Curriculum Vitae/Resume

Nok To Omega TONG
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Education

The Chinese University of Hong Kong, MPhil in Mathematics 2023 – present

- Supervisor: Prof. Michael McBREEN
- Topics: Additive and Multiplicative Hypertoric Varieties, Hodge Theory of Matroids, Poisson Manifolds and Quantum Groups, Quiver Varieties, Quantum Field Theory
- Coursework: Topics in Geometry I & II by Prof. Conan Nai Chung LEUNG (about Deformation Quantization, Equivariant Cohomology, and Mirror Symmetry), Topology of Manifolds

The Chinese University of Hong Kong, BSc in Enrichment Mathematics 2019 – 2023

- Readings: Tropical Geometry (D. Maclagan & B. Sturmfels), Reflection Groups and Coxeter Groups (J. Humphreys), Cohomology of Groups (K. Brown), Toric Varieties (W. Fulton)
- Coursework: Modules and Representation Theory, Abstract Algebra (Postgraduate), Topics in Algebra by Prof. Yu Jiu Kang (Pg, about Ihara Zeta functions and their generalizations)

Pui Ching Middle School, Hong Kong

Research Experience

The Group Cohomology of the Periodized Hypertoric Variety, *Mphil in CUHK,* 01/23 – Present
(On-going Joint work with Law Sum Kiu)

- Readings: Deletion-Contraction Triangles for Hausel Proudfoot Varieties (Dancso, McBreen & Shende), A Survey of Hypertoric Geometry and Topology (N. Proudfoot), Cohomology of Groups (K. Brown)
- Studied the cohomology ring of the multiplicative hypertoric varieties using the group cohomology of the periodized hypertoric variety, and provided geometric interpretations for some cohomology classes
- One can associate with a graph a hypertoric variety. Infinitely segment each edge of the graph with a label of integer, the periodized hypertoric variety is defined as the associated variety. The multiplicative hypertoric variety is defined as the quotient of the periodized by a free abelian group of dimension equal to the genus of the graph. This can be used to study the cohomology of compactified Jacobians of nodal curves.

Seminar on Supersymmetric Gauge Theory (Prof. Michael McBREEN), *CUHK*, 11/23 – Present

- Topics: Classical Mechanics, Symplectic Reduction, Quantum Mechanics, Special Relativity, Quantum Field Theory, Supersymmetric QFT, Morse Theory, Gauge Theory, Conformal Field Theory, Topological QFT
- Attended and gave weekly seminars held by Prof. Michael McBREEN on the above topics
- Learned symplectic reduction by considering symmetries in classical mechanics systems, and its application to toric and hypertoric geometry, and studied the quantization of classical mechanics as QFT, as well as SUSY QFT and its connection with Morse theory

Seminar on Quantum Groups and Quiver Varieties (Prof. Michael McBREEN), *CUHK,* 11/23

- Readings: Lectures on Nakajima's Quiver Varieties (V. Ginzburg), A Brief Introduction to Quantum Groups (P. Etingof & M. Semenyakin), A Guide to Quantum Groups (V. Chari & A. Pressley)
- Held and gave a one-week seminar organized by Prof. Michael McBREEN
- Studied quantum groups and their Hoft algebra structure by quantizing the Poisson manifolds
- Discussed Drinfeld center, R-matrix, affine quantum groups, and Yangians
- Learned Quiver varieties as a generalization of hypertoric varieties and how quiver varieties can be realized as representations of quantum groups

Coxeter Matroids (Prof. Xuhua HE), *Final Year Project, CUHK,* 09/22 – Present

- Coxeter Matroids (A. Borovik et al.), Reflection Groups and Coxeter Groups (J. Humphreys), Introduction to Lie Algebras and Representation Theory (J. Humphreys)
- Defined matroids in terms of the symmetric group, or Coxeter group for the generalization (Matroids have a natural symmetric group action on the set of bases by the Exchange Property)
- Learned Lie Theory from a combinatorics viewpoint by studying Lie-type matroids
- Studied Coxeter Building and its application in constructing Coxeter Matroids

Elliptic Curve Cryptography (Dr. Kelvin LIU), *CUHK Research Project,* 03/21 – 07/21

- Elliptic Curve in Cryptography (I. Blake et al.), The Arithmetic of Elliptic Curves (J. Silverman), Algebraic Geometry (J. Milne)
- Learned EC theorems (Dual Isogeny, Hasse Theorem) and EC cryptography (Diffie-Hellman, ECDSA, ECIES)
- Implemented Elliptic Curve point counting algorithm with log complexity using Julia (Schoof's Algorithm)

Working Experience

Mathematical Olympiad Trainer, *The Hong Kong Academy for Gifted Education,* 09/19 – Present

- Lectured and trained Hong Kong's International Mathematical Olympiad Team members.
- Served as the Leader of the Hong Kong team to chaperon the student contestants to take part in the 22nd China Girls' Mathematics Olympiad (CGMO 2023)
- Tutored schools' Mathemetics Team (Diocesan Girls' School, Pui Ching Middle School)

Data Scientist / Quantitative Researcher, *Th3ia, Caldera Capital Limited,* 07/21 – 08/21

- Conducted features engineering for magnitude and signs prediction of different cryptocurrencies
- Developed, modified, and supported automated trading strategies

Awards and Achievements

Mathematics Olympiad	International Mathematics Olympiad (IMO) 2019 (Bath), ***Bronze Medal***	
	Asian Pacific Mathematics Olympiad (APMO) 2019, ***Bronze Award***	
Mathematics Research	University Research Opportunity Program • ***2021 Bronze Award:*** **Elliptic Curve Cryptography** • ***2022 Gold Award:*** **The Geometry of Matroid** • ***2023 Gold Award:*** **The GroupCohomology of Periodized Hypertoirc Variety**	
Blockchain Competition	International Blockchain Olympiad 2020, ***Gold Medal, Most Privacy Centric Award*** • Designed a Blockchain Platform for Academic Credentials (BCred)	
Coding Award	Hong Kong Olympiad in Informatics 2018, ***Gold Award***	
Scholarships (CUHK)	Mathematics Scholarship (Top mathematics student for admission)	2019
	CCC Class Scholarship (Top math students in Chung Chi College)	2020 & 2021
	CCC Mathematics Scholarship (Top math students in CC College)	2020 & 2021
	Talent Development Scholarship	2019 & 2020

Additional Information

Language	English (fluent), Cantonese (native), Mandarin (fluent), Japanese (proficient)
Skills	Programming (Julia, Python, C++, Bash), Linux, Latex
Interests	Cello (AT level), Guitar, Piano, Classical Music, Movies, Magic