RUIJUN LIN

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An aspiring student with strong research interests in Operator algebras, especially C*-algebras and related topics

EDUCATION

University of Copenhagen **September 2021 - June 2023**
Master of Science in Mathematics

Souther University of Science and Technology **September 2016 - June 2021**
Bachelor of Science in Mathematics and Applied Mathematics

RESEARCH EXPERIENCE

Member, Project Outside the Course Scope on Groups, Operator Algebras and Dynamics
Instructor: Professor Mikael Rørdam **September 2022 - November 2022**

- **Reference Book:** Brown, N.P. and Ozawa, N. (2008) *C*-algebras and Finite-dimensional Approximations*. Providence, RI: American Mathematical Society.
- **Topics Covered:** Amenability of groups, C*-algebras arising from groups, Nuclearity and exactness of C*-algebras, as well as important results such as Stinespring's theorem, Tomiyama's theorem and Arveson Extension theorem.

WORK EXPERIENCE

Research and Teaching Assistant for Assistant Professor Man Shun (John) Ma, Department of Mathematics
Employer: Southern University of Science and Technology **February 2024 - Present**

Research Support:

- Providing comprehensive research assistance to Professor Ma, including literature reviews, data collection, and assistance in translating grant proposals and some other administrative affairs to support the ongoing research projects in the areas of geometric analysis.
- Maintaining detailed records of research progress, methodology, and findings, ensuring the smooth documentation and organisation of the research workflow.

Professional Development:

- Actively participating in research group meetings, journal clubs, and training workshops to stay abreast of the latest developments in C*-algebras and related topics.
- Seeking opportunities to expand my own knowledge and skillset, such as attending relevant conferences, taking specialised courses, or pursuing additional certifications.
- Maintaining a strong sense of initiative and proactivity, identifying areas for improvement and proposing innovative solutions to enhance the research group's productivity and impact.

ATTENDANCES AND TALKS

- Participant in The Second BIMSA Workshop on Digraph Topology and GLMY Theory (25th October, 2024 - 28th October, 2024)
- Visiting student at Institute of Advanced Study in Mathematics, Harbin Institute of Technology (Host: Professor Fedor Sukochev and Professor Jinghao Huang, 12th September, 2024 - 16th September, 2024)

- Participant in Special Week for Operator Algebras 2024, East China Normal University (29th July, 2024 - 2nd August, 2024)
- Participant in Spring Operator Algebras Program 2024, East China Normal University (8th April, 2024 - 15th April, 2024)
- Visiting student at Institute of Advanced Study in Mathematics, Harbin Institute of Technology (Host: Guixiang Hong, 11th December, 2023 - 21st November, 2023)
- Visiting student at Research Center for Operator Algebras, East China Normal University (Host: Professor Huaxin Lin, 9th September, 2023 - 14th September, 2023)
- Participant in Young Mathematicians in C*-algebras (YMC*A) 2023, KU Leuven, Belgium (7th August, 2023 - 11th August, 2023)
- Participant in Masterclass: Dilation and Classification in Operator Algebra Theory, University of Copenhagen (17th October, 2022 - 21st October, 2022)
- Participant in Operator Algebras, Dynamics and Groups - an ICM Satellite Conference, University of Copenhagen (1st July, 2022 - 4th July, 2022)
- Main Speaker in Student Seminar on Harmonic Analysis, Department of Mathematics, Southern University of Science and Technology (September 2020 - May 2021)

THESIS

C*-algebras of Left Cancellative Small Categories with Garside Families
MSc Mathematics Dissertation, supervised by Professor **Søren Eilers**

- **Abstract:** This thesis provides a unifying theoretical framework that connects Garside categories, groupoids, and C*-algebras, building on recent work by Xin Li. It begins with a concise overview of Garside theory as applied to left-cancellative small categories. The thesis then examines the groupoids and C*-algebras that naturally arise from this Garside-theoretic foundation, covering the fundamental results that underpin these connections. A key focus is elucidating the structural characterisations and inherent relationships that emerge from this unified perspective. As a representative example, the thesis includes an application of the theory to higher-rank graphs. Overall, this thesis offers a coherent and comprehensive synthesis of Xin Li's groundbreaking approach, which brings together concepts from Garside theory, groupoids, and C*-algebras into a powerful unifying theory.

Harmonic Analysis and Hausdorff Dimension, a Brief Survey
BSc Mathematics and Applied Mathematics Dissertation, supervised by Associate Professor Bochen Liu

- **Abstract:** This thesis provides a comprehensive survey of the diverse forms of Fourier analysis and their intricate interplay with the concept of Hausdorff dimension. The central aim is to leverage these connections in order to prove a specific result about the behaviour of Borel rings on the real line. The thesis first explores the various types of Fourier analysis covered, ranging from classical Fourier series and integrals to more advanced techniques, and then delves into the relationships between Fourier analysis and Hausdorff dimension, examining how these mathematical frameworks inform and interact with each other. Building upon this foundational understanding, the thesis presents an application that utilises the insights gained, proving that a Borel ring on the real line either has Hausdorff dimension zero or encompasses the entire real line, shedding light on the structural properties of Borel sets and their connection to Fourier-analytic concepts. Overall, this thesis offers a thorough examination of the diverse facets of Fourier analysis and their intersection with Hausdorff dimension, culminating in an application that demonstrates the power of these interconnected mathematical theories.

INTEREST IN MATHEMATICS

- ♩ In general: Operator algebras, Hilbert spaces, harmonic analysis and related topics such as category theory and quantum information.
- ♩ Specifically: C*-algebra arising from groupoids, graphs and small categories.
- ♩ Recently I am following the topics Zappa-Szép products of small categories and their C*-algebras.

PERSONAL ADVANTAGES

- ☺ Unwavering Dedication: Exhibit an unwavering commitment to mastering specialised academic content and personal interests, demonstrating determination and capacity for continuous self-improvement.
- ☺ Exceptional Learning Aptitude: Developed a robust learning foundation and the ability to self-direct my academic development through a diligent process of repeated exposure and reinforcement of fundamental knowledge,
- ☺ Empathetic Communication Prowess: Possess a keen ability to listen attentively, a humble demeanour, and a considerate, caring nature, all of which enable me to cultivate strong interpersonal relationships within my academic and professional circles.
- ☺ Clearly Defined Research Interests: Exhibit a profound passion for frontier research areas such as Functional Analysis, Operator algebras, and C*-algebras, reflecting a focused and well-articulated vision for my scholarly pursuits.

LANGUAGES

- Chinese (native)
- English (proficient)

SKILLS AND HOBBIES

Music (erhu level 10, piano (basic)), photography and reading.
Programming: LaTeX, Python (Basic).