Benjamin Morris, Ph.B.

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Current Position

- **University of Leeds, Leeds (UK)**
  PhD Candidate in Pure Mathematics, supervisor: Prof. Paul Martin

Research Interests

- My research currently concerns the algebraic structures which appear at the interface between mathematical physics (especially lattice models in statistical mechanics), low-dimensional topology, and representation theory. My doctoral studies have focused on the representation theory of diagram algebras/categories, as well as explicit approaches to constructing examples of such categories. I enjoy solving problems in algebra and topology by combinatorial and homological methods and am experienced in performing and managing large calculations with computer algebra software, especially Mathematica (although I am always keen to learn more languages!).

Keywords

- Diagram categories, cellular algebras, representation theory, tensor categories, cobordism categories, categorification.

Short CV

- In 2021, I obtained a Ph.B. with first class honours, from the Australian National University, under the supervision of Assoc. Prof. Vladimir Mangazeev.
- My PhD has so far resulted in two papers. During this time I have given 16 research talks at seminars, international conferences, and workshops, within Europe. In 2025 I won a LMS Travel Grant for Early Career Researchers to attend the IMPAN conference "Yang-Baxter Equation and all that" in Poland.
- In Leeds, I have strived to foster an active, collaborative, and fair research environment by taking on various roles. These include organising a Pure Maths Seminar for PhD students, running three reading groups among peers, volunteering as a buddy for first year PhD students, and attending and supporting initiatives such as the IDEAL conference. By actively participating in the Leeds algebra seminar I was able to establish an international collaboration with Dr D. Ibarra and Dr G Montoya-Vega.
- In March 2025, I helped to coordinate and write the successful application for the project: "Mathematics and Implementation of Quantum Computing" (MIQC), jointly funded by the University of Leeds and Universität Hamburg. This is an interdisciplinary project between the Algebra group in Leeds, the Higher Structure group in Hamburg, and the Quantum group (Physics) in Leeds. In February and March 2026, I co-organised two workshops in Leeds as part of this project. In April 2026, I will be co-organising a conference "Introduction to Modern Advances in Algebra" for PhD students in algebra. This has successfully received small grant funding from 5 different sources.

Education

2022 – 2026[1] **Ph.D. in Mathematics**, University of Leeds, Leeds, United Kingdom.

2018 – 2021 **Ph.B. with First Class Honours in Mathematics**, Australian National University, Canberra, Australia.
Thesis title: *Towards a Factorised Solution of the Yang-Baxter Equation with $U_q(\mathfrak{sl}_4)$ Symmetry*.

Research Publications

[1] expected

Preprints

1. **B. Morris** and P. P. Martin, *On semisimplicity criteria and non-semisimple representation theory for the kadar-yu algebras*, Dec. 2025. arXiv: 2512.24535 [math.RT]. URL: https://arxiv.org/abs/2512.24535.
2. D. Ibarra, G. Montoya-Vega, and **B. Morris**, *Temperley-Lieb categories on non-orientable surfaces*, Jun. 2025. arXiv: 2506.14319 [math.CT]. URL: https://arxiv.org/abs/2506.14319.

Talks

Presentations at conferences and workshops

1. **Morris, B**, *Some non-semisimple representation theory for the Kadar-Yu algebras*, The Interplay Between Skew Braces and Hopf-Galois Theory, (Leeds, UK), Feb. 2026.
2. **Morris, B**, *Temperley-Lieb categories on non-orientable surfaces*, Higher Structures: Recent developments and applications, (Hamburg, Germany), [Gong Show Talk], Sep. 2025.
3. **Morris, B**, *Temperley-Lieb categories on non-orientable surfaces*, The Yang-Baxter equation and all that, (Bedlewo, Poland), Jun. 2025.
4. **Morris, B**, *A diagram category for non-orientable surfaces*, Introduction to Modern Advances in Algebra, (Manchester, UK), Apr. 2025.
5. **Morris, B**, *A diagram category for non-orientable surfaces*, Biracks and Biquandles: Theory, applications, and new perspectives, (Leeds, UK), Dec. 2024.
6. **Morris, B**, *An unorientable extension of the Temperley-Lieb category*, Topological aspects of low-dimensional quantum physics, (Maynooth, Ireland), [Poster], Apr. 2024.
7. **Morris, B**, *Towards a factorised solution of the Yang-Baxter equation with $U_q(sl_n)$ symmetry*, SIDE 14.2 (Symmetries and Integrability of Difference Equations), (Warsaw, Poland), Jun. 2023.
8. **Morris, B**, *Towards a factorised solution of the Yang-Baxter equation with $U_q(sl_n)$ symmetry*, Applications of Hecke and related algebras: Representations, Integrability and Physics, (Les Houches, France), Feb. 2023.
9. **Morris, B**, *Towards a factorised solution of the Yang-Baxter equation with $U_q(sl_n)$ symmetry*, 65th Annual Meeting of the Australian Mathematical Society, Integrable Systems and Mathematical Physics special session, (Newcastle, Australia), Dec. 2021.

Seminar talks

10. **Morris, B**, *TBA*, Research Seminar on Quantum Topology and Categorification (QTCat), (Hamburg, Germany), [Upcoming], Jun. 2026.
11. **Morris, B**, *How to make lasagna*, Pure Mathematics Postgraduate Seminar, (Leeds, UK), Feb. 2026.
12. **Morris, B**, *Semi simplicity criteria for the Kadar-Yu algebras*, York Algebra Seminar, (York, UK), Nov. 2025.
13. **Morris, B**, *Semi simplicity criteria for the Kadar-Yu algebras*, Leeds Algebra Seminar, (Leeds, UK), Nov. 2025.
14. **Morris, B**, *The Yang-Baxter equation and quantum group symmetry*, Mathematical Physics at Leeds, (Leeds, UK), Nov. 2024.
15. **Morris, B**, *What's the deal with cellular algebras*, Pure Mathematics Postgraduate Seminar, (Leeds, UK), Oct. 2024.

16 **Morris, B**, *Algebra from statistical mechanics*, Students in Theoretical and Mathematical Physics, (Edinburgh, UK), Apr. 2024.

17 **Morris, B**, *An unorientable extension of the Temperley-Lieb category*, Junior London Algebra Colloquium, (London, UK), Mar. 2024.

18 **Morris, B**, *Lattice statistical mechanics is algebra*, Pure Mathematics Postgraduate Seminar, (Leeds, UK), Mar. 2024.

19 **Morris, B**, *Towards a factorised solution of the Yang-Baxter equation with $U_q(sl_n)$ symmetry*, Pure Mathematics Postgraduate Seminar, (Leeds, UK), Jan. 2023.

Conference Organisation

15/04–17/04/2026 [2] — *Introduction to Modern Advances in Algebra III*
Leeds (United Kingdom)
(organisers: O. McGrath, B. Mills, **B. Morris**)

26/03–27/03/2026 — Workshop for Leeds-Hamburg joint project (MIQC): *Dijkgraaf-Witten Theory, Tensor Categories, and Applications*
Leeds (United Kingdom)
(local organisers: P. Huston, P.P. Martin, J.F. Martin, **B. Morris**)

17/02/2026 — Workshop for Leeds-Hamburg joint project (MIQC): *Mathematical and Physical underpinnings of Topological Quantum Computation*
Leeds (United Kingdom)
(organisers: P.P. Martin, E. Rowell, **B. Morris**)

Research Visits

14/06 – 26/06/2026 [2] — Visiting PhD Student @ Universität Hamburg, Germany
Supported by Leeds-Hamburg joint project: MIQC
(host Prof. P. Wedrich) – 2 weeks

11/2019 – 02/2020 — Summer Research Scholar @ Australian National University, Canberrra, Austrlia
"Q-operators in Integrable Systems"
(host A/Prof. V. Mangazeev) – 3 months

Grants

2025 — Conference grants. "Introduction to Modern Advances in Algebra".
Organisers: O. McGrath, B. Mills, **B. Morris**.
Funding bodies: Heilbronn Institute , MAGIC Maths , LMS (London Mathematical Society), EPSRC "RepNet grant", University of Leeds. £ 8700

Participant in Leeds-Hamburg joint project: "Mathematics and Implementation of Quantum Computing" (MIQC).
Grant Holders: Prof. P. P. Martin, Prof. C. Schweigert
Funding bodies: University of Leeds, Universität Hamburg, Germany. £ 7600

Travel Grants for Early Career Researchers: used to attend "Yang-Baxter Equation and all that" (Bedlewo, Poland).
Grant Holder: **B. Morris**
Funding bodies: LMS (London Mathematical Society). £ 500

[2] Upcoming

Teaching experience

University of Leeds, Leeds (UK)

Demonstrator	**MATH1110 Real Analysis**	AY 2025 – 26
Marker	**MATH2130 Further Linear Algebra and Discrete Mathematics**	AY 2025 – 26
Demonstrator	**MATH1110 Real Analysis**	AY 2024 – 25
	MATH1120 Introduction to Group Theory	AY 2024 – 25
	MATH2017 Real Analysis	AY 2023 – 24
	MATH1050 Calculus and Mathematical Analysis	AY 2023 – 24
	MATH1055 Numbers and Vectors	AY 2023 – 24
Marker	**MATH3071 Groups and Symmetry**	AY 2023 – 24

Australian National University, Canberra (Australia)

Demonstrator	**ODEs** (SDU-ANU Joint Science College)	AY 2022
	Mathematical Abstraction I (SDU-ANU Joint Science College)	AY 2022
	MATH2301 Applied Mathematics I	AY 2022

Other Teaching Roles

Australian National University, Canberra (Australia)

Private Tutor — **MATH1115 Advanced Mathematics and Applications 1**
Private tuition for undergraduate student in pure mathematics — AY 2022

Academic Service

Other organisational experience

- 2025 — I helped write the successful, interdisciplinary project bid "Mathematics and Implementation of Quantum Computing" (MIQC) for the Leeds-Hamburg joint funding partnership.
- 2024 – 2025 — I co-organised (with L. Seemungal) the Pure PGR Seminar @ University of Leeds (UK).

Student Mentoring

- 2024-2025 — **Buddy** for first year PhD Students in Mathematics @ the University of Leeds
- 2019 — **Peer assisted learning (PAL) mentor** for first year chemistry students @ the Australian National University
- **Academic mentor** for for first year students in chemistry, physics and mathematics @ Ursula Hall, Australian National University

Other

Programming Languages

- Mathematica, Python, MatLab.

Language

- English (native).

References

Available on Request