Miłosz Szymański

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Research Interests

My research interests include Non-commutative Ring Theory, Algebraic Geometry, Representation Theory, Algebraic Topology, Category Theory, Mathematical Logic with emphasis on Model Theory, and the interactions between all these fields.

Education

MMath Degree - University of Edinburgh Sep. 2021 - present

Integrated Masters in Mathematics with Honours; predicted 1st class based on straight A record.

Listed below are some relevant courses, a full academic transcript is available upon request.

Algebraic Geometry	**Galois Theory**	**Topics in Rings and Representation Theory**
Differential Geometry	**Algebraic Topology**	**Honours Algebra**
Category Theory	**Group Theory**	**Axiomatic Set Theory**

Research Experience

Topics in Non-commutative Algebraic Geometry Sep. 2025 - present

For my dissertation I am studying how notions of dimension generalised to non-commutative spaces can be used to classify them. Specifically, I am investigating the classification of Artin-Schelter regular algebras through the papers *Stephenson&Zhang* 1997 and *Artin,Tate&Van der Bergh* 1991 which classify AS-regular algebras of global dimension two and three respectively. In addition, I am researching related questions concerning finite-dimensional filtrations of algebras and the Noetherianity of their associated graded algebras, through the work *McConnell&Stafford* 1988. Supervised by Prof. Susan Sierra.

Matroid Applications in Phylogenetic Algebraic Geometry Jul. 2025 - Sep. 2025

Studied the correspondence between phylogenetic models and their associated algebraic matroids, with a view towards investigating the generic identifiability results presented in the *Hollering&Sullivant* 2021 paper. Based on the authors' code written in the Mathematica language, I wrote a novel implementation of the generic identifiability algorithm in the SageMath language, and presented a complete exposition of the underlying matroid theory used in their results. Supervised by Dr Dimitra Kosta.

Intuitionistic and Many-Valued Logics Sep. 2024 - Mar. 2025

Examined the results of Gödel and Jaśkowski which relate Intuitionistic Logic and Many-Valued Logics as part of a group research project which was awarded an A grade. I was responsible for providing a detailed exposition of Mathematical Logic used in the statement and proofs of the results, as well as for setting the calendar for the project to ensure steady and timely progress. Towards the end of the project, we gave a well-received 30-min presentation to an audience of students and professors, in a mock-conference setting. Supervised by Prof. Antony Maciocia.

Phylogenetic Algebraic Geometry Jun. 2024 - Aug. 2024

Researched the work of B.Sturmfels and S.Sullivant on Phylogenetic Algebraic Geometry, specifically their results regarding the phylogenetic invariants of group-based models of claw trees. The report presents numerous explicit calculations, using the Macaulay2 language, of the examples mentioned in the works *Eriksson et al.* 2004 and *Sturmfels&Sullivant* 2005, and in detail explains the recursive procedure to obtain phylogenetic invariants of larger trees from simpler trees. Supervised by Dr Dimitra Kosta.

Professional Experience

Data Science Research Assistant Jan. 2024 - Jun. 2025

Conducted a data analysis of lecturing habits together with a team of other students, as part of a study into teaching practices conducted by Woods, Kinnear & Galloway. I was responsible for creating clear and informative visualisations of our results which developed my proficiency in R, and through weekly technical discussions with my team members I strongly improved my communication skills. My work was incorporated by the authors into their official communication.

Maths Outreach Intern Jun. 2023 - Aug. 2023

Worked closely with Dr Francesca Iezzi on conducting a data analysis on the SIMD metrics of partnered schools as well as on creating new activities which encourage mathematical thinking. Took a proactive role in the research for the new instalment of the Geometry Art & Mind exhibition; my contributions culminated into the development of a new exhibition on Sugihara Shapes which I together with Dr Iezzi showcased at the Talking Maths in Public 2023 conference. Furthermore, I have automated the look-up system used to identify the SIMD metrics of Scottish schools, which has greatly aided my team's efforts in completing a comprehensive data analysis of the partnered schools.

Outreach Experience

Member of the Maths Outreach Team at Edinburgh since 2021; highly involved with the numerous outreach initiatives at the University of Edinburgh. The following are selected high-profile projects:

MathsCircles Oct. 2021 - present

Part of a team which plans and runs maths activities for school children every month. This includes working with children on various problems in an interactive manner, probing their understanding and carefully guiding them to a potential solution, developing their confidence in their problem-solving abilities. I have also had the opportunity to run mini-classes on various mathematical topics, which included an exposition to topology for a high-school audience.

MathPals Jan. 2023 - present

As the treasurer of MathPALS, the university's peer-support scheme, I am responsible for working with the School of Maths on the financial and administrative side of things. Furthermore, having been a previous tutor, I am closely involved in the every-day running of MathPALS, regularly checking in with student volunteers for feedback and actively helping students with any concerns.

Maths Walking Tours 2023 - present

Responsible for the preparation and running of the annual Edinburgh mathematical walking tour. Improved my oral presentation skills by humorously lecturing on the mathematical history of the city. Through proper planning and good time-keeping we have been able to deliver a highly-engaging hour-long presentation to a non-expert audience.

Nabój Competition 2024 - present

Having previously worked with other volunteers to deliver the competition, this year I have taken on an executive role in the event committee. In particular, I will be responsible for recruiting new volunteers and the communication between them and the internal team. Through my contributions I hope to deliver a memorable event which will develop the pupils' passion for mathematics.

Edinburgh Science Festival Jan. 2023 - Apr. 2023

Was selected to co-organise and co-run the School of Maths' contribution to the Edinburgh Science Festival. This involved working closely with the individual project teams to research and develop the activities, developing my team-working and adaptability skills, as well as coordinating on a larger scale the entire exhibit, ensuring that the whole project is completed on time.