Conference 2025

Glasgow Grosvenor Hotel
G12 0TB

04 - 05 **November** 2025
Algebra, Geometry and Quantum CDT

Tuesday 4th November

09:00 - 10:00	Arrival from other institutions
10:00 - 10:30	Welcome tea and coffee
10:30 - 11:30	PostDoc talk: **Jennifer Brown,** University of Edinburgh
11:30 - 11:55	break
11:55 - 12:30	PhD talk: **Subrabalan Murugesan,** Heriot-Watt University
12:30 - 13:30	lunch
13:30 - 15:10	Short talks session
15:10 - 15:30	break
15:30 - 16:20	Careers talk: **Eugénie Hunsicker,** University of Loughborough
16:20 - 16:45	break
16:45 - 17:30	**Careers panel**
17:30 - 18:30	free time
18:30 - 20:30	**Conference dinner** @ Glasgow University Union
20:30 - 22:30	**Ceilidh** @ Glasgow University Union

Wednesday 5th November

09:00 - 09:30	Welcome tea and coffee
09:30 - 10:30	PostDoc talk: **Anja Meyer,** University of Manchester
10:30 - 11:00	break
11:00 - 11:35	PhD talk: **Lucia Noelle,** University of Glasgow
11:35 - 11:55	break
11:55 - 12:30	PhD talk: **Danil Kozevnikov,** University of Edinburgh
12:30 - 13:30	lunch
13:30 - 14:30	PostDoc talk: **James Rawson,** University of Glasgow
14:30 - 15:00	break
15:00 - 15:35	PhD talk: **Alessandro Proserpio,** University of Glasgow
15:35 - 16:00	break
16:00 - 17:00	PostDoc talk: **James Timmins,** University of Edinburgh
17:00 - 17:15	Thanks and farewell

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Careers panel

Dr Alan Logan,
Centre for Sustainable Road Freight,
Heriot-Watt University

Dr Charlotte Desvages,
Acoustics and Audio Group,
University of Edinburgh

Dr Daniele Turchetti,
Algebra and Number Theory Group,
Durham University

Prof Minhyong Kim,
Director of the International Centre for Mathematical Sciences,
Edinburgh

Prof Sara Lombardo,
Dean of the School of Mathematical and Computer Sciences,
Heriot-Watt University

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Postdoctoral speakers

Dr Jennifer Brown,
University of Edinburgh

TQFTs from graphical calculus

Abstract: *In this talk we'll introduce the graphical calculus of ribbon categories and how it leds to skein theory. Our motivating application will be the quantisation of character varieties, i.e. moduli spaces of flat connections.*
With this story in mind, we will show how to build 3D topological quantum field theories (TQFTs) using skein theory.

Dr Anja Meyer,
University of Manchester

Invariants in Group Cohomology

Abstract: *Invariant theory and group cohomology are two ways to gain information of a group action on a (algebraic) space. It is not surprising that they are closely linked. In this talk we will explore the point of view of group cohomology and how invariant theory provides crucial tools for computations. As example we will look at finite matrix groups in the modular case.*

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Postdoctoral speakers

Dr James Rawson,
University of Glasgow

Geometry Controls Arithmetic: Rational Points and Beyond

Abstract: *Finding solutions to equations has been a central theme in number theory for over 2000 years. In this talk, I will discuss recent results showing that the behaviour of rational solutions (and also larger classes of solutions) is determined by the geometry of an associated object.*

Dr James Timmins,
University of Edinburgh

Dimension in the Langlands programme

Abstract: *The Langlands programme is a branch of mathematics concerned with finding a deep connection between number theory and representation theory. Within the latter, a dimension-theoretic invariant manifests in three different ways: via growth, cohomology, and geometry. In this talk, you'll find out what this means and why I proved something about it during my PhD.*

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PhD plenary speakers

Subrabalan Murugesan, Heriot-Watt University

Spectral networks and abelianisation

Abstract: *The moduli space of flat G-connections on a Riemann surface C makes frequent appearances in physics, especially in the context of supersymmetric gauge theories. It was shown by [Gaiotto, Moore, Neitzke] that the moduli space admits a particularly nice set of coordinates when C is equipped with some additional structure known as a spectral network. In this talk, I will introduce the technology of spectral networks, and go over the above construction using a concrete example.*

Lucia Noelle, University of Glasgow

Adventures in Fock Spaces

Abstract: *Fock spaces are fundamental objects in the representation theory of quantum groups. In this talk I will give an overview of the combinatorics underlying it as well as present some connections to Degenerate Affine Hecke Algebras and Rational Cherednik Algebras. Join me for the journey!*

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PhD plenary speakers

Danil Kozevnikov,
University of Edinburgh

A biased introduction to homological mirror symmetry

Abstract: *Homological mirror symmetry (HMS) is a conjecture due to Maxim Kontsevich, predicting an equivalence between the derived category of coherent sheaves of an algebraic variety X and the Fukaya category of the "mirror" symplectic manifold Y. In this talk, I will introduce some basic ideas related to HMS, explain a general strategy for proving the conjecture (based on the ideas of Paul Seidel) and briefly survey how it could be applied to one of the broadest classes of mirror pairs, the Batyrev—Borisov mirrors.*

Alessandro Proserpio,
University of Glasgow

Open associativity equations and ADE singularities

Abstract: *Frobenius manifolds were introduced by B. Dubrovin in the nineties as a geometrical way to encode solutions to the WDVV equations, arising in 2d topological field theories. The parameter spaces of miniversal deformations of ADE singularities are well-known to carry such a structure. Much more recently, the existence of an extension to a flat F-manifold of one dimension higher was shown in these cases. We argue that extensions of rank two should be expected, even though we are yet to find them. This is based on ongoing work with my supervisor Ian Strachan.*

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Breakout rooms for the short talks session *13:30 - 15:30, 4th November*

Breakout room 2

"Algebra" group

1 ***Julia Bierent***
University of Edinburgh

Quantisation of wild character varieties

Abstract: *Wild character varieties are moduli space of Stokes local systems. They are described by a decorated complex surface, with line and point defects. We want to quantise them using factorisation homology. For that, we need to assign a category to the basic disks, with some tensor structure. The line defects are already known, but I will introduce what category we want to assign to the point defects, and what structure this category has.*

2 ***Francesco Tesolin***
Heriot-Watt University

Étale actions of inverse semigroups and a generalisation of the Munn semigroup

Abstract: *I recall the notion of étale action of an inverse semigroup and show the connection of these actions with presheaves of sets. I will define a generalisation of the Munn semigroup of a semilattice to the case of a presheaf over a semilattice. I will explain the connection between étale actions and representations into the generalised Munn semigroup. I shall talk about the connection between working with spaces and working with frames.*

3 ***Ruth Raistrick***
University of Glasgow

Galois Module Structures Unit Groups of Number Fields

Abstract: *Arithmetic statistics is the study of "the proportion" of arithmetic objects. That is to say, we count certain objects up to some bound, in this case we count a certain Galois module structure of the free part of the units of a number field. Say we have K a number field of unit rank 1 and L, an extension of K of unit rank 2, the free part of the unit group has the natural structure of a Gal(L/K)-module, given we only have two possible such structures, we ask how often we see one over the other.*

4 ***Scott Warrander***
University of Glasgow

Quiver varieties and quantum affine algebras

Abstract: *I will discuss the construction of representations of quantum affine algebras on the equivariant K-theory of Nakajima quiver varieties, including the relation to the theory of stable envelopes.*

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Breakout rooms for the short talks session *13:30 - 15:30, 4th November*

Main conference room

"Geometry" group

1 ***Susanna Terron***
University of Glasgow

Thompson knot theory and connected sum

Abstract: *In 2017, Vaughan Jones introduced a construction to obtain knots and links from Thompson's group F, and proved surjectivity for such construction. The question of when two group elements result in the same link is still unanswered. I will present the construction and show how it behaves with connected sum, obtaining a surjective monoid homomorphism into pointed links up to isotopy.*

2 ***Emanuel Roth***
University of Edinburgh

Canonical reductions

Abstract: *In the classical moduli theory of bundles, we impose stability to obtain varieties parametrizing bundles. When bundles are unstable, we have less of a grasp on how to classify them. Harder and Narasimhan constructed a unique filtration of vector bundles that measures to what extent a bundle is stable, which has been generalized to coherent sheaves and principal bundles (by Ramanathan) under the name of canonical reductions. Results from Kai Behrend's PhD thesis provide a method of constructing canonical reductions through complementary polyhedra, a root-theoretic object that records the stability of bundles. If time permits, I will explain how such polyhedra help us construct canonical reductions of Higgs bundles, parabolic bundles, parahoric bundles and more, which are in the interest of recent research."*

3 ***Isacco Nonino***
University of Glasgow

Pseudo-isotopy for topological 4-manifolds

Abstract: *We define obstructions which obstruct topological pseudo-isotopies from being isotopic to isotopies in dimension four. These match the smooth obstructions of Hatcher-Wagoner for smooth pseudo-isotopies. This new definition opens the gates for future studies on purely topological pseudo-isotopies of 4-manifolds.*
This is joint work with Daniel Galvin.

4 ***Xiaoqi Lu***
University of Glasgow

Hilbert transforms on Coxeter groups and groups acting on buildings

Abstract: *Cotlar identities were used as a tool to show the L_p $(1 < p < \infty)$ boundedness of Hilbert transforms on the real line. In 2017, Mei and Ricard first generalized Cotlar identities to the non-commutative setting and showed the L_p-boundednesses $(1 < p < \infty)$ of Hilbert transforms on free groups. Then in 2022, González-Pérez, Parcet and Xia generalized the result on groups acting on $\mathbb{R}$-trees by using a geometric model. In this talk, we will further discuss this topic on Coxeter groups (abstract reflection groups) and groups which admit actions on buildings. This is a joint work with Runlian Xia.*

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Breakout rooms for the short talks session *13:30 - 15:30, 4th November*

Breakout room 1

"Quantum" group

1 Giorgio Pizzolo
Durham University

The Asymptotic Homotopy Algebra of Gauge Theories

Abstract: *Lie algebras play a central role in gauge theories, providing the algebraic structure of infinitesimal gauge transformations. However, once equations of motion or field-dependent gauge parameters are taken into account, the algebra "opens up" into something richer, namely a homotopy Lie algebra. In this talk, I will motivate the study of such algebras through their relevance to the double copy and to flat space holography, and explain how they encode the full structure of gauge theories (symmetries, dynamics, and consistency conditions) within a single coherent framework. I will then show how the homotopy Lie algebra of self-dual Yang–Mills theory at null infinity can be derived from its bulk structure via homotopy transfer. Based on arXiv:2503.21035.*

2 Hidde Stoffels
Heriot-Watt University

Dr. Stoffels on: How I learned to stop worrying and love the boom

Abstract: *What happens when we make a large amount of charge explode? As simplified descriptions of charge detectors, light-ray operators promise to answer this question with minimal damage to university buildings. In this talk, I will introduce light-ray operators, in particular in the context of conformal field theory. Additionally, I'll discuss what we can learn by computing correlation functions of light-ray operators in a highly charged (and rapidly exploding) state.*

3 Laura Walsh
University of Edinburgh

The Landau Bootstrap

Abstract: *The evaluation of Feynman integrals is one of the biggest hurdles in physicists' endeavour to determine scattering amplitudes - vital quantities that bridge the gap between theoretical predictions and experimental data. It is well known that these integrals give rise to special functions with rich analytic structures, one particular case being multiple polylogarithms.*

In this talk, I will introduce multiple polylogarithms and discuss the Landau bootstrap; by studying the analytic structure of the integrand and contour involved, we are able to gather information that allows us to constrain the space of functions that appear in the final result. These ingredients then allow us to determine the full form of the integral, effectively "bootstrapping" the result without ever having to perform an integration.

4 Benjamin Haake
University of Edinburgh

Gauging Higher Group Symmetries (a.k.a. Quotienting a physical theory by a higher group action)

Abstract: *I will briefly introduce the notions of generalised symmetries and higher-group symmetries in particular. The orbifold construction then serves as a tool to gauge such symmetries, producing a new theory from the given one. In some cases, this can be undone by gauging a symmetry of the resulting theory. On this journey, we encounter higher groups and higher categories, Frobenius algebras and their modules, and many group actions.*