

Marius Leonhardt

Curriculum Vitae

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Research Interests

Area Arithmetic Geometry
Topics Rational points, anabelian geometry, abelian varieties, complex multiplication, Shimura varieties

Employment

Oct 2024 – Mar 2025 **Substitute Professor**, Goethe-Universität Frankfurt.
giving a lecture about the arithmetic of elliptic curves.

since Apr 2020 **Research Associate**, Universität Heidelberg.
Arbeitsgruppe of Prof. Alexander Schmidt (Arithmetic Homotopy Theory).
Since Sept 2021: part of **CRC-TRR GAUS** (<https://crc326gaus.de/>), project C01.
Since June 2022: additional role as **person of contact for young researchers** within GAUS;
mentor of two PhD students.
June - Sept 2024: deputy member of the Research Council Fields of Focus 2 (<https://www.uni-heidelberg.de/en/research/research-profile/fields-of-focus/field-of-focus-ii>), coordinating the academic development within the faculties of chemistry, engineering, physics, and mathematics. Part of the excellence strategy at Heidelberg University.

Publications and Preprints

4. **Bounds on the Chabauty–Kim locus of hyperbolic curves** (with L.A. Betts and D. Corwin), *Int. Math. Res. Not. IMRN*, 2024, Issue 12, 9705–9727; <https://doi.org/10.1093/imrn/rnae067>, arXiv:2206.11085
3. **Linear and quadratic Chabauty for affine hyperbolic curves** (with M. Lüdtkke and J.S. Müller), *Int. Math. Res. Not. IMRN*, 2023, Issue 21, 18752–18780; <https://doi.org/10.1093/imrn/rnad185>, arXiv:2301.11193
2. **Plectic Galois actions on CM points and connected components of Hilbert modular varieties**, *Bull. Lond. Math. Soc.*, 54(6):2254–2277, 2022; <https://doi.org/10.1112/blms.12692>, arXiv:2001.11097
1. **Plectic Arithmetic of Hilbert modular varieties**, PhD thesis, <https://doi.org/10.17863/CAM.49057>

Education

2015 – 2020 **Ph.D. in Pure Mathematics**, University of Cambridge, DPMMS.
Thesis: **Plectic Arithmetic of Hilbert modular varieties**.
Supervisor: Tony Scholl

2012 – 2015 **M.Sc. in Mathematics**, Universität Heidelberg and Karlsruhe Institute of Technology.
Started at Karlsruhe, interrupted for a year at Cambridge, continued at Heidelberg.
Master thesis: **Galois characteristics of local fields**.
Thesis advisor: Alexander Schmidt. Final grade: 1.0.

2013 – 2014 **MAST in Mathematics**, University of Cambridge, Trinity College.
Part III essay (mini thesis): **p -adic L -functions**.
Essay advisor: Tony Scholl. Final grade: with distinction.

2009 – 2012 **B.Sc. in Mathematics**, Karlsruhe Institute of Technology.
Bachelor thesis: **Minkowski’s existence and uniqueness theorem for surface area measures**.
Thesis advisor: Daniel Hug.

Scholarships and Awards

- 2017 **Smith-Knight & Rayleigh-Knight Prize**, essay prize.
- 2015 **EPSRC Studentship #1648608**, covering university fees.
- 2015 **Trinity Internal Graduate Studentship**, maintenance stipend.
- 2011 – 2015 **German National Academic Foundation**, monthly stipend .
- 2011 – 2012 **Deutschlandstipendium**, monthly stipend.

Talks

At conferences and workshops.

- The Mordell conjecture 100 years later, MIT, Cambridge MA, 2024.
- Journées Arithmétiques, Nancy, July 2023.
- British Mathematical Colloquium (BMC-BAMC), Glasgow, April 2021.
- Christmas workshop for geometry and number theory, Karlsruhe, Dec 2019.
- Young Researchers in Algebraic Number Theory, Warwick, Nov 2019.
- Journées Arithméétiques, Istanbul, July 2019.
- Young Researchers in Algebraic Number Theory, Sheffield, Nov 2018.
- “Kleine AG” about Shimura varieties, Bonn, Oct 2018.

At research seminars.

- GAUS seminar, Frankfurt, Oct 2024.
- Algebra seminar, Groningen, May 2022.
- DFG research group “symmetry, geometry, arithmetic”, Heidelberg, Jan 2020.
- Linfoot Number Theory Seminar, Bristol, May 2018.
- Junior Seminar, Lancaster, April 2018.
- Number Theory Seminar, Cambridge, Feb 2017.
- Number Theory Seminar, Copenhagen, Dec 2016.
- Junior Algebra/Logic/Number Theory Seminar, Cambridge, Nov 2016.

General mathematical audience and colloquia.

- Tag der Mathematik, Heidelberg, Oct 2024
- Mathematisches Kolloquium, Universität Heidelberg, May 2024
- Trinity Mathematical Society Centenary Symposium, Cambridge, Feb 2019.
- Trinity Mathematical Society Symposium, Cambridge, Feb 2018.
- PhD Colloquium, Cambridge, April 2017.

University teaching

- 2024 **Goethe-Universität Frankfurt.**
 - Winter Term 2024/25: Arithmetic of Elliptic Curves (lecture)
 - Co-supervision of two PhD students
 - Supervision of 3 Bachelor theses

- since 2020 **Universität Heidelberg.**
 - Summer Term 2024: Algebraic Number Theory II (exercise sheets)
 - Winter Term 2023/24: Étale cohomology I (example classes)
 - Summer Term 2023: Galois cohomology II (example classes)
 - Winter Term 2022/23: Galois cohomology I (example classes)
 - Winter Term 2022/23: Visualising root systems (HEGL student project with A. Strupp), <https://apps.hegl.mathi.uni-heidelberg.de/Proseminar-WS22-Root-Systems/>
 - Summer Term 2022: Galois and fundamental groups (seminar)
 - Summer Term 2021: Arithmetic of Elliptic Curves (lecture)
 - Winter Term 2020/21: Algebra 1 (teaching assistant, example classes and sheets)
 - Winter Term 2020/21: p -adic numbers (proseminar)
 - Summer Term 2020: Lubin–Tate theory (seminar)
 - Summer Term 2020: E-Learning challenge about digital realisation of seminars
 - Supervision of 10 Bachelor theses and 1 Master thesis.

- 2015 – 2019 **University of Cambridge**, supervisor and teaching assistant.
- Easter Term 2019: number fields.
 - Lent Term 2019: algebraic geometry.
 - Michaelmas Term 2018: Lie algebras and their representations (teaching assistant).
 - Easter Term 2018: number fields.
 - Lent Term 2018: groups — rings — modules.
 - Michaelmas Term 2017: Lie algebras and their representations (teaching assistant).
 - Easter Term 2017: number fields.
 - Lent Term 2016: number fields.
 - Michaelmas Term 2016: number theory.
 - Easter Term 2016: number fields.
 - Lent Term 2016: number fields.
 - Michaelmas Term 2015: linear algebra.
- 2014 – 2015 **Universität Heidelberg**, examples classes.
- Summer Term 2015: functional analysis.
 - Winter Term 2014/15: advanced mathematics III for physicists.
- 2010 – 2013 **Karlsruhe Institute of Technology**, examples classes.
- Summer Term 2013: coding and cryptography (seminar).
 - Winter Term 2012/13: mathematics III for economical engineers.
 - Winter Term 2012/13: stochastic geometry (lecture notes).
 - Summer Term 2012: probability theory.
 - Summer Term 2012: spatial stochastics (lecture notes).
 - Winter Term 2011/12: introduction to stochastics.
 - Summer Term 2011: mathematics II for economical engineers.
 - Winter Term 2010/11: mathematics I for economical engineers.

Other Teaching Activities

- July 2024 **Course Instructor**, Deutsche Schülerakademie Torgelow.
Organising a course about the magic of solving or insolubility of (algebraic, Diophantine, differential) equations, aimed at final year high school students (age 17).
- Aug 2021 **Course Instructor**, Deutsche Schülerakademie (online).
Organising a course about elliptic curve cryptography, aimed at final year high school students (age 17).
- Feb 2020 **Course Instructor**, Abiturma, Germany.
Teaching a preparatory course for the final mathematics exam (Abitur) in high school.
- July 2018 **Course Instructor**, Deutsche JuniorAkademie Neuerburg.
Organising and realising a course about the mathematical and practical aspects of knots, aimed at secondary school students (age 13).

Organisational Roles

- Feb 2024 organiser of the Winter Workshop Chabauty–Kim, Heidelberg.
- Oct 2023 organiser of a retreat for the junior researchers within GAUS, Oberwesel.
- Apr 2023 Study group on six functor formalism and Poincaré duality, Heidelberg.
- 2023 organiser of “What is . . . ?” seminar for young researchers, Heidelberg.
- May 2019 organiser of a workshop (“Kleine AG”) on Serre’s Modularity Conjecture, Bonn.
- 2015 – 2019 chair of the number theory section of the part III seminars, Cambridge.
- Oct – Dec 2017 Learning Seminar on Drinfeld upper half plane and p -adic uniformization of Shimura curves, Cambridge.
- May – July 2017 Learning Seminar on p -adic Hodge theory, perfectoid spaces and Scholze’s torsion paper, Cambridge.

Participation at selected conferences and workshops

- May/June 2023 An expedition into Arithmetic Geometry, Leiden.

- Oct 2022 Arithmetic Algebraic Geometry, Darmstadt.
- Sept 2022 Women in Arithmetic Geometry, Heidelberg.
- Aug 2022 Mordell Conference (100 years of elliptic curves), Cambridge.
- Apr 2022 Cohomology of varieties, Warsaw.
- July 2020 Lean for the Curious Mathematician, Online.
- Nov 2019 Workshop (“Kleine AG”) on Lawrence–Venkatesh’s proof of Mordell’s conjecture.
- June 2019 Summer School on Computational Number Theory, Bristol.
- Oct 2017 Workshop (“Kleine AG”) on Faltings’ *Endlichkeitssätze für Abelsche Varietäten*, Heidelberg.
- Mar 2017 Arizona Winter School on Perfectoid Spaces, Tucson.
- Feb 2017 Workshop (“Kleine AG”) on Tate’s *p-divisible groups*, Heidelberg.
- June 2016 “Crash course” on Shimura varieties, Leiden.

Study groups

- 2024/25 Mochizuki’s proof of the Hom-Conjecture, Frankfurt and Heidelberg.
- 2024 Geometric Galois representations and where to find them, Frankfurt.
- 2024 Purity for flat cohomology, Heidelberg.
- 2023/24 Applications of the étale fundamental gerbe, Heidelberg and Frankfurt.
- 2023/24 Rigid Meromorphic Cocycles, Heidelberg.
- 2023 Six functor formalism and Poincaré duality, Heidelberg.
- 2022/23 *K*-theory of the integers, Heidelberg and Mainz.
- 2022 Tamagawa’s Grothendieck conjecture for affine curves, Heidelberg and Frankfurt.
- 2021/22 Hübner–Schmidt’s Tame cohomology, Heidelberg.
- 2021/22 Fornea–Gehrmann’s Plectic Stark–Heegner points, Heidelberg.
- 2021 Boxer–Pilloni’s Higher Hida Theory, Heidelberg.
- 2020/21 Clausen–Scholze’s Condensed Mathematics, Heidelberg.
- 2020 Lawrence–Venkatesh’s Diophantine problems and *p*-adic period mappings, Heidelberg.
- 2019 Deligne–Lusztig theory, Cambridge.
- 2018 Lawrence–Venkatesh’s proof of the Mordell conjecture, Cambridge.
- 2018 Geometric Satake equivalence, Cambridge.
- 2018 Vincent Lafforgue’s *shtukas* and excursion operators, Cambridge.
- 2017 Scholze–Weinstein’s moduli of *p*-divisible groups, Cambridge.
- 2017 Drinfeld’s work, Cambridge.
- 2016 The Euler system of Heegner points, Cambridge.
- 2016 Scholze’s Langlands–Kottwitz method for the modular curve, Cambridge.

Languages and IT

- Languages German (native), English (fluent), Spanish (basic), French (reading)
- IT Basic knowledge of SageMath, some knowledge of Python

Hobbies

roundnet, climbing, mountaineering, reading