# James Rawson

*PhD student*

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## Current Projects

Under the supervision of Samir Siksek, I am exploring low degree points on curves and surfaces. In the case of curves, my focus is on understanding the Galois theory of the points. The goal is to find explicitly computable criteria for when a curve has infinitely many points with specified Galois group. We expect this to be closely related to the geometry of the curve, as in Abramovich–Harris, and Kadets–Vogt. For surfaces, in ongoing joint work, the focus is on understanding the set of degrees where points of this degree are dense in the surface. We are trying to determine both it explicitly for certain classes of surfaces (primarily products of curves), and also find structure in this set for arbitrary surfaces.
As well as this principal focus, I am interested in topics in classical algebraic geometry, computational number theory and modular jacobians.

## Preprints

May 2024 **Cyclic Cubic Points on Higher Genus Curves**
https://arxiv.org/abs/2405.13743

March 2024 **On a problem posed by Bjorn Poonen**
https://arxiv.org/abs/2403.09440

February 2024 **Computing Tangent Spaces to Eigenvarieties**
https://arxiv.org/abs/2402.13799

January 2024 **3-Torsion Subgroups of Jacobians of Plane Quartics (joint with Elvira Lupoian)**
https://arxiv.org/abs/2401.13577

November 2022 **Solvable Points on Higher Genus Curves**
To appear in the Bordeaux Journal of Number Theory. https://arxiv.org/abs/2211.10367

## Teaching

2021–2023 **Supervisions**, *University of Warwick*
Supervisions at Warwick are small group (typically 5 students) teaching for first year students. They are the main source of support, outside lectures, for the core mathematics modules (covering analysis, algebra and differential equations and multivariable calculus). This entails meeting the students twice a week, as well as marking assignments. I saw three groups of students through their first year.

2023– **Support Classes**, *University of Warwick*
Support classes are the classroom opportunities outside of lectures for older students. These are larger groups, met weekly, for a single subject. As well as discussing homework questions, this entails marking assignments. I am currently providing these classes for a second year course on geometry, with a focus on the underlying isometry groups.

## Education

2021– **PhD Mathematics**, *Warwick University*

I am working as a student of Samir Siksek and, formerly, also under David Loeffler. My research interests are at the intersection of geometry and number theory. I am exploring low degree points on varieties. I also have an interest in computational number theory

2020–2021 **MMath Mathematics**, *Cambridge University*, Distinction

Course topics include algebraic number theory, algebraic geometry (via scheme theory), elliptic curves, modular forms, and profinite groups. In addition, a dissertation on the Honda-Tate theorem supervised by Rong Zhou

2017–2020 **BA Mathematics**, *Cambridge University*, 1:1

Topics covered include number fields, Galois theory, classical algebraic geometry, representation theory, algebraic topology and differential geometry. The course also contained coursework focusing on a fusion of mathematics and programming, along with technical report writing

## Undergraduate Research

Summer 2020 **Enumerative Geometry of Quadric Surfaces**

Approximately 8 weeks spent virtually collaborating with a peer under the supervision of Dhruv Ranganathan, investigating the characteristic number problem on a quadric surface via moduli spaces, in the style of Vakil. The numbers for incidence at points and tangency to lines were completely computed for rational curves. Preliminary results were also determined for genus 1 curves, with a large number fully justified. Additionally, a result analogous to Kontsevich's formula for rational plane curves was derived. A report summarising this work will be available at `https://www.dhruvrnathan.net/undergraduate-research`

Summer 2019 **Combinatorial Group Theory**

Under the supervision of Matthew Tointon, I investigated the structure of groups with filtrations of bounded growth. In particular, if a filtration of a finitely-generated group has that the quotients have diameter bounded below by a fixed power, $\alpha > 0$ of their order, the filtration is said to be $D_\alpha$. We studied groups where all filtrations were $D_\alpha$ for some $\alpha$. I was able to show under suitable assumptions, uniform $D_{\frac{1}{2}}$ groups of sub-exponential growth are virtually nilpotent, and with assumption of the existence of certain filtrations, this holds for all $\alpha > 0$

## Awards

- *College Scholarship*: I was elected a scholar of the college for the academic years starting 2018, 2019, and 2020. This is in recognition of my examination results
- *College Prize*: Due to my results in my finals, I was awarded a College Prize for the academic year 2020-21, in addition to the renewal of my scholarship

## Skills

- *Programming*: I have been a keen programmer for close to a decade, with plenty of computational methods experience. In this time I have used several programming languages, including Python, Magma and Julia.