CV - Jeremy B. Hume

Email: jeremybhume@gmail.com **Nationality:** Canadian

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Education and Academic Employment

Postdoctoral Fellow, Mathematics *January 2025 - December 2025*
Carleton University (Supervisor: Charles Starling)

PhD, Mathematics *September 2021 - December 2024*
University of Glasgow (Supervisor: Xin Li)

MSc, Mathematics *September 2019 - August 2021*
University of Victoria (Supervisor: Ian F. Putnam)

H.BSc, Mathematics *September 2015 - May 2019*
University of Toronto

Research Interests

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

Papers and Preprints

KK-duality for self-similar groupoid actions on graphs
arxiv:2302.03989 (published 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.

Katsura's self-similar groupoid actions, Putnam's binary factors, and their limit spaces
arxiv:2405.19863 (Invited submission to a special edition of the Journal of the Australian Mathematical Society in honour of Iain Raeburn). Joint with M. F. Whittaker. We investigate the properties of a certain class of self-similar groupoid actions, the *Katsura actions*. 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 actions. We prove these limit spaces embed into the plane, answering a question of Putnam.

Minimal covers with continuity-preserving transfer operators for topological dynamical systems
arXiv:2408.11917 (submitted). Joint with K. A. Brix and X. 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 the cover.

On Hausdorff covers for non-Hausdorff groupoids
arXiv:2503.23203. Joint with K. A. Brix, J. Gonzales and X. Li. We develop a new approach to non-Hausdorff étale groupoids using Hausdorff covers. As an application, we characterize in terms of a groupoid property when singular ideals vanish for Steinberg algebras and for C*-algebras of groupoids satisfying a finiteness condition. Moreover, our approach reduces questions about simplicity, the ideal intersection property and amenability for groupoids to the Hausdorff case.

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.

Recent Invited and Contributed Talks

Operator Algebra Seminar, University of Southern Denmark, Odense, Denmark *November 2024*
(Invited talk: Dynamical covers)

Functional Analysis Seminar, University of Oxford, England *November 2024*
(Invited talk: Spectral gap in the operator on traces induced from a C*-correspondence)

Operator Algebras in the South of the UK, Southampton, England *September 2024*
(Invited talk: The K-theory of the C*-algebras associated to complex dynamical systems)

OdenSeaG, Odense, Denmark *August 2024*
(Invited talk: Contracting C*-correspondences)

UK Operator Algebras Conference, Newcastle, England *June 2024*
(Contributed talk: Katsura groupoid actions and their limit spaces)

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

Algebra, Geometry and C^*-algebras, ICMS, Edinburgh, Scotland *June 2023*
(Invited talk: The K-theory of a rational function)

Analysis seminar University of Waterloo, Canada *January 2023*
(Invited talk: The K-theory of a rational function)

Organizing

YMC*A 2024, University of Glasgow, Scotland *August 2024*
I led the organizing committee for "Young Mathematicians in C^*-algebras", which was an international conference designed for early career researchers working in the field of operator algebras. The number of participants was 115.

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.

Teaching

Complex analysis tutorial, University of Glasgow, Scotland *Winter 2021*
I led the 4^{th} year honours complex analysis tutorial where I taught supplemental material and went through problem set excercises 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 2024[3] **£3500 GBP** *2024*

Glasgow Mathematical Journal Trust Award for YMC*A 2024[2] **£3000 GBP** *2024*

University of Glasgow Graduate Scholarship[1] **£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 F. Pagliuca)
[1](funded through ERC grant No. 817597)