

Lalit Jain

CONTACT INFORMATION

Paul G. Allen School of
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RESEARCH INTERESTS

Broad: Building machine learning and adaptive data collection algorithms and systems. My research includes applications in **Experimentation Platforms for Scientific Discovery, Crowdfunding, and User Preference Learning**.

Specific: Metric/Ordinal Embedding and Multidimensional Scaling, Multi-Armed Bandits, Active Learning, Ranking Models, Practical Systems for Adaptive Crowdsourced Data Collection.

RESEARCH POSITIONS

Current Position: Paul G. Allen School of Computer Science and Engineering University of Washington, Seattle, Washington USA
Research Scientist (Postdoc), Started January 2018, Mentored by Professor Kevin Jamieson.

Department of Mathematics, University of Michigan, Ann Arbor, Michigan USA
Assistant Professor (Postdoc), September 2016-December 2017, Mentored by Professor Anna Gilbert

Intuit Inc., San Diego, CA, 6/2015-9/2015
Data Scientist Consumer Tax Group: Responsible for developing and deploying contextual bandits algorithms for market segmentation. Also worked on a library for data transformation, manipulation and imputation. Received a company spotlight for my work.

EDUCATION

University of Wisconsin-Madison, Madison, Wisconsin USA
Ph.D., Mathematics, August 2016
Dissertation Topic: “Big Mod ℓ Monodromy of Families of G -Covers”
Advisor: Jordan Ellenberg
Minor: Computer Science

University of Waterloo, Waterloo, Ontario Canada
Masters of Mathematics in Pure Mathematics, May 2008
Thesis: “Koblitz’s Conjecture for the Drinfeld Module”
Advisors: Yu-Ru Liu and Wentang Kuo

University of Waterloo, Waterloo, Ontario Canada
Bachelors of Mathematics in Pure Mathematics, December 2006
Minor in Combinatorics and Optimization, Graduated with Honors and Distinction

PUBLICATIONS

Machine Learning Publications

L. Jain, K. Jamieson, *Firing Bandits: Optimizing Crowdfunding*. International Conference on Machine Learning, 2018

K. Jamieson, L. Jain, *A Bandit Approach to Multiple Testing with False Discovery Control*. Advances in Neural Information Processing Systems 31, 2018.

L. Jain, B. Mason, R. Nowak, *Learning Low-Dimensional Metrics*. Advances in Neural Information

Processing Systems 30, 2017

S. Katariya, L. Jain, N. Sengupta, J. Evans, R. Nowak, *Adaptive Sampling for Coarse Ranking*. AISTATS, 2017.

Anna Gilbert, L. Jain, *If it ain't broke, don't fix it: Sparse metric repair*. Allerton 2017

L. Jain, K. Jamieson, R. Nowak, *Finite Sample Prediction and Recovery Bounds for Ordinal Embedding*. Advances in Neural Information Processing Systems 29, 2016.

K. Jamieson, L. Jain, C. Fernandez, N. Glattard, R. Nowak, *NEXT: A System for Real-World Development, Evaluation, and Application of Active Learning* in Advances in Neural Information Processing Systems 28, 2015.

Number Theory and Algebraic Geometry:

L. Jain, *The Big Mod ℓ Monodromy of Families of G -Covers*. Available as PhD Thesis. Currently being prepared for Journal Publication

E. Dummit, R. Harron, L. Jain, R. Pollack, D. Ross, M. Hablicsek, *Explicit computations of Hida families via overconvergent modular symbols*. Research in Number Theory. 2015.

L. Jain, P. Tzermias, *Beukers' integrals and Apéry's recurrences*. Journal of Integer Sequences. 8: Issue 1, Article 05.1.1., 2005

J. Holmes, V. Danilov, L. Jain, *Transverse Stability Studies of the SNS Ring*. Proceedings of 2005 Particle Accelerator Conference, Knoxville, Tennessee, 2254-2256, 2005.

INVITED TALKS

Sequential Experimentation for False Discovery Control Systems, Information, Learning and Optimization, University of Wisconsin, March 2019

Large Scale Human Driven Data Collection for Preference and Similarity Learning ESience Colloquium, University of Washington, February 2019

Never Fearing Features. Research Seminar, Amazon, October 2018

Adaptive Data Collection for Crowdfunding. Computational and Applied Math Colloquium, University of Chicago, October 2018

Large Scale Human Driven Data Collection for Preference and Similarity Learning. Stanford Graduate School of Business, October 2018

Monodromy and Cohen Lenstra Heuristics. Number Theory Seminar, University of Washington, April 2017

NEXT: Active Learning in the Wild. Interactive Learning, Simons Institute, February 2017

Active Learning in Theory and Practice. Recent Advances and Applications in Machine Learning, Chicago Chapter of American Statistical Association, March 2016

Ordinal Embedding. Student Signal Processing Seminar, University of Michigan, November 2016

PSD matrices and Ordinal Embedding. Applied Algebra Days, University of Wisconsin-Madison, April 2016

Monodromy of Hurwitz Spaces. Topology Seminar, University of Wisconsin-Milwaukee, Fall 2016

The ℓ -adic monodromy of G -covers. Frontier Seminar, Colorado State University, Fall 2014,

Applications of Monodromy to Number Theory. PANTS XXII Fall 2014

TEACHING
EXPERIENCE

University Level

University of Michigan, Ann Arbor, Michigan

Instructor - Fall 2017. Instructor for Math 425, Introduction to Probability. Main instructor for a three credit course on Probability Theory. Topics included discrete probability, working with continuous distributions, and limit theorems.

Instructor - Fall 2016. Instructor for two sections of Math 115, Calculus 1. Responsible for writing quizzes and leading three eighty minute flipped classroom sessions.

University of Wisconsin-Madison, Madison, Wisconsin

Teaching Assistant. Led discussion sections, wrote and graded quizzes/homework and held office hours. Received excellent TA evaluations each semester.

Fall 2014, Math 221: Calculus I

Fall 2013, Math 114: Algebra and Trigonometry

Fall 2012, Math 320: Differential Equations and Linear Algebra

Spring 2011-2013, Math 490: NSF sponsored CURL (Collaborative Undergraduate Research Lab)

Fall 2010, Math 221: Calculus I

University of Waterloo, Waterloo, Ontario Canada

Instructor. Taught a three credit class on introductory number theory. Received an excellent teaching evaluation.

Fall 2007, Math 135: Introduction to Algebra and Number Theory

Grade School and Enrichment

Ida B. Wells High School, 2008-2010, San Francisco, California USA

Teacher. Taught a variety of classes as a Teach for America high school teacher.

San Francisco and Oakland Math Circles, 2008-2010, San Francisco, California USA

Teacher. Led a variety of enrichment math classes for high school and middle school students.

University of Wisconsin-Madison *Organizer and Instructor* Organized the Madison Math Circles from 2011-2014. Also gave several talks on topics ranging from enumerating the ways to make change for a dollar, to facts about platonic solids.

HONORS AND AWARDS

Math Department TA Teaching Award, UW-Madison, Spring 2014

NSF VIGRE Fellowship recipient, UW-Madison, 2011-2014

University of Waterloo Mike Vangoch Memorial Award, 2006

University of Waterloo, W.T. Tutte Fellow

University of Waterloo, Dean's Honours List

OTHER EMPLOYMENT

Seventh Harmonic LLC, Madison, WI, 8/2013-Present, Co-Founder: Co-founder and software engineer (seventhharmonic.com). Responsible for developing new products, such as Bee-Line, an Android game.

Oak Ridge National Lab/Spallation Neutron Source, Oak Ridge, TN, 1/2008-4/2008, Intern: Researched instability thresholds at the Spallation Neutron Source particle accelerator. Studied experimental beam data using Matlab and C++ for signal processing and visualization.

OTHER TALKS

Conference Talks and Posters

International Conference on Machine Learning, Talk: *Firing Bandits: Optimizing Crowdfunding*. Stockholm Sweden, June 2018

Neural Information Processing Systems, Poster: *A Bandit Approach to Multiple Testing with False Discovery Control*. Long Beach CA, December 2017

Neural Information Processing Systems, Poster: *Finite Sample Prediction and Recovery Bounds for Ordinal Embedding*. Barcelona Spain, December 2016

Park City Math Institute, Talk: *Distance Matrices*. Also a TA for Steve Wright's course on optimization. June 2016

Neural Information Processing Systems, Spotlight Presentation: *NEXT: A System for Real-World Development, Evaluation, and Application of Active Learning*, Montreal CA, Dec 2015

Topology Student Workshop, *Monodromy of Cyclic Covers*, Georgia Institute of Technology, Atlanta GA, June 2014

Midwest Number Theory Conference for Graduate Students, *Cohen Lenstra Heuristics and Monodromy*, University of Illinois at Urbana-Champaign, June 2014

Joint Mathematics Meetings, *Optimal Control of Piecewise Continuous State Processes*, Atlanta, GA, 2005

Canadian Undergraduate Mathematics Conference, *Beukers' Integrals and Apéry's Recurrences*, 2006

Other Conferences Attended

Conference on Learning Theory, Stockholm Sweden, June 2018

International Conference on Machine Learning, New York NY, June 2016

Arizona Winter School on Arithmetic and Higher-Dimensional Varieties, Tucson AZ, March 2015

Graduate Workshop on Moduli of Curves, Simons Center for Geometry and Physics, Stony Brook NY, July 2014

Thin Groups, University of Michigan, Ann Arbor MI, April 2014

Western Algebraic Geometry Symposium, Boulder CO, April 2014

Arizona Winter School on Arithmetic Statistics, Tucson AZ, March 2014

Hot Topics: Perfectoid Spaces and their Applications, Berkeley CA, 2014

New Geometric Techniques Summer Graduate School, Berkeley CA, 2013

Atkin Memorial Lecture and Workshop Cohen-Lenstra Heuristics, Chicago IL, May 2013

Sage Days, 44, Madison, Wisconsin, 2013

Arizona Winter School on Modular Forms, Tucson AZ, 2013

Penn State Göttingen International Summer School on Number Theory, Göttingen, 2012

Arizona Winter School on Ramification and Geometry, Tucson AZ, 2012

Park City Mathematics Institute Graduate Summer School on Moduli Spaces of Riemann Surfaces, Park City UT, June 2011

Arizona Winter School on Stark-Heegner Points, Tucson AZ, 2011

LEADERSHIP ACTIVITIES

Co-Organizer Midwest Number Theory Conference for Graduate Students/Midwest Number Theory Days, 2011, University of Wisconsin-Madison

Co-Organizer Waterloo Symposium in Undergraduate Mathematics, 2007, University of Waterloo, Ontario

SOFTWARE PROJECTS

NEXT System for Active Learning: NEXT (nextml.org) is a real time computational framework and open-source machine learning system that simplifies the deployment and evaluation of active learning algorithms relying on human feedback. Example applications include online classification, bandit problems, and multidimensional scaling. Currently being employed by the *New Yorker* magazine to help choose the winner for their weekly caption contest. Project was done in close collaboration with Kevin Jamieson.

Bee-Line: Working alongside Nathan Clement and Leland Jefferis (two fellow grad students at the University of Wisconsin) I created Bee-Line, an Android educational puzzle game. The goal in Bee-Line is to help Beatrice the bee find a path through a garden of flowers. As the paths get longer the challenge and fun increases! Bee-Line has received over 2000 downloads on the Google Play store. The art, music, puzzle concept and storyline are completely original.

FORTE-Faster Ordinal Triplet Embedding: FORTE (www.github.com/lalitikumarj/FORTE) provides highly optimized algorithms for ordinal embedding in Cython. It implements several of the standard objectives including, stochastic triplet embedding, crowd kernel, and hinge loss. FORTE is designed to be used by practitioners using ordinal embedding in their research and theorists interested in developing new algorithms.

SAGE: Overconvergent Modular Symbols: Participated in the development of an overconvergent modular symbols library for Sage that explicitly implements work of Pollack and Stevens.

Music Hack Day, Boston Fall 2012: Participated with Jordan Ellenberg, Ben Recht, and Andrew Bridy. We used statistical information from the Million Song Database to create our own composition. Extended this project to use machine learning algorithms for identifying metrics of when two songs were similar. Won 20th place in a related Kaggle competition.

REFERENCES

Kevin Jamieson

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