undergraduate Research Award - University of Lethbridge (2008) - \$5,625
- NSERC-CMS Math in Moscow Scholarship (2008) - \$9,000
- NSERC Undergraduate Student Research Award (2006, 2007) - \$5,625
- Governor General's Academic Medal (2004)

## PRESENTATIONS

- *Construction of Explicit Salem Sets in  $R^n$* , Analysis Seminar, Department of Mathematics, University of Rochester, Feb 5, 2021.
- *Explicit Salem Sets of Arbitrary Dimension in  $R^n$* , Analysis Seminar, Department of Mathematics, Indiana University Bloomington, Nov 4, 2020.
- *Explicit Salem Sets of Arbitrary Dimension in Euclidean Space*, Mid-Atlantic Analysis Meeting Seminar, Nov 6, 2020.
- *Compressive Recovery Defense: Defending Neural Networks Against  $\ell_2$ ,  $\ell_\infty$ , and  $\ell_0$  Norm Attacks*, 2020 International Joint Conference on Neural Networks (IJCNN), Special Session I-SS38: Adversarial Machine Learning and Cyber Security, Jul 21, 2020.
- *Explicit Salem Sets in Euclidean Space*, Purdue Analytic Number Theory and Harmonic Analysis Seminar, Purdue University, Jan 22, 2020.
- *Explicit Salem Sets: A Wedding of Fractals, Fourier Analysis, and Diophantine Approximation*, Department of Mathematics and Statistics Colloquium, York University, Jan 20, 2020.
- *Explicit Salem Sets in Euclidean Space*, AMS Special Session on Harmonic Analysis, 2020 AMS-MAA Joint Mathematical Meeting, Denver, Jan 15-18, 2020.
- *Explicit Salem Sets in Euclidean Space*, AMS Special Session on Analysis and Geometry of Fractals, Fall Central Sectional Meeting, University of Wisconsin - Madison, September 14-15, 2019.
- *Construction of Fractal Measures with Rapid Fourier Decay*, 2018 Canadian Mathematical Society Winter Meeting, Vancouver, Dec 7-10, 2018.
- *Fourier Decay and Fourier Restriction for Fractal Measures on Curves*, Analysis Seminar, University of Wisconsin - Madison, Nov 12, 2018.
- *Problems on the Fourier Decay of Measures on Fractal Sets*, AMS Special Session on Analysis and Geometry of Fractals, Fall Western Sectional Meeting, San Francisco State University, October 27-28, 2018.
- *Measure and Dimension of Unions of Fractals*, Colloquium, San Jose State University, Oct 17, 2018.
- *Problems on Fourier Decay and Fourier Restriction for Fractal Measures*, Analysis Seminar, University of Rochester, Oct 20, 2017.
- *Fourier Analysis in Metric Diophantine Approximation*, Colloquium, University of Lethbridge, Oct 13, 2017.
- *Optimal Fourier Decay of Fractal Measures and Metric Diophantine Approximation*, Postdoctoral Seminar, University of Calgary, Oct 11, 2017.
- *Fourier Decay of Singular Measures, Salem Sets, and Metric Diophantine Approximation*, Analysis Seminar, Ohio State University, Sep 28, 2017.

- *Diophantine Approximation and Fourier Analysis on Fractals*, Colloquium, San Jose State University, Feb 3, 2017.
- *Sharpness of the Mockenhaupt-Mitsis-Bak-Seeger  $L^2$  Restriction Theorem in Higher Dimensions*, Analysis Seminar, University of Rochester, Oct 16, 2015.
- *Explicit Salem Sets*, 2014 Canadian Mathematical Society Winter Meeting, McMaster University, Dec 5-8, 2014.
- *Well-Approximable Numbers*, 11th PIMS Young Researchers Conference in Mathematics and Statistics, University of British Columbia, Jun 2-4, 2014.
- *The Sharpness of Mockenhaupt's Restriction Theorem*, Harmonic Analysis Seminar, University of British Columbia, Mar 4, 2013.
- *Buffon's Needle Estimates for Rational Product Cantor Sets, after M. Bond, I. Laba, and A. Volberg*, Harmonic Analysis, Geometric Measure Theory, and Additive Combinatorics Summer School, Catalina Island, Jun 24-29, 2012.
- *Automatic Resolution of Thue-Mahler Equations: Examples and Applications*, Canadian Number Theory Association XII Meeting, University of Lethbridge, Jun 17-22, 2012.