

CV - Jeremy B. Hume

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Nationality: Canadian, Age: 26

Education

PhD, Mathematics
University of Glasgow (Supervisor: Xin Li)

*September 2021 - Present
(Defending Summer 2024)*

MSc, Mathematics
University of Victoria (Supervisor: Ian F. Putnam)

September 2019 - August 2021

H.BSc, Mathematics
University of Toronto

September 2015 - May 2019

Research Interests

C^* -algebras, K -theory, groupoids and dynamical systems.

Recent Projects

KK -duality for self-similar groupoid actions on graphs

arxiv:2302.03989 (accepted in Transactions of the American Mathematical Society). Joint with N. Brownlowe, A. Buss, D. Gonçalves, A. Sims and M. F. Whittaker. We prove that two naturally associated C^* -algebras to a regular and contracting self-similar groupoid are Spanier-Whitehead dual (in KK -theory) to each other by showing they are strongly Morita equivalent to the stable and unstable Ruelle C^* -algebras of a Smale space arising from the self-similar limit space.

The K -theory of the C^* -algebras associated to a rational function

arxiv:2307.13420 (submitted). We compute the K -theory of the three C^* -algebras associated to a rational function, thought of as a dynamical system acting on its Julia set, Fatou set or the entire Riemann sphere. Our results yield new dynamical invariants for rational functions and a C^* -algebraic formulation of the Density of Hyperbolicity Conjecture for quadratic polynomials.

Renormalization procedures for C^* -algebras

(MSc. Thesis) (<http://hdl.handle.net/1828/13285>). We introduce renormalization procedures for C^* -algebras, in analogy to renormalization procedures for families of dynamical systems. We prove a C^* -analog to Masur's unique ergodicity criterion for flat surfaces and apply this criterion to show a variety of C^* -algebras have unique trace.

Dynamical covers

(In preparation, pre-print available upon request). Joint with Kevin Brix and Xin Li. To a non-invertible dynamical system we construct two covers of it by better behaved systems, generalizing the Krieger and Fischer covers of a sub-shift. We show these covers are functorial, have universal properties and study the relationship between properties of the original system and properties of the cover.

Katsura's groupoids and Putnam's binary factors

(In preparation, pre-print available upon request). Joint with Michael F. Whittaker. We investigate the properties of a certain class of self-similar groupoid actions defined from two integer valued matrices A, B , which we call Katsura groupoid actions. By results of Katsura and Exel-Pardo, their C^* -algebras exhaust all Kirchberg algebras. We show a recent class of dynamical systems studied by Putnam can be realized as a sub-class of the limit space dynamical systems associated to Katsura groupoid actions. We prove these limit spaces embed into the plane, answering a question of Putnam.

Recent Invited and Contributed Talks

NSeaG24, Odense, Denmark
(Invited talk: TBA)

August 2024

UK Operator Algebras Conference, Newcastle, England
(Contributed talk: TBA)

June 2024

YMC*A 2023, Leuven, Belgium
(Contributed talk: The K -theory of a rational function)

August 2023

Algebra, Geometry and C^* -algebras, ICMS, Edinburgh, Scotland
(Invited talk: The K -theory of a rational function)

June 2023

Analysis seminar University of Waterloo, Canada
(Invited talk: The K -theory of a rational function)

January 2023

Organizing

Analysis working seminar, University of Glasgow, Scotland

September 2022 - April 2023

I organized with two fellow PhD students a weekly seminar for members of the analysis department and visiting scholars to present topics related to their research.

YMC*A 2024, University of Glasgow

August 2024

I am leading the organizing committee for “Young Mathematicians in C^* -algebras”, which is an international conference designed for early career researchers working in the field of operator algebras. Expected number of participants is 150.

Teaching

Complex analysis tutorial, University of Glasgow

Winter 2021

I led the 4th year honours complex analysis tutorial where I taught supplemental material and went through problem set exercises carefully with students.

Teichmüller theory seminar, University of Victoria, Canada

Fall 2019

I hosted a Teichmüller theory seminar at the University of Victoria and gave two one-hour lectures each week.

Calculus, Toronto, Canada

July 2019

I taught an approximately 100-hour-long course on high-school level calculus to an individual through Forest Hill Tutoring Company in Toronto.

Awards and Scholarships

Heilbronn Institute’s Small Grant Award for YMC*A 2024³ £3500 GBP

2024

Glasgow Mathematical Journal Trust Award for YMC*A 2024² £3000 GBP

2024

University of Glasgow Graduate Scholarship¹ £60 000 GBP

2021

British Columbia Graduate Scholarship \$15 000 CAD

2019

University of Victoria Graduate Award \$4872 CAD

2019

Margaret Ronald Taylor & Thomas Paxton Taylor Scholarship \$1414 CAD

2019

Dean’s List (University of Toronto)

2016, 2017, 2018

F Ray Irwin Scholarship \$1000 CAD

2018

Regents In-Course Scholarship \$1000 CAD

2017

Dr John Benjamin Gullen Scholarship \$1000 CAD

2016

President’s Entrance Scholarship \$2000 CAD

2015

³(Conference grant, joint with U. Chakraborty, J. Gonzales, F. Pagliuca and S. Pilgrim)

²(Conference grant, joint with Francesco Pagliuca)

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