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British citizen, Hong Kong permanent resident

Research Interests:

Symmetric functions and other combinatorial Hopf algebras/monoids, subalgebras of Solomon's descent algebra, and their interaction with Markov chains.

Employment

- 2016 - present Assistant Professor, Hong Kong Baptist University, Hong Kong
- 2014 - 2016 CRM-ISM postdoctoral fellow, Laboratoire de Combinatoire et d'Informatique Mathématique (LaCIM), Université du Québec à Montréal (UQAM), Canada
- 2015 Course Lecturer (part time), McGill University, Montreal, Canada

Education

- 2014 PhD in Mathematics, Stanford University, USA (*Advisor: Persi Diaconis*;
dissertation title: Hopf Algebras and Markov Chains)
- 2009 Certificate of Advanced Study in Mathematics ('Part III') with distinction, Trinity Hall, University of Cambridge, UK
- 2008 BA in Mathematics, Trinity Hall, University of Cambridge, UK

Research Grants

- 2018-2020 RGC-ECS: *Markov Chains driven by Permuted and Hyperoctahedral Descent Operators on Combinatorial Hopf Algebras.*

Publications

- 6 *Lumpings of Algebraic Markov Chains arise from Subquotients*, J. Theoret. Probab., accepted.
- 5 (with M. Josuat-Vergès) *Subalgebras of Solomon's Descent Algebra based on Alternating Runs*, J. Combin. Theory Ser. A, 158 (2018), 36–65.
- 4 *Card-Shuffling via Convolutions of Projections on Combinatorial Hopf Algebras*, 27th Annual International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2015), 49-60, Discrete Math. Theor. Comput. Sci. Proc., Assoc. Discrete Math. Theor. Comput. Sci., Nancy, 2015
- 3 (with P. Diaconis, A. Ram) *Hopf Algebras and Markov Chains: Two Examples and a Theory*, J. Algebraic Combin., 39(3):527–585, 2014.
- 2 *A Hopf-power Markov chain on Compositions*, 25th Annual International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2013), 499-510, Discrete Math. Theor. Comput. Sci. Proc., AS, Assoc. Discrete Math. Theor. Comput. Sci., Nancy, 2013
- 1 (with 27 others) *Supercharacters, Symmetric Functions in Noncommuting variables, and related Hopf Algebras*, Adv. Math. 229 (2012), no. 4, 2310–2337

Preprints

Markov Chains from Descent Operators on Combinatorial Hopf Algebras

Invited Talks

- 03/2018 *Lumpings of Algebraic Markov Chains arise from Subquotients*, Hong Kong Probability Seminar
- 10/2016 *A Uniform Analysis of Combinatorial Markov Chains using Hopf Algebras*, Department of Stat. Seminar, Chinese University of Hong Kong
- 01/2016 Department of Math. Colloquium, Hong Kong Baptist University
- 01/2016 Numerical Methods and Applied Analysis Seminar, University of Hong Kong
- 10/2015 *A Hopf-Algebraic Lift of the Down-Up Markov Chain on Partitions to Permutations*, Special Session on Hopf Algebraic Combinatorics, AMS Sectional Meeting, Chicago, USA.
- 01/2015 *Card Shuffling and Convolutions of Projections on graded Hopf Algebras*, Applied Algebra Seminar, York University
- 09/2014 Combinatorics Seminar, LaCIM
- 12/2014 *Card Shuffling, Tree-Pruning and Convolutions of Projections on graded Hopf Algebras*, CRM-ISM Probability Seminar
- 06/2014 *Card Shuffling and other Hopf-Power Markov Chains*, Combinatorics Seminar, LaCIM
- 01/2014 Combinatorics Seminar, University of Michigan
- 08/2013 Algebra/Geometry/Topology Seminar, University of Melbourne
- 03/2013 Algebra and Combinatorics Seminar, Loyola University Chicago
- 02/2014 *Markov Chains from Combinatorial Hopf Algebras*, Probability Seminar, Cornell University

Other Research Presentations

- 05/2018 *Markov Chains and Descent Subalgebras*, HKBU-NCKU Joint Workshop on Mathematical Sciences, National Cheng Kung University, Taiwan.
- 07/2015 *Card-Shuffling via Convolutions of Projections on Combinatorial Hopf Algebras*, 27th International Conference on Formal Power Series and Algebraic Combinatorics, Daejeon, South Korea.
- 03/2015 *Card Shuffling and Markov Chains on Combinatorial Hopf Algebras*, Probability Seminar, University of Ottawa
- 01/2015 *Card Shuffling and Convolutions of Projections on graded Hopf Algebras*, Combinatorial Algebra meets Algebraic Combinatorics, Kingston, Canada.
- 07/2013 *A Hopf-power Markov chain on Compositions (poster)*, 25th International Conference on Formal Power Series and Algebraic Combinatorics, Paris, France.
- 04/2012 *Ribbon Characters, Garsia-Reutenauer idempotents and a Biased Amazing Matrix??*, Student Probability and Related Fields Seminar, Stanford University
- 05/2011 *Kolmogorov's Rock-Breaking and Related Walks on Species*, Student Probability and Related Fields Seminar, Stanford University

Expository Presentations

- 03/2014 *What is a Combinatorial Hopf Algebra?* Graduate Student Colloquium, Stanford University
- 05/2011 *Card Games and Crystals*, Graduate Student Colloquium, Stanford University

04/2010 *The Art Gallery Problem*, Stanford University Mathematics Organisation
Hopf Algebras and Representation Theory
 10/2009 Graduate Student Colloquium, Stanford University
 03/2009 Part III seminar, University of Cambridge

Teaching

at Hong Kong Baptist University:

2016 - present Math 2207, Linear Algebra
 2019 Math 3407, Advanced Linear Algebra
 2017 Math 2205, Multivariate Calculus

Course Lecturer at McGill University:

2015 Math 141, Integral Calculus

Guest Lecturer at Université du Québec à Montréal (3 lectures):

2015 Mat 995B, Research Seminar on Combinatorics: Descent Algebras

Teaching Assistant at Stanford University (leading recitations):

2013 Math 41A, Accelerated Differential Calculus
 2010 - 2013 Math 51, Linear Algebra and Multivariable Calculus

Course Assistant at Stanford University (office hours, grading):

2012 Math 19, Differential Calculus
 2012 Math 110, Applied Number Theory and Field Theory
 2011 Math 210B, Graduate Algebra
 2010 Math 113, Linear Algebra and Matrix Theory
 2009 Math 120, Introduction to Abstract Algebra

Administrative Teaching Assistant at Stanford University:

2014 Math 51, Linear Algebra and Multivariable Calculus (200 students)

Teaching Assistant at Stanford University Mathematics Camp:

2009 - 2010 Program I, Abstract Algebra and Number Theory

Teaching Assistant at Enrichment Program for Young Mathematical Talents, Chinese University of Hong Kong:

2007 Non-Euclidean Geometry

Student Supervision

2016 - present Undergraduate final year projects (5 research, 3 expository) and summer projects (1 research), Hong Kong Baptist University

Conference and Workshop Participation

06/2018 Mini Symposium on Technology Enhanced Active Learning in Tertiary STEM Education, Hong Kong Polytechnic University, Hong Kong
 05/2018 SIAM Conference on Applied Linear Algebra, Hong Kong
 08/2017 3rd International Congress in Algebras and Combinatorics, Hong Kong
 12/2016 Joint UM-HKBU Workshop on Mathematics and Statistics, Macau
 06/2016 4th Institute of Mathematical Statistics Asia Pacific Rim Meeting, Hong Kong
 12/2015 Canadian Mathematical Society Winter Meeting, Montreal, Canada
 08/2015 BIRS workshop on Positivity in Algebraic Combinatorics, Banff, Canada
 06/2015 SageDays65, Chicago, USA
 04/2015 SageDays67, Montreal, Canada
 2011 - 2014 Bay Area Discrete Mathematics Days, USA

02/2014	Lie Groups, Lie Algebras and Their Representations, Stanford, USA
01/2013	Algebraic Groups and Representation Theory - a Conference in Memory of Tonny A. Springer, Hong Kong
07/2012	24th International Conference on Formal Power Series and Algebraic Combinatorics, Nagoya, Japan

Service, Academic

2018	Program committee member, 28th International Conference on Formal Power Series and Algebraic Combinatorics
2014 - present	Journal referee, J. Alg. Combi.; J. Combin. Theory Ser. A

Service, Departmental

2018 - present	HKBU coordinator, Simon Marais Mathematics Competition
2017 - present	Library coordinator, HKBU Math Department
2017 - present	Science faculty representative, Advisory Committee for Language Enhancement Program (HKBU)
2017, 2018	Interviewer, year 3 direct entry (to HKBU Math Department), and year 1 (to HKBU Science Faculty)
2011 - 2013	Co-organiser, Stanford Women in Math
2010 - 2011	Co-organiser, Stanford Graduate Student Colloquium