BARINDER SINGH BANWAIT

@ barinder.s.banwait@gmail.com   🔗 barinderbanwait.github.io   ⚙ github.com/barinderbanwait   🏴 British

RESEARCH INTERESTS

Algebraic Number Theory   Arithmetic Geometry   Abelian Varieties   Modular Forms

ACADEMIC APPOINTMENTS

Postdoctoral researcher in Mathematics
Boston University

📅 Sep 2022 – present   📍 Boston, USA

Mentor: Prof. Jennifer Balakrishnan

- -

Postdoctoral researcher in Mathematics
Ruprecht-Karls-Universität Heidelberg

📅 Oct 2021 – Apr 2022   📍 Heidelberg, Germany

Mentor: Prof. Dr. Gebhard Böckle

- -

Postdoctoral researcher in Mathematics
Harish-Chandra Research Institute

📅 Feb – Sep 2021   📍 Prayagraj, India

- -

Visiting Scientist
Max-Planck-Institut für Mathematik

📅 Oct 2016 – Nov 2016   📍 Bonn, Germany

Host: Prof. Alex Bartel

- -

Postdoctoral researcher in Mathematics
Universität Duisburg-Essen

📅 Jan 2015 – Jan 2017   📍 Essen, Germany

Mentor: Prof. Dr. Ulrich Görtz

- -

Postdoctoral researcher in Mathematics
Institut national de recherche en informatique et en automatique (INRIA)

📅 Jan – Dec 2014   📍 Bordeaux, France

Mentor: Dr. Andreas Enge

PAPERS AND PREPRINTS

- **Computing nonsurjective primes associated to Galois representations of genus 2 curves**, with A. Brumer, H. J. Kim, Z. Klagsbrun, J. Mayle, P. Srinivasan and I. Vogt. *arXiv:2301.02222*. 2023, submitted.
- **Modularity over $\mathbb{C}$ implies modularity over $\mathbb{Q}$**. *arXiv:2212.14412*. 2022, submitted.
- **Explicit isogenies of prime degree over number fields**, with M. Derickx. *arXiv:2203.06009*. 2022, submitted.
- **Cyclic isogenies of elliptic curves over fixed quadratic fields**, with O. Adascalitei and F. Najman. *arXiv:2206.08891*. 2022, submitted.
- **Explicit isogenies of prime degree over quadratic fields**. *International Mathematics Research Notices*. (2022)
- **Examples of abelian surfaces failing the local-global principle for isogenies**. *Research in Number Theory*. 7(55) (2021)
- **Del Pezzo surfaces over finite fields and their Frobenius traces**, with F. Fité and D. Loughran. *Mathematical Proceedings of the Cambridge Philosophical Society*. 167(1) (2019) 35-60.
- **Tetrahedral Elliptic Curves and the local-global principle for isogenies**, with J. Cremona. *Algebra and Number Theory*. 8:5 (2014) 1201-1229.

INDUSTRY EXPERIENCE

Quantitative Analyst
Quantile

📅 Sep 2019 – Mar 2020   📍 London, UK

- Linear, mixed-integer, and multi-objective optimisation for compression of interest-rate derivative portfolios using Gurobi.
- Visualisation of FX trading datasets across several client investment banks.
- Modelling of reset risk and PV01 for swaptions.
- Git code management with Bitbucket.

- -

Research Engineer
CMR Surgical

📅 Jan 2018 – Sep 2019   📍 Cambridge, UK

- Research and optimisation of robotic control algorithms, including inverse kinematics and mass-spring-damper models.
- Mathematical modelling in Matlab, with Robotics and Control Systems toolboxes.
- Writing production-level, safety-critical embedded C code, compliant with MISRA C and International Standard IEC 62304.
- Time-series telemetry processing in Python, using pandas, numpy, and matplotlib.
- Analysis and visualisation of system log messages with Elasticsearch and kibana.
- Development with Amazon Web Services, including Lambda, S3, and Athena.
- Implementing machine learning algorithms for robot arm condition monitoring, using scikit-learn and Tensorflow.
- Unit and Regression tests in C, C++, and Matlab, including Google Test framework, continuously integrated with TeamCity.
- Agile software development with SVN and Git.

EDUCATION

PhD Mathematics
University of Warwick

📅 Jan 2010 – Sep 2013   📍 Coventry, UK

Supervisor: Prof. John Cremona
Thesis: On some local to global phenomena for abelian varieties

- -

BA and MMath Mathematics
University of Cambridge - Christ's College

📅 Oct 2005 – June 2009   📍 Cambridge, UK

MMath (*Part III of the Mathematical Tripos*) - Distinction
Part III Essay: Class Field Theory (Cohomological Approach), supervised by Dr. Tim Dokchitser

INVITED TALKS   *(recent)*

- MIT Number Theory Seminar, Cambridge MA, Nov 2022
- Boston University Number Theory Seminar, Boston MA, Nov 2022
- Séminaire de Théorie des Nombres, Université de Strasbourg, France, Apr 2022
- Séminaire de Théorie des Nombres, ENS de Lyon, France, Apr 2022
- Séminaire de Théorie des Nombres, Université Blaise-Pascal, Clermont-Ferrand, France, Apr 2022
- Bhaskaracharya Pratishthana, Pune (online), Feb 2022
- Atelier PARI/GP 2022, Besançon, France (online), Jan 2022
- Arithmetic Geometry Seminar, Universität Bayreuth (online), July 2021
- VaNTAGe Seminar (online), June 2021
- Effective Methods in Algebraic Geometry (online conference), June 2021
- Algebra Seminar, Rijksuniversiteit Groningen (online), June 2021
- Mathematics Colloquium, Indian Institute of Technology, Hyderabad (online), June 2021
- University of Washington Number Theory Seminar (online), June 2021

- Séminaire de Théorie Algorithmique des Nombres, Bordeaux (online), May 2021
- Stat-Math Unit, Indian Statistical Institute, Delhi (online), Apr 2021
- Mathematics Colloquium, Indian Institute of Science Education and Research, Mohali (online), Apr 2021
- Joining Seminar, Harish-Chandra Research Institute, Prayagraj (online), Feb 2021
- Zagreb Number Theory Seminar (online), Jan 2021
- Number Theory Seminar, Indian Institute of Science Education and Research, Pune, Jan 2020

ACADEMIC MEMBERSHIPS

Member of the *L-functions and Modular Forms Database*. 15 pull requests merged since October 2020 across the codebase, including Classical and Bianchi Modular Forms, Testing utilities, and Dirichlet Characters.

OPEN SOURCE SOFTWARE CONTRIBUTIONS

Absolutely simple endomorphism rings - Sage
📅 2021

- First functionality to check for geometric simplicity of Jacobians of genus 2 curves over $\mathbb{Q}$.
- Scheduled for inclusion into sage-9.5.

TEACHING EXPERIENCE

Course Lecturer

Computational Number Theory
📅 Oct 2021 - present   📍 Heidelberg, Germany

Masters course covering algorithmic and computational topics in elliptic curves, modular forms, and algebraic number theory.

Vertiefung Zahlentheorie
📅 Apr - July 2016   📍 Essen, Germany

Representability of primes via quadratic forms - from Fermat, Euler, Gauss, and to Artin Reciprocity. Three hours per week for 15 weeks. Lectures given in German.

Einführung in das Computer-Algebra-Paket *Sage*
📅 Sep 2015   📍 Essen, Germany

Introductory week-long course on *Sage* aimed at final year undergraduates. Course given in German.

Algebraic Number Theory
📅 July 2009   📍 Linyi, China

Introductory course at summer school aimed at second year undergraduates.

- -

Seminar Organiser

Abelian Varieties
📅 Oct 2021 - present   📍 Heidelberg, Germany

Masters level seminar organised with Prof. Böckle.

Algebraic Surfaces
📅 Oct 2015 - Jan 2016   📍 Essen, Germany

Masters level seminar organised with Prof. Görtz.

- -

Teaching Assistant

Linear Algebra	🗓 Apr - July 2015	🎓 Vytautas Paškūnas	🏛 Universität Duisburg-Essen
Modular Forms	🗓 Oct - Dec 2012	🎓 Mehmet Haluk Şengün	🏛 University of Warwick
Algebraic Number Theory	🗓 Jan - Mar 2012	🎓 Johan Bosman	🏛 University of Warwick
Elliptic Curves	🗓 Oct - Dec 2011	🎓 Lassina Dembélé	🏛 University of Warwick
Algebraic Number Theory	🗓 Jan - Mar 2010	🎓 William Hart	🏛 University of Warwick

Undergraduate Supervisor

🗓 Oct 2010 - Apr 2013   🏛 University of Warwick

Holding supervisions of groups of 5 undergraduates.

STEP Mentor

🗓 Apr 2007 – 2009   🏛 University of Cambridge

Coaching groups of 10 A-Level students in the STEP mathematics entrance exams to increase diversity and access at Cambridge.

REFEREE DUTIES FOR JOURNALS

Mathematics of Computation International Journal of Number Theory Algebra and Number Theory
Research in Number Theory

AWARDS

Engineering and Physical Sciences Research Council, UK

🗓 Jan 2010

- Full funding for PhD studies.

Institute for Advanced Study, Princeton NJ, USA

🗓 Jul 2008

- Full funding to attend Undergraduate Summer School Program of Park City Mathematics Institute on Algebraic Geometry in 2008.

Whelan Prize

🗓 Oct 2007

- Awarded by Christ's College, University of Cambridge, for outstanding examination performance (top of college in mathematics).

Nuffield Trust, UK

🗓 Jul 2007

- Undergraduate Research Bursary to conduct summer research project.
- Supervisor: Dr. Jon Bevan, University of Surrey, UK.

LANGUAGES

Language	Level		Skill	Level
English	●●●●●●		Python	●●●●●●
ਪੰਜਾਬੀ (Punjabi)	●●●●●		Sage	●●●●○
Deutsch	●●●●○		C	●●●●○
हिंदी (Hindi)	●●●○○		PARI/GP	●●●○○
Français	●●●○○		Magma	●●●○○