Lalit Jain **University of Michigan**

CONTACT INFORMATION

Computer Science and Engineering
University of Washington
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RESEARCH INTERESTS

Broad: Machine Learning, Algebraic Geometry, Number Theory
Specific: Metric/Ordinal Embedding, Active Learning, Ranking Problems, Algebraic Geometry, Number Theory

CURRENT POSITION

University of Washington, Seattle, Washington USA
Research Scientist (Postdoc), Computer Science and Engineering, Started January 2018, Mentored by Professor Kevin Jamieson

EDUCATION

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

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

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

PUBLICATIONS

L. Jain, B. Mason, R. Nowak , *Learning Low-Dimensional Metrics*, in Advances in Neural Information Processing Systems 29, 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* in Advances in Neural Information Processing Systems 29, 2016. http://arxiv.org/abs/1606.07081

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*, https://arxiv.org/abs/1510.05795. Research in Number Theory. 2015.

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. http://www.cs.berkeley.edu/~kjamieson/resources/next.pdf

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.

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.

Other Employment

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

for my work.

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.

Talks

Invited Talks

Monodromy and Cohen Lenstra Heuristics Number Theory Seminar, University of Washington, April 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
The Monodromy of Hurwitz Spaces, Topology Seminar, University of Wisconsin-Milwauke, 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

Conference Talks and Posters

Neural Information Processing Systems, Poster: *Finite Sample Prediction and Recovery Bounds for Ordinal Embedding*, Barcelona, Spain, December 2016
Park City Math Institute, *Distance Matrices Lightning Talk.* Also a TA for Steve Wright's course on optimization. June 2016
Applied Algebra Days, *Ordinal Embeddings*, University of Wisconsin-Madison, April 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 Apry's Recurrences*, 2006

Other University of Wisconsin-Madison Seminar Presentations

Ordinal Embeddings from Pairwise Comparisons, Systems, Information and Learning Seminar, Spring 2016 **NEXT: A system for Active Learning** Hamlet Seminar, Fall 2015
Monodromy and Hurwitz Schemes, Student Number Theory Seminar, Fall 2014
Hasse Principle, Brauer-Manin Obstructions and del Pezzo surfaces, Student Number Theory Seminar, Fall 2013
Intersection Theory, Algebraic Geometry Seminar, Fall 2012
Counting Cubic Number Fields, Number Theory Seminar, Spring 2012
Divisors and Surfaces, Number Theory Seminar, Fall 2012
Grassmannians as a Moduli Space, Algebraic Geometry Seminar, Fall 2011
Music Hacking, Systems, Information and Learning Seminar, Fall 2011

Ranks of Elliptic Curves, Number Theory Seminar, Fall 2010

Other Conferences Attended

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 is advised by Robert Nowak at UW-Madison and was done in close collaboration with Kevin Jamieson at UC-Berkeley.

FORTE-Faster Ordinal Triplet Embedding: FORTE (www.github.com/lalitkumarj/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 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

Jordan Ellenberg

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Robert Nowak

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UW-Madison
Madison, WI 53706
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