

**BÁLINT VIRÁG**  
CURRICULUM VITAE

**PERSONAL**

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**Email:** balint@math.toronto.edu

**Date of Birth:** November 2, 1973.

**Citizenship:** Hungarian, Canadian.

**EDUCATION**

**University of California, Berkeley, 1996-2000**

Ph.D. in Statistics June 2000.

Thesis: Random walks and geometry on graphs of exponential growth.

Advisor: Yuval Peres. Eric Lehmann citation for Ph.D. thesis.

**Harvard University, 1992-1996**

B.A. Magna Cum Laude in Mathematics, June 1996.

Thesis: Random walk on finite convex sets of lattice points. Advisor: Persi Diaconis.

Thomas Temple Hoopes Prize awarded for outstanding honours thesis.

**EMPLOYMENT HISTORY**

**University of Toronto, 2003-present**

Professor, July 2011-present

Canada Research Chair, 2003-2013

Associate Professor (tenured), 2008-2011

Assistant professor, 2003-2008

**Rényi Institute, Budapest, 2013-2015**

Visiting professor, Marie Curie Research Fellowship

Senior researcher, 2016-present.

**Mathematical Sciences Research Institute, spring 2005**

Semester-long workshop on probability, algorithms and statistical physics.

**Institut Henri Poincaré Paris, spring 2003**

Visiting Researcher

**Massachusetts Institute of Technology, 2000-2003**

C.L.E. Moore Instructor, Department of Mathematics

## **Clay Mathematics Institute, summer 2000**

Liftoff Program, research support.

**Research Interests:** Random matrices, random polynomials, random walks, randomness in groups

## **HONOURS, GRANTS AND AWARDS**

CRM-Fields-Pims prize, 2021 *“the premier Canadian award for research achievements in the mathematical sciences.”*

Elected Institute of Mathematical Statistics Fellow, 2021

Best paper of the year in the Annales de l’institut Henri Poincare, 2019, [14].

Momentum grant of the Hungarian Academy of Sciences 2016

*A \$IM research grant. Given to 11 researchers in all sciences.*

John L. Synge Award of the Royal Society of Canada, 2014

*“The award is given for outstanding research in any of the branches of the mathematical sciences.”*

International Congress of Mathematicians, Invited speaker, 2014

European Union Marie Curie Research Fellowship, 2013-2015

Institute of Mathematical Statistics, Medallion Lecturer, 2013

*ML “is an honor and an acknowledgment of a significant research contribution.”*

Canadian Mathematical Society Coxeter-James Prize, 2010

*For “young mathematicians who have made outstanding contributions to mathematical research.”*

Rollo Davidson Prize, 2008

*Awarded annually to early-career probabilists by the R.D. trustees at Cambridge University.*

Sloan Research Fellow, Fall 2004-2008

Connaught Research Grant, Fall 2004-2008

NSERC Research Grant, Fall 2004-present

NSERC Discovery Accelerator grant 2009-present

Canada Research Chair, 2003-2013

NSF Research Grant, 2001-2004

Loève Fellowship in Probability, 1998-2000

Hewlett Scholarship, 1996-97

*Given to Berkeley graduate students in recognition of distinguished academic record.*

Putnam Mathematical Competition, 1996

*Placed among the 25 highest-ranking individuals.*

Hoopers Prize, 1996

*Given to thirty students in the Harvard graduating class for the best honors theses.*

## **RECENT INTERNATIONAL WORKSHOPS, CONFERENCES ORGANIZED**

**KPZ meets KPZ.** (w D. Dauvergne and X. Sun) Fields Institute, Toronto 5/2024.

**Measured group theory, stochastic processes and Borel combinatorics** CIRM Luminy. (w. M. Abert, D. Gaboriau, A. Tserumyan) 5/2023 (happening after being postponed many times due to COVID).

**Permutations and probability.** Banff International Research Station (second, hybrid occasion). (w. O. Angel, and J. Martin) 9/2021

**Permutations and probability.** Banff International Research Station (online). (w. O. Angel, and J. Martin) 9/2020

**Graph limits, groups and stochastic processes II.** Renyi Insititute, Budapest. Summer school. (with M. Abert, A. Backhausz, L. Lovasz, B. Szegedy) 8/2017

## PUBLICATIONS

### Book

- [1] *Zeros of Gaussian analytic functions and determinantal point processes*, volume 51 of *University Lecture Series*. American Mathematical Society, Providence, RI, 2009 (with J. B. Hough, M. Krishnapur, and Y. Peres).

### Refereed publications

- [2] Uniform convergence to the Airy line ensemble. *To appear in Annales IHP, arXiv:1907.10160*, 2023 (with D. Dauvergne and M. Nica).
- [3] RSK in last passage percolation: a unified approach. *Probability Surveys*, 19:65–112, 2022 (with D. Dauvergne and M. Nica).
- [4] The directed landscape. *Acta Mathematica*, 229(2):201–285, 2022 (with D. Dauvergne and J. Ortmann).
- [5] Large deviations for the interchange process on the interval and incompressible flows. *Geometric and Functional Analysis*, 1–71, 2022 (with M. Kotowski).
- [6] The many faces of the stochastic zeta function. *Geometric and Functional Analysis*, 32(5):1160–1231, 2022 (with B. Valkó).
- [7] Bulk properties of the Airy line ensemble. *The Annals of Probability*, 49(4):1738–1777, 2021.
- [8] The bead process for beta ensembles. *Probability Theory and Related Fields*, 179(3):589–647, 2021 (with J. Najnudel).
- [9] Uniform point variance bounds in classical beta ensembles. *Random Matrices: Theory and Applications*, 10(04):2150033, 2021 (with J. Najnudel).
- [10] Brownian absolute continuity of the KPZ fixed point with arbitrary initial condition. *The Annals of Probability*, 49(4):1718 – 1737, 2021 (with S. Sarkar).
- [11] Entropy and expansion. *Annales de l’Institut Henri Poincaré, Probabilités et Statistiques*, 56(4):2428–2444, 2020 (with E. Csóka and V. Harangi).
- [12] Circular support in random sorting networks. *Transactions of the American Mathematical Society*, 373(3):1529–1553, 2020 (with D. Dauvergne).
- [13] Operator limit of the circular beta ensemble. *Annals of Probability*, 48(3):1286–1316, 2020 (with B. Valkó).

- [14] The local limit of random sorting networks. *Annales de l'Institut Henri Poincaré, Probabilités et Statistiques, awarded best paper of the year 2019*, 55(1):412–440, 2019 (with O. Angel, D. Dauvergne, and A. E. Holroyd).
- [15] A short introduction to operator limits of random matrices. In Alexei Borodin, Ivan Corwin, and Alice Guionnet, editors, *Random Matrices*, volume 26, 213–251. American Mathematical Soc., 2019 (with D. Holcomb).
- [16] Tracy–Widom fluctuations in 2d random Schrödinger operators. *Communications in Mathematical Physics*, 370(3):873–893, 2019 (with M. Kotowski).
- [17] Geometry of permutation limits. *Combinatorica*, 39(4):933–960, 2019 (with M. Rahman and M. Vizer).
- [18] Eigenvectors of the 1-dimensional critical random Schrödinger operator. *Geometric and Functional Analysis*, 28(5):1394–1419, 2018 (with B. Rifkind).
- [19] Speed exponents of random walks on groups. *International Mathematics Research Notices*, 2017(9):2567–2598, 2017 (with G. Amir).
- [20] Spectral measures of factor of i.i.d. processes on vertex-transitive graphs. *Ann. Inst. Henri Poincaré Probab. Stat.*, 53(4):2260–2278, 2017 (with Á. Backhausz).
- [21] Mean quantum percolation. *J. Eur. Math. Soc.*, 19(12):3679–3707, 2017 (with C. Bordenave and A. Sen).
- [22] Holder continuity of the integrated density of states in the one-dimensional Anderson model. *Comm. Math. Phys.*, 355(3):839–863, 2017 (with E. Hart).
- [23] Dyson’s spike for random Schroedinger operators and Novikov-Shubin invariants of groups. *Comm. Math. Phys.*, 352(3):905–933, 2017 (with M. Kotowski).
- [24] Local algorithms for independent sets are half-optimal. *The Annals of Probability*, 45(3):1543–1577, 2017 (with M. Rahman).
- [25] The  $\text{Sine}_\beta$  operator. *Inventiones Mathematicae*, 209(1):275–327, 2017 (with B. Valkó).
- [26] The measurable Kesten theorem. *Ann. Probab.*, 44(3):1601–1646, 2016 (with M. Abért and Y. Glasner).
- [27] The Liouville property for groups acting on rooted trees. *Ann. Inst. Henri Poincaré Probab. Stat.*, 52(4):1763–1783, 2016 (with G. Amir, O. Angel, and N. Matte Bon).
- [28] Limits of spiked random matrices II. *Ann. Probab.*, 44(4):2726–2769, 2016 (with A. Bloemendal).
- [29] Universality of the stochastic Airy operator. *Communications on Pure and Applied Mathematics*, 69(1):145–199, 2016 (with M. Krishnapur and B. Rider).
- [30] A central limit theorem for products of random matrices and GOE statistics for the Anderson model on long boxes. *Comm. Math. Phys.*, 343(3):881–919, 2016 (with C. Sadel).
- [31] Ramanujan graphings and correlation decay in local algorithms. *Random Structures Algorithms*, 47(3):424–435, 2015 (with Á. Backhausz and B. Szegedy).

- [32] Invariant Gaussian processes and independent sets on regular graphs of large girth. *Random Structures Algorithms*, 47(2):284–303, 2015 (with E. Csóka, B. Gerencsér, and V. Harangi).
- [33] Independence ratio and random eigenvectors in transitive graphs. *Ann. Probab.*, 43(5):2810–2840, 2015 (with V. Harangi).
- [34] Non-Liouville groups with return probability exponent at most  $1/2$ . *Electron. Commun. Probab.*, 20:no. 12, 12, 2015 (with M. Kotowski).
- [35] Kesten’s theorem for invariant random subgroups. *Duke Mathematical Journal*, 163(3):465–488, 2014 (with M. Abért and Y. Glasner).
- [36] Positive speed for high-degree automaton groups. *Groups Geom. Dyn.*, 8(1):23–38, 2014 (with G. Amir).
- [37] The Ginibre ensemble and Gaussian analytic functions. *International Mathematics Research Notices*, 2014(6):1441–1464, 2014 (with M. Krishnapur).
- [38] Random schrödinger operators on long boxes, noise explosion and the goe. *Transactions of the American Mathematical Society*, 366(7):3709–3728, 2014 (with B. Valkó).
- [39] Operator limits of random matrices. *Proceedings of the ICM Seoul*, 4:247–272, 2014.
- [40] Amenability of linear-activity automaton groups. *J. Eur. Math. Soc. (JEMS)*, 15(3):705–730, 2013 (with G. Amir and O. Angel).
- [41] Limits of spiked random matrices I. *Probab. Theory Related Fields*, 156(3-4):795–825, 2013 (with A. Bloemendal).
- [42] Patterns in Sinai’s walk. *Ann. Probab.*, 41(3B):1900–1937, 2013 (with D. Cheliotis).
- [43] The right tail exponent of the Tracy–Widom  $\beta$  distribution. *Ann. Inst. Henri Poincaré Probab. Stat.*, 49(4):915–933, 2013 (with L. Dumaz).
- [44] Random walks veering left. *Electron. J. Probab.*, 18, 2013 (with R. Normand).
- [45] The scaling limit of the critical one-dimensional random Schrödinger operator. *Comm. Math. Phys.*, 314(3):775–806, 2012 (with E. Kritchanski and B. Valkó).
- [46] Beta ensembles, stochastic Airy spectrum, and a diffusion. *J. Amer. Math. Soc.*, 24(4):919–944, 2011 (with J. A. Ramírez and B. Rider).
- [47] Absolute continuity of the limiting eigenvalue distribution of the random Toeplitz matrix. *Electron. Comm. Probab.*, 16:706–711, 2011 (with A. Sen).
- [48] The spectrum of the random environment and localization of noise. *Probab. Theory Related Fields*, 148(1-2):141–158, 2010 (with D. Cheliotis).
- [49] Large gaps between random eigenvalues. *Ann. Probab.*, 38(3):1263–1279, 2010 (with B. Valkó).
- [50] On the girth of random Cayley graphs. *Random Structures Algorithms*, 35(1):100–117, 2009 (with A. Gamburd, S. Hoory, M. Shahshahani, and A. Shalev).
- [51] Continuum limits of random matrices and the Brownian carousel. *Invent. Math.*, 177(3):463–508, 2009 (with B. Valkó).

- [52] Random sorting networks. *Adv. Math.*, 215(2):839–868, 2007 (with O. Angel, A. E. Holroyd, and D. Romik).
- [53] Complex determinantal processes and  $H^1$  noise. *Electron. J. Probab.*, 12:no. 45, 1238–1257, 2007 (with B. Rider).
- [54] The noise in the circular law and the Gaussian free field. *Int. Math. Res. Not. IMRN*, (2):Art. ID rnm006, 33, 2007 (with B. Rider).
- [55] Determinantal processes and independence. *Probab. Surv.*, 3:206–229, 2006 (with J. B. Hough, M. Krishnapur, and Y. Peres).
- [56] Dimension and randomness in groups acting on rooted trees. *J. Amer. Math. Soc.*, 18(1):157–192, 2005 (with M. Abért).
- [57] Amenability via random walks. *Duke Math. J.*, 130(1):39–56, 2005 (with L. Bartholdi).
- [58] Zeros of the i.i.d. Gaussian power series: a conformally invariant determinantal process. *Acta Math.*, 194(1):1–35, 2005 (with Y. Peres).
- [59] Random walks that avoid their past convex hull. *Electron. Comm. Probab.*, 8:6–16, 2003 (with O. Angel and I. Benjamini).
- [60] Brownian beads. *Probab. Theory Related Fields*, 127(3):367–387, 2003.
- [61] Fast graphs for the random walker. *Probab. Theory Related Fields*, 124(1):50–72, 2002.
- [62] Anchored expansion and random walk. *Geom. Funct. Anal.*, 10(6):1588–1605, 2000.
- [63] On the speed of random walks on graphs. *Ann. Probab.*, 28(1):379–394, 2000.
- [64] Random walks on finite convex sets of lattice points. *J. Theoret. Probab.*, 11(4):935–951, 1998.

## Preprints

- [65] Eigenvectors of the square grid plus gue. *arXiv:2212.09614*, 2022 (with A. Mészáros).
- [66] KPZ fluctuations in the planar stochastic heat equation. *arXiv:2210.13607*, 2022 (with J. Quastel and A. Ramirez and B. Virag).
- [67] Palm measures for dirac operators and the sine beta process. *arXiv:2207.10626*, 2022 (with B. Valkó).
- [68] Amenability of quadratic automaton groups. *arXiv:2111.15206*, 2021 (with G. Amir and O. Angel).
- [69] The scaling limit of the longest increasing subsequence. *arXiv:2104.08210*, 2021 (with D. Dauvergne).
- [70] Infinite geodesics, competition interfaces and the second class particle in the scaling limit. *arXiv:2112.06849*, 2021 (with M. Rahman).
- [71] The heat and the landscape I. *arXiv:2008.07241*, 2021.
- [72] Brownian motion as limit of the interchange process. *arXiv:1609.07745*, 2016 (with M. Rahman).

## RECENT MINICOURSES, SUMMER SCHOOLS

**Random plane geometry**

The Statistical Physics of Continuum Particle Systems, IMS Singapore, August 2022

Graphs, Groups, Stochastic Processes, Erdős Center, Rényi Institute, Budapest, June 2022

**The directed landscape**

Randomness in Physics and Mathematics, ZIF Bielefeld Summer School, Bielefeld, Germany 8/2019

**Operator limits of random matrices**

Institut des Hautes Études Scientifiques summer school, Paris, 8/2017

Institute of Advanced Study summer school, Park City, 7/2017

Les Houches summer school, 8/2015

IMA Summer School in Random Matrices, Minneapolis, 6/2012

UK Easter probability meeting, Warwick, 3/2012

ICTS, Bangalore, India, 1/2012

Technical University, Budapest, 10/2011

**SELECTED INVITED LECTURES****Eigenvectors of the square grid plus GUE**

Probability Seminar, University of Durham, April 2023

**The planar stochastic heat equation and the directed landscape**

Probability Seminar, University of Madison, Wisconsin, March 2022

Random Geometry and Statistical Physics, University of Pennsylvania, October 2022

**Amenability of quadratic automaton groups**

Online Seminar on Probabilistic and Geometric Group Theory, June 2022

**Bisectors in random plane geometry**

Probability Seminar, Institute for Advanced Study, Princeton, March 2023

Rényi100, Hungarian Academy of Sciences, June 2022

National University of Singapore colloquium, September 2022

Random Matrices and Beyond, Kurt Johansson's 60th birthday, Stockholm, Sweden, June 2022

Random Matrices, Random Geometry and SPDEs, Oberwolfach, Germany, June 2022

**Random plane geometry: a gentle introduction**

Colloquium, UM Wisconsin, March 2022

CMS-Fields prize colloquium, CRM, Montreal, November 2022

CMS-Fields prize lecture, UBC, Vancouver, September 2022

**The many faces of the stochastic zeta function**

Leipzig probability seminar, April 2021.

Workshop on random functions, Ohio, April 2021.

Tel Aviv analysis seminar, December 2020.

**The heat and the landscape: scaling limit of the KPZ equation and the O'Connell-Yor model**

Probability seminar of the Americas, February 2021.

Minnesota and Northwestern joint probability seminar, February 2021.

Oberseminar Wahrscheinlichkeitstheorie, Munich, January 2021.

Joint Bristol-Queen Mary-Warwick seminar, January 2021.

Probability seminar, UC Berkeley, September, 2020.

Madison probability seminar, October 2020.

### **The directed landscape**

Kutzszem, Renyi Institute, January, 2022.

Random geometry and statistical physics seminar, UPenn, December 2021

Universality and integrability in random matrix theory MSRI, September 2021

Stochastic spatial processes, March 2021.

Lyon probability seminar, March 2021.

Kent State analysis seminar, March 2021.

One world probability seminar, February 2021.

Joint Israeli probability seminar, December 2020.

Institute colloquium, Alfred Renyi mathematical institutre, Budapest, December 2020.

Random Schrodinger operators and related topics, Villa Finaly, Florence, February 2020.

Random Matrices, Oberwolfach, December 2019.

Neyman Seminar, UC Berekely, October, 2019.

Probability and Analysis, Bedlewo, May 2019.

The Minerva Lectures (3 lectures) Columbia University, March 2019.

University of Pennsylvania. Mathematics Colloquium. February 2019.

University of Chicago. Probability Seminar. February 2019.

Renyi Insitute, Budepest. January 2019.

Technical University, Budapest. Stochastics seminar. February 2019.

Patagonia, Chile. Random Physical Systems conference. December 2018.

### **Entropy and expansion**

Renyi Institute research seminar, December, 2017.

Toronto probability seminar, December 2017.

### **Random sorting networks**

CIRM Luminy, workshop on random walks with memory, June 2017.

Northeast Probability Colloquium, New York City, November 2016.

### **Random matrices and canonical systems**

CIRM Luminy workshop on Random matrices and determinantal processes, March 2017.

### **The Sine- $\beta$ operator**

Cincinnati Symposium on Probability Theory and Applications. November, 2018.

### **Dyson's Spike and the spectral measure of groups**

Montreal, Canada. Spectral Theory of Quasi-periodic and Random Operators. November, 2018

## **SUPERVISION**

### **POSTDOCTORAL FELLOWS**

**Dimitris Cheliotis** (2004-2007) Currently faculty at Athens University.

**Benedek Valko** (2005-2008) Full professor at University of Wisconsin, Madison

**Manjunath Krishnapur** (2006-2009) Currently faculty at the Indian Insitute of Science, Bangalore

**Gideon Amir** (2007-2010) Currently faculty at Bar-Ilan Unviersity, Israel

**Gabor Pete** (Coxeter Lecturer, 2008-2011) Currently at the Renyi Insitute of Mathematics, Budapest

**Tom Alberts** (2008-2011) Currently at the University of Utah.

**Viktor Harangi** (2012-14) Currently at Renyi Insitute, Budapest.

**Janosch Ortmann** (2012-15) Currently at Université du Québec à Montréal



**Raoul Normand** (2012-2013) Currently at NYU Shanghai.

**Aukosh Jagannath** (2017-2018) Currently at University of Waterloo.

**Mihai Nica** (2017-2020) Currently faculty and university of Guelph.

**Sourav Sarkar** (2019-2021) Currently at Cambridge University.

**Andras Meszaros** Brauer postdoctoral fellow. Random eigenvalues. (2021-)

#### **CURRENT PHD STUDENTS**

**Virginia Maria Pedreira** (2018-present) Last passage percolation.

**Stanislav Balchev** (2019-present) Random polymers.

**Julian Ransford** (2019-present) Properties of continuum random polymers.

**Lemone Alie-Lamarche** (2019-present) Properties of the Sine-beta operator.

#### **PAST PHD STUDENTS**

**Guangyu Fu** PhD 2006, Thesis title: Random walks and random polynomials. Currently director, Director, Global Analytics and Financial Engineering at Scotiabank, Toronto.

**Alex Bloemendal**, PhD. 2011, Limits of spiked random matrices. Currently at the Broad Institute of MIT and Harvard.

**Eric Hart** (2009-2014) Random Schrödinger operators with singular noise distribution. Currently Staff Data Scientist at Anheuser-Busch.

**Ben Rifkind** (2009-2014) Dynamics of stochastic operators and KPZ dimension formulas. The scaling limit of the eigenvector of 1-D random Schrodinger operators. Currently Staff Data Engineer, NextRoll.

**Andrew Stewart** (2010-2016) Central limit theorem for free group bridges. Currently working in the blockchain industry.

**Danny MacDonald** (2012-2013) Random Sorting Networks (did not finish). Currently Sales and Marketing Development Associate at Baxter Media.

**Mustazee Rahman** (2011-2015) Graph limits and belief propagation. Currently on a tenure-track position at the University of Durham.

**Michal Kotowski** (2012-2016) Return probabilities on groups and large deviations for permuton processes. Currently at the University of Warsaw.

**Marcin Kotowski** (2012-2016) Random Schroedinger operators with connections to spectral properties of groups and directed polymers. Currently at the University of Warsaw

**Duncan Dauvegne** (2015-2019) Random sorting networks. The directed landscape. Winner of the 2020 Canadian Mathematical Society doctoral prize. Currently tenure-track at University of Toronto.

**Lucas Ashbury-Bridgwood** (2019-2023) Random Canonical Products and the Secular Function of the Stochastic Airy Operator Currently mathematics teacher at TanenbaumCHAT high school, Toronto.

**Alex Gatea** (2019-2023) Grid entropy in last passage percolation, a variational formula for Gibbs Free Energy, and applications to a “choose the best of D samples” model. Currently compiler developer at IBM, Toronto.

**Laure Dumaz**, (fall, 2008) visiting from Ecole Normale Supérieure, Paris. Project title: Large deviations for the Tracy-Widom  $\beta$  distribution. Currently at Universite Paris-Dauphine.

**Pierre Tarrago**, (fall, 2010) visiting from Ecole Normale Supérieure, Paris. Project title: Measures associated with random matrices. Currently at CIMAT.

**Raoul Normand** (2011) (Visiting for one year from Paris 6) Multifractal spectrum of tridiagonal operators. Currently at NYU Shanghai.

**Hongzhou Lin**, (fall, 2012) visiting from Ecole Normale Supérieure, Paris. Project title: Isoperimetric inequalities for eigenvectors on trees. Currently a postdoc in machine learning at MIT.

#### **MASTERS STUDENTS**

**Efstathios Ioannidis** (MA 2004) (informal supervision) Thesis title: Towards an understanding of last encounter routing in ad hoc networks

**Michael Andrushchenko** Project title: Central limit theorems for the GUE ensemble

**Eckhard Schlemm** (2007-2008) Provisional thesis title: First passage formulas in one dimension

**Kyle Thompson** (summer 2010) Determinantal processes on spheres

**Anjie Zhou** (summer 2008) Project title: Stochastic analysis and its connection to PDEs

**Charles Zhi Hao Li** (spring, summer, 2009) Project title: The volume of the Birkhoff polytope

**Gergely Odor** (spring, 2017) Resistance limits of graphs.

**Allen Lee** (2019-2020) The Directed Landscape.

**Cameron Martin** (2021) Overlap in Gaussian processes

#### **UNDERGRADUATE RESEARCH PROJECTS**

**Alexander Chestopalov** Project title: Random walks in random environments and flows

**Mu Cai** Project title: Stochastic analysis of the Brownian Carousel.

**Janet Li** Project title: Continuum percolation models

**Kai Yang** (summer 2010) Project title: Mixing of Markov Chains

**Kai Yang** (fall 2011) Erdos-Renyi random graphs

**Kai Yang** (winter 2012) Compressed sensing

**Danny Cao** (summer 2012) Eigenvalues of graphs (USRA project)

**Danny Cao** (winter 2012) Eigenvalues of graphs (Reading course)

**Jiongji Guo** (winter 2020) Random polymers. Convergence of discrete stochastic Airy operators. (Visiting student)

**Sasha Voitovich** (fall 2021) The directed geodesic.