Pui Kuen Leung

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Research Interests

Probability Theory, Statistical Physics, Mathematical Statistics, Statistical Computing, Optimization.

Education

2024 (expected) **Australian National University**
Master of Philosophy in Statistics

2022 **The University of Sydney**
Bachelor of Science (Honours) in Pure Mathematics
First Class Honours and the University Medal

2021 **Australian National University**
Bachelor of Science in Mathematics
GPA: 7.00/7.00

Research Projects

- **Topics in Lévy processes in vector spaces**
  MPhil thesis at ANU supervised by Boris Buchmann and Dale Roberts
  - Reformulated the theory of weak subordination for Lévy processes in general vector spaces.
  - Obtained conditions characterising the stability of multivariate subordinated processes.
  - By making use of additive processes in tangent spaces, formulated an approach to defining additive processes in Riemannian manifolds which is compatible with the classical definition for Lie groups.
- **On the strong continuity and local equicontinuity of OU semigroups in open sets of Hilbert spaces**
  Honours thesis at the University of Sydney supervised by Ben Goldys
  - Wrote an exposition of the C_0-property of Ornstein-Uhlenbeck semigroups in the space of bounded continuous functions on a separable Hilbert space H with respect to the mixed topology.
  - Gave a partial extension of the above result to the case of the restricted semigroup to an open subset of H.
- **A_∞-absolute continuity of elliptic measures in 1-sided chord arc domains**
  Project for *Regularity Theory for Uniformly Elliptic Operators* at ANU supervised by Joseph Feneuil
  - Wrote a mini-thesis detailing a recent result on a Carleson measure condition for elliptic measures in 1-sided chord arc domains to belong to the A_∞ class of Muckenhoupt weights.
- **A random matrix approach to existence of tracial states on unital stably finite exact C*-algebras**
  Project for *Operator Algebras* at ANU
  - Covered an approach to the existence of traces on stably finite unital exact C*-algebras using an asymptotic lower bound for the spectrum of Gaussian random matrices.

Awards and Honours

2023 Australian Government Research Training Program Scholarship for MPhil at ANU
2022 University Medal for outstanding performance in Pure Mathematics Honours
2022 Harriet Beard Scholarship (declined) for Part III of the Mathematical Tripos at Cambridge
2021 Faculty of Science Honours Relocation Scholarship

Talks and Teaching

2023 **Spectral Theory for Unbounded Self-adjoint Operator in Hilbert Spaces (ANU)** – gave several lectures covering topics on adjoints of differential operators, spectral measures, Kato-Rellich theorem, essential spectrum.
2020 **Stochastic Analysis with Financial Applications (ANU)** – gave a talk on the construction of stochastic integration with non-continuous semimartingale integrator.
2020 **Advanced Calculus & Linear Algebra II (UQ)** – taught tutorial classes and graded assignments.

Computer Skills

Python, Java, C, R, LaTeX.

Graduate Coursework

- **Geometric Analysis** – harmonic map heat flow, comparison theorems in Riemannian geometry, eigenvalue estimates and isoperimetric inequalities, Hodge theory, Ricci flow
- **Operator Algebras** – theory of Banach and C*-algebras
- **Spectral Theory for Unbounded Self-adjoint Operators in Hilbert Spaces** – spectral theorem, functional calculus, unitary groups, perturbations of operators, self-adjoint extensions of symmetric operators
- **Regularity Theory for Uniformly Elliptic Operators** – uniformly elliptic PDEs with rough coefficients in 1-sided chord arc domains, tools from real variable methods in harmonic analysis and geometric measure theory
- **Randomised Numerical Algorithms with Applications in Data Science** – concentration inequalities, Johnson-Lindenstrauss lemma, stochastic optimisation, randomised numerical linear algebra
- **Functional Analysis** – Banach and Hilbert spaces, spectral theory of compact operators, complex representation theory of finite groups, Peter-Weyl theorem for compact topological groups
- **Probability and Martingale Theory** – abstract measure theory, limit and ergodic theorems, general theory of stochastic processes, exchangeability, martingales, (strong) Markov processes
- **Stochastic Analysis** – stochastic calculus, diffusion processes and PDEs, invariant and ergodic measures
- **Commutative Algebra** – commutative and homological algebra, affine algebraic geometry