

# Andreas Johannes Mihatsch

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## Research Interests

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My research area is arithmetic geometry. I am especially interested in the geometry of cycles on Shimura varieties, their relations with automorphic representations and orbital integrals, their modularity properties when assembled into arithmetic theta series (Kudla program), and algebraic aspects of their intersection theory.

## Academic Positions

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Oct. 2023 – Mar. 2024	Visiting Scholar, MIT Host: Prof. Wei Zhang
July 2020 – Present	Wissenschaftlicher Assistent (Akademischer Rat a. Z.), Bonn University Arithmetic Geometry Group
Sep. 2019 – July 2020	Postdoc, MIT Mentor: Prof. Wei Zhang Funding: DFG Research Stipend MI 2591/1-1
Jan. 2018 – Sep. 2019	Postdoc, Bonn University Mentor: Prof. Peter Scholze

## Non-Academic Positions

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Oct. 2016 – Dec. 2017	Consultant for credit risk management Basycon Unternehmensberatung GmbH, München
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## Education

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Aug. 2014 – Dec. 2014	Visiting Scholar, MSRI, Berkeley Trimester program: <i>New Geometric Methods in Number Theory</i>
July 2014 – Sep. 2016	Ph. D. studies, Bonn University Thesis title: <i>Relative unitary RZ spaces and the AFL</i> Advisor: Prof. Dr. Michael Rapoport
June 2014	M. Sc., Bonn University Thesis title: <i>An Arithmetic Transfer Identity</i> Advisor: Prof. Dr. Michael Rapoport
March 2012	B. Sc., Ulm University Thesis title: <i>Nicht-archimedische Schottkygruppen</i> Advisor: Prof. Dr. Werner Lütkebohmert
Sep. 2009 – June 2010	Zivildienst
June 2009	Abitur, Landesgymnasium für Hochbegabte, Schwäbisch Gmünd

## Publications

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### Preprint

11. *An arithmetic Siegel–Weil formula for central simple algebras*  
with T. Yang, Preprint (2024).
10. *A linear AFL for quaternion algebras*,  
with N. Hultberg, Preprint (2023), arXiv:2208.10144.
- \*9. *Arithmetic transfer for inner forms of  $GL_{2n}$***   
with Q. Li, Preprint (2023), arXiv:2307.11716.
8. *On the linear AFL: The non-basic case*  
Preprint (2022), arXiv:2208.10144.

### Published and Accepted

- \*7.  *$\delta$ -Forms on Lubin–Tate space***  
to appear in Duke Math. J. (2023).
6. *On Tropical Intersection Theory*  
Selecta Math. **29** (2023), no. 2, Paper No. 17, 34 pp.
- \*5. *On the Arithmetic Fundamental Lemma conjecture over a general  $p$ -adic field***  
with W. Zhang, J. Eur. Math. Soc. (JEMS), Online First (2023).
4. *Local Constancy of Intersection Numbers*  
Algebra Number Theory **16** (2022), no. 2, 505–519.
3. *Relative Unitary RZ Spaces and the Arithmetic Fundamental Lemma*  
J. Inst. Math. Jussieu **21** (2022), no. 1, 241–301.
2. *On the Arithmetic Fundamental Lemma through Lie algebras*  
Math. Z. **287** (2017), no. 1, 181–197.
1. *An Arithmetic Transfer Identity*  
Manuscripta Math. **150** (2016), no. 1, 1–19.

## Invited Talks in Research Seminars and Conferences

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|-------------------|---|
| 2024, Feb.        | University of Wisconsin, Number Theory Seminar  |
| <b>2024, Jan.</b> | <b>AIM (American Institute of Math)</b><br>Workshop on Intersection theory on Shimura varieties                       |
| 2024, Jan.        | Zhejiang University, Number Theory Seminar  |
| 2023, Dec.        | Beijing University, Number Theory Seminar   |
| <b>2023, Sep.</b> | <b>Darmstadt, Modular Forms and Arithmetic Geometry</b><br>Conference on the occasion of Tonghai Yang’s 60th birthday |
| <b>2023, July</b> | <b>Regensburg days on non-archimedean geometry</b><br>Conference on non-archimedean and tropical geometry             |
| <b>2023, Mar.</b> | <b>SLMath, Berkeley, Trimester program seminar</b>  |

<b>2023, Jan.</b>	<b>Oberwolfach, Workshop on the Arithmetic of Shimura Varieties</b>
<b>2023, Jan.</b>	<b>Joint Mathematics Meeting of the AMS in Boston</b> Special Session on Special cycles and $L$ -values
<b>2022, Aug.</b>	<b>Regensburg, Conference on tropical and non-archimedean geometry</b> Invited introductory lecture on non-archimedean analytic spaces
2022, June	Barcelona University, Algebraic Geometry Seminar
2022, May	Frankfurt University, Oberseminar
2022, May	N3-Days Workshop, Copenhagen University
2022, May	Münster University, Mittagseminar Arithmetik
<b>2022, Feb.</b>	<b>Oberwolfach, Workshop on non-archimedean geometry</b>
2021, Oct.	Regensburg University, Oberseminar über Arakelov–Geometrie
2021, Apr.	Essen University, Essener Seminar
2021, Mar.	Arizona University, Number Theory Seminar
<b>2021, Jan.</b>	<b>AIM (American Institute of Mathematics)</b> Workshop on Intersection theory on Shimura varieties
2020, June	ZAGA (Zoom Algebraic Geometry and Arithmetic)
2020, Apr.	Columbia University, Automorphic Forms and Arithmetic Seminar
2019, Nov.	University of Maryland, Algebra and Number Theory Seminar
2019, Nov.	MIT, Number Theory Seminar
<b>2019, Oct.</b>	<b>Clay Mathematics Institute</b> Workshop on Periods, Representations, and Arithmetic
2019, Apr.	Paris Nord (Paris 13), Arithmetic Geometry Seminar
2019, Apr.	IMJ-PRG (Paris 7), Séminaire Groupes Réductifs et Formes Automorphes

## Funding and Scholarships

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July 2019	DFG Research Stipend to visit of Prof. Wei Zhang at MIT Grant ID: MI 2591/1-1
July 2019	DAAD Research Stipend to visit of Prof. Wei Zhang at MIT (Declined in favour of DFG stipend)
July 2014 – Sep. 2016	Bonn International Graduate School Ph. D. study scholarship
Feb. 2011 – June 2014	Fellow of the <i>Studienstiftung des Deutschen Volkes</i>

## Conference and Workshop Organization

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2023, Oct.	<b>Conference on Arithmetic Algebraic Geometry, Münster</b> On the occasion of Michael Rapoport’s 70th birthday Jointly with E. Hellmann, T. Richarz and E. Viehmann
2023, July	<b>Young Researcher’s Network, Hausdorff Institute Bonn</b> Workshop on the arithmetic of the Langlands program Jointly with B. Heuer and M. Zhang

- 2019, Sept.           **Hausdorff Summer School, Hausdorff Center Bonn**  
School on the Emerton–Gee stack  
Jointly with J. Anschütz, A.-C. Le Bras
- 2018, Oct.           **Kleine Arbeitsgemeinschaft Arithmetische Geometrie**  
Workshop on Shimura Varieties  
Jointly with F. Gora
- 2018, July           **Summer School, Higher School of Economics, Moscow**  
School on the geometrization of the Langlands program (after Fargues–Scholze)  
Jointly with J. Anschütz and A.-C. Le Bras

## Research Seminar Organization

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- Winter 2021/22      Arithmetische Geometrie Oberseminar, Bonn  
Topic: Arithmetic Bigness and uniform Bogomolov (after X. Yuan)  
Jointly with P. Scholze
- Summer 2019        Arithmetische Geometrie Oberseminar, Bonn  
Topic: Weil representation and Arithmetic Fundamental Lemma (after W. Zhang)  
Jointly with M. Rapoport
- Summer 2018        Arithmetische Geometrie Oberseminar, Bonn  
Topic: The  $B_{\text{dR}}^+$ -Grassmannian  
Jointly with P. Scholze
- Summer 2016        Arithmetische Geometrie Oberseminar, Bonn  
Topic: Shtuka and the Taylor expansion of  $L$ -functions (after Yun–Zhang)  
Jointly with M. Rapoport

## Further professional activities

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Peer-reviewing and quick opinions for *Inventiones Mathematicae*, *Duke Mathematical Journal*, *Forum of Mathematics*, *Sigma*, *Algebra & Number Theory*, *American Journal of Mathematics*, *Manuscripta Mathematica*

## Teaching

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- 2024 Summer        **Elliptic curves**  
(Lecture course, Master, 4 SWS)
- 2023 Summer        **Commutative algebra**  
(Lecture course, Bachelor, 4 SWS)
- 2022/23 Winter     **Representation theory of finite groups**  
(Seminar, Bachelor)
- 2022 Summer        **Arithmetic intersection theory**  
(Lecture course, Master, 2 SWS)
- Jacobians of curves**  
(Seminar, Master)
- 2021/22 Winter     **Moduli spaces of elliptic curves**  
(Lecture course, Master, 4 SWS)

2021 Summer	<b>Abelian varieties</b> (Lecture course, Master, 4 SWS)
2020/21 Winter	<b>Quadratic forms</b> (Seminar, Bachelor)
	<b>Algebraic number theory</b> (Exercises, Bachelor)
2019 Summer	<b>Mathematics for geengineers II</b> (Exercises, Bachelor, Service)
2018/19 Winter	<b>Differential forms in non-archimedean geometry</b> (Lecture course, Master, 4 SWS)
2018 Summer	<b>Moduli spaces of <math>p</math>-divisible groups</b> (Lecture course, Master, 2 SWS)
2016 Summer	<b>Algebraic number theory</b> (Exercises, Bachelor)

## Supervised Theses

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12. *Quadratic base change for  $GL_2$* , Bachelor thesis of Tien Nguyen Thanh, ongoing.
11. *Brauer's theorem and the meromorphic continuation of Artin  $L$ -functions*, Bachelor thesis of Maria Stroe, ongoing.
10. *Spherical harmonic functions*, Bachelor thesis of Tristan Hansen, ongoing.
9. *Intersection theory*, Bachelor thesis of Jonas Ferel, ongoing.
8. *KR divisor intersection over function fields*, Master thesis of Calle Sönne, 2023.
7. *Comparison of Gross–Zagier and Gan–Gross–Prasad formulas*, Master thesis of Paul-Levin Siemon, 2023.
6. *RZ spaces for inner forms of  $GL_n$* , Master thesis of Rein Groesbeek, 2022.
5. *Generating series of complex multiplication cycles*, Master thesis of Lucas Gerth, 2022.
4. *On the Drinfeld AFL for  $GL_4$* , Master thesis of Nuno Hultberg, 2021.
3. *Stacks and moduli of shtuka for  $\mathbb{G}_m$* , Master thesis of Silvan Rincke, 2020.
2. *Ring class fields and their application to diophantine equations*, Bachelor thesis of Nuno Hultberg, 2019.
1. *Reziprozitätsgesetz für globale Funktionenkörper*, Bachelor thesis of Leo Gitin, 2019.