

Department of Mathematics, Hong Kong Baptist University, Kowloon, Hong Kong  
amypang@hkbu.edu.hk  
<http://www.math.hkbu.edu/~amypang>, <http://amypang.github.io/>  
British citizen, Hong Kong permanent resident

### Research Interests

Algebraic structures on combinatorial objects (e.g. symmetric functions, combinatorial Hopf algebras/monoids, dual graded graphs, 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 with first class honours, 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](https://arxiv.org/abs/1609.04312)

arxiv.org/abs/1609.04312

[Hopf Algebras and Markov Chains](https://arxiv.org/abs/1412.8221) (thesis) arxiv.org/abs/1412.8221

## Presentations

### Invited Talks

- 03/2018 *Lumpings of Algebraic Markov Chains arise from Subquotients*, Hong Kong Probability Seminar
- A Uniform Analysis of Combinatorial Markov Chains using Hopf Algebras*,
- 10/2016 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.
- Card Shuffling and Convolutions of Projections on graded Hopf Algebras*,
- 01/2015 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
- Card Shuffling and other Hopf-Power Markov Chains*,
- 06/2014 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](https://arxiv.org/abs/1412.8221), 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

### Undergraduate research honours projects, Hong Kong Baptist University:

2018 *Cocycles on Graphs*  
 2017 *A Remove-and-Reattach Markov Chain on Planar Binary Trees*  
 2017 *A Vertex Deletion Markov Chain on Graphs*  
 2017 *A Vertex Deletion Markov Chain on Ordered Trees*  
 2017 *The Catalan Hopf Algebra*

### Undergraduate expository honours projects, Hong Kong Baptist University:

2018 *Sim and Ramsey Theory*  
 2016 *Around Sylow's Theorems*  
 2016 *Partition Bijections*

### Summer undergraduate research fellowship, Hong Kong Baptist University:

2018 *Comonoids on finite vector spaces*

### *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*

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

#### *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