

Timo Richarz

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Research Interests

Arithmetic Algebraic Geometry, Langlands program, Moduli spaces of bundles, Geometric Representation Theory

Positions

- 2019–25 **Professor (W1)**, *Technische Universität Darmstadt*, Germany.
- 2018–19 **Postdoc**, *Sorbonne Université*, Paris, France.
Research group of Laurent Fargues
- 2016–18 **Wiss. Mitarbeiter**, *University of Duisburg-Essen*, Germany.
Research group of Jochen Heinloth
- 2014–16 **Fellow for Teach First Deutschland**, *Dreikönigsgymnasium*, Köln, Germany.
Teaching mathematics and philosophy
- 2014 **Wiss. Mitarbeiter**, *Bonn University*, Germany.
Research group of Michael Rapoport

Studies

- 2010–14 **PhD Studies Mathematics**, *Bonn University*, Germany.
Advisor: Michael Rapoport, defended 30.01.2014 (summa cum laude)
Title: *Affine Grassmannians and Geometric Satake Equivalences*
- 2006–10 **Diploma in Mathematics**, *Bonn University*, Germany.
Advisor: Michael Rapoport, defended 21.07.2010

Research Visits

- Mar 2019 **University of Maryland**, *Invitation by T. J. Haines*, College Park MD, USA.
- Jun 2018 **École normale supérieure de Lyon**, *Groupes algébriques et géométrisation du programme de Langlands*, Lyon, France.
- Mar 2018 **University of Maryland**, *Invitation by T. J. Haines*, College Park MD, USA.
- Aug–Sep 2016 **Max-Planck Institut für Mathematik**, *Gastaufenthalt*, Bonn, Germany.
- Jul 2013 **Mathematical Sciences Research Institute**, *Fellow visitor of Peter Scholze*, Berkeley CA, USA.
- Feb–Mar 2012 **Fields Institute**, *Thematic Program on Galois Representations*, Toronto, Canada.
- Sep–Dec 2010 **Harvard University**, *Fellow visitor of Michael Rapoport*, Cambridge MA, USA.
- Jan–Mar 2010 **Institut Henri Poincaré**, *Galois trimester*, Paris, France.

Funds

- 2018 Scholarship, *Deutsche Forschungsgemeinschaft*, Forschungsstipendium.
- 2010–13 Scholarship, *Max-Planck Gesellschaft*, Promotionsstipendium.
- 2008–10 Scholarship, *Studienstiftung des Deutschen Volkes*.

PhD students

Patrick Bieker, started April 2019.

Refereed Publications (published/accepted)

Thomas J. Haines, Timo Richarz, *Smoothness of Schubert varieties in twisted affine Grassmannians*, arXiv:1809.08464, 23 pages, accepted in **Duke Math. Journal**.

Thomas J. Haines, Timo Richarz, *The Test Function Conjecture for Parahoric Local Models*, arXiv:1801.07094, 68 pages, accepted in **Journal of the American Mathematical Society**.

Thomas J. Haines, Timo Richarz, *The Test Function Conjecture for Local Models of Weil-restricted groups*, **Compositio Mathematica**, 156 (2020), 1348-1404.

Timo Richarz, Jakob Scholbach, *The intersection motive of the moduli stack of shtukas*, **Forum Mathematics, Sigma** 8 (2020), 1-99.

Timo Richarz, *Spaces with \mathbb{G}_m -action, hyperbolic localization and nearby cycles*, **J. Algebraic Geom.** 28 (2019), 251-289.

Timo Richarz, *On the Iwahori-Weyl Group*, Bulletin de la SMF **144** (2016), 117- 124.

Timo Richarz, *Affine Grassmannians and Geometric Satake Equivalences*, **Int. Math. Res. Not.** 12 (2016), 3717-3767.

Timo Richarz, Xinwen Zhu, Appendix to Xinwen Zhu: *The Geometrical Satake Correspondence for Ramified Groups*, **Annales scientifiques de l'ENS** 48 (2015), 409-451.

Timo Richarz, *A new approach to the Geometric Satake Equivalence*, **Documenta Mathematica** 19 (2014), 209-246.

Timo Richarz, *Schubert Varieties in Twisted Affine Flag Varieties and Local Models*, **Journal of Algebra** 375 (2013), 121-147.

Preprints

Thomas J. Haines, Timo Richarz, *Normality and Cohen-Macaulayness of Parahoric Local Models*, arXiv:1903.10585, 19 pages.

Timo Richarz, Jakob Scholbach, *The motivic Satake equivalence*, arXiv:1909.08322, 35 pages.

Arnaud Mayeux, Timo Richarz, Matthieu Romgany, *Néron blowups and low-degree cohomological applications*, arXiv:2001.03597, 22 pages.

Timo Richarz, Jakob Scholbach, *Tate motives on Witt vector affine flag varieties*, arXiv:2003.02593, 23 pages.

Proceedings

Timo Richarz, *Cohen-Macaulayness of local models*, Arithmetic Geometry, Oberwolfach Reports (2020).

Timo Richarz, *The test function conjecture for parahoric local models*, Arithmetic of Shimura varieties, Oberwolfach Reports (2019).

Timo Richarz, *The stack Bun and Hecke stacks*, Arbeitsgemeinschaft: Higher Gross-Zagier Formulas, Oberwolfach Reports (2017).

Timo Richarz, *Affine Grassmannians and Geometric Satake Equivalences*, Langlands correspondence and constructive Galois theory, Oberwolfach Reports (2014).

Invited Lectures

Sep 2019 *Basic geometry of affine Grassmannians*, 6h, Research School on Buildings and affine Grassmannians, CIRM, Luminy.

Oct 2018 *The geometric Satake isomorphism*, 3h, London Number Theory Study group, Imperial College, London.

Conference Talks

- Apr 2021 *t.b.a.*, Algebraic Groups, MFO.
- Mar 2021 *t.b.a.*, IMU-DMV Meeting, Hebrew University, Israel.
- Jul 2020 *Cohen-Macaulayness of local models*, Arithmetic Geometry, MFO.
- Oct 2019 *Singularities in the reduction modulo p of Shimura varieties*, Modularity and Moduli spaces, Oaxaca, Mexico.
- Jul 2019 *The motivic Satake equivalence*, L-Functions and Geometric Representation Theory, Island of Nisyros, Greece.
- Jul 2019 *Cohen-Macaulayness of parahoric local models*, Shimura varieties, representation theory and related topics, Hokkaido University, Japan.
- Jun 2019 *Cohen-Macaulayness of parahoric local models*, Arithmetic Geometry in Carthage, Tunisian Academy Beit al-Hikma, Tunisia.
- Jan 2019 *The test function conjecture for parahoric local models*, Arithmetic of Shimura Varieties, Workshop MFO.
- Oct 2018 *Smoothness of Schubert varieties in twisted affine Grassmannians*, Conference on the occasion of Michael Rapoport's 70th birthday, Bonn University.
- Jun 2018 *The test function conjecture for parahoric local models*, Groupes algébriques et géométrisation du programme de Langlands, ENS Lyon.
- Mar 2018 *Spaces with \mathbb{G}_m -actions and applications*, DMV Tagung, University of Paderborn.
- Apr 2017 *The stack Bun and Hecke stacks*, Higher Gross-Zagier formulas, Arbeitsgemeinschaft MFO.
- Feb 2014 *Ramified geometric Satake isomorphisms*, Langlands correspondence and constructive Galois theory, Workshop MFO.

Seminar Talks

- Jul 2020 *Reduktion von Shimura-Varietäten*, University of Mainz, online.
- Jun 2020 *Motivische Methoden im Langlandsprogramm*, University of Duisburg-Essen, online.
- Jun 2020 *The motivic Satake equivalence*, Séminaire TN, Lyon, online.
- May 2020 *The motivic Satake equivalence*, HUJI-BGU AGNT seminar, Israel, online.
- May 2020 *Néron blowups and integral models of shtuka spaces*, POINTS seminar, Beijing, China, online.
- Jan 2020 *The motivic Satake equivalence*, Séminaires de Géométrie Arithmétique et Motivique, Université Paris 13.
- Dec 2019 *Geometry in the reduction modulo p of Shimura varieties*, Max-Planck-Institut, Bonn.
- Dec 2019 *The motivic Satake equivalence*, SAGA, Département de Mathématiques d'Orsay.
- Nov 2019 *Smoothness of Schubert varieties in affine Grassmannians*, Seminar, École Polytechnique Fédérale de Lausanne.
- Nov 2019 *The motivic Satake equivalence*, Forschungsseminar Arithmetische Geometrie, Technische Universität München.
- Jul 2019 *Geometry in the reduction modulo p of Shimura varieties*, Workshop of the GRK 2240, Bergische Universität Wuppertal.
- May 2019 *The intersection motive of the moduli stack of shtukas*, Séminaire Autour des cycles algébriques, IMJ, Paris.
- Mar 2019 *Smoothness of Schubert varieties in affine Grassmannians*, Algebra and Number Theory Seminar, Louisiana State University.
- Mar 2019 *The intersection motive of the moduli stack of shtukas*, Algebra and Number Theory Seminar, University of Maryland.
- Dec 2018 *Smoothness of Schubert varieties in affine Grassmannians*, Séminaire, Université Clermont Auvergne.

- Nov 2018 *The test function conjecture for parahoric local models*, Séminaire de théorie des nombres, Université de Caen.
- Oct 2018 *Motivic Satake Equivalence*, Seminar, Universität Heidelberg.
- May 2018 *The geometric Satake isomorphism over non-algebraically closed fields*, Séminaire Quantique, Université de Strasbourg.
- Sep 2017 *The test function conjecture for parahoric local models*, Séminaire d'arithmétique à Lyon, ENS Lyon.
- Feb 2017 *Spaces with \mathbb{G}_m -actions and applications*, Seminar des Sonderforschungsbereichs "Higher Invariants", University of Regensburg.
- Jan 2017 *Spaces with \mathbb{G}_m -actions and applications*, Mittagssseminar zur Arithmetik, University of Münster.
- May 2014 *The geometric Satake isomorphism*, Oberseminar zur Arithmetischen Geometrie, University of Bayreuth.
- Nov 2012 *On the geometric Satake isomorphism*, Arbeitsgemeinschaft Arithmetische Geometrie, University of Paderborn.
- Nov 2012 *On the geometric Satake isomorphism*, Forschungsseminar Arithmetische Geometrie, University of Duisburg-Essen.
- Nov 2012 *Schubert varieties in twisted affine flag varieties*, Oberseminar Darstellungstheorie, Bergische Universität Wuppertal.
- Mar 2012 *On the geometric Satake isomorphism*, Thematic Program on Galois Representations, Fields Institute Toronto.

Teaching Experience

Lecture Courses

Prepared, organized and held lectures; prepared problem sheets; administered final written and oral exam.

- SS 20 *Galois cohomology*, TU Darmstadt.
- WS 19/20 *Algebraic Geometry II*, TU Darmstadt, joint with Torsten Wedhorn.
- SS 19 *Weil Conjectures*, TU Darmstadt.
- SS 19 *Algebraic Geometry I*, TU Darmstadt.
- WS 18/19 *Pro-étale cohomology*, TU Darmstadt, joint with Torsten Wedhorn.
- WS 17/18 *Didaktik der Linearen Algebra und Analytischen Geometrie*, University of Duisburg-Essen.
- SS 17 *Figuren und Abbildungen im Geometrieunterricht*, University of Duisburg-Essen.
- WS 16/17 *Didaktik der Linearen Algebra und Analytischen Geometrie*, University of Duisburg-Essen.

Seminars

Prepared the program, and organized the seminars.

- WS 20 *Condensed Mathematics*, TU Darmstadt/Universität Frankfurt, joint with Torsten Wedhorn.
- SS 20 *Homological Algebra and Sheaves*, TU Darmstadt/Universität Frankfurt, joint with Torsten Wedhorn.
- WS 18/19 *Prismatic cohomology*, Institut de Mathématiques de Jussieu, joint with Ariane Mezard.
- WS 17/18 *The Fargues-Fontaine curve*, University of Duisburg-Essen.
- WS 17/18 *Seminar on Stacks*, University of Duisburg-Essen, joint with Jochen Heinloth.
- WS 16–WS17 *Forschungsseminar Arithmetische Geometrie*, University of Duisburg-Essen, WS16 joint with Michael Wong.
- SS 11 *The unramified Drinfeld-Langlands Correspondence*, University of Bonn.

Assistency

Prepared and organized tutorials for students; prepared exercise sheets; prepared and administered final exam; substituted professor when needed.

WS 13/14 Michael Rapoport, *Algebra II*, University of Bonn.

SS 13 Michael Rapoport, *Algebra I*, University of Bonn.

WS 12/13 Michael Rapoport, *Einführung in die Algebra*, University of Bonn.

Tutorials

Prepared and held tutorials for students.

SS 07–WS 10 Courses in *Topology, Algebra, Complex Geometry, Linear Algebra and Analysis*.

Other Publications

Ulf Grebe, Timo Richarz, *Brennpunkt Rechenschwäche*, Mathematik lehren 201 (2017), Themenheft Inklusion.

Further Activities

Languages German (Native), English (Fluent), French (Basic), Latinum

Referee Selecta, Compositio, JEP, J. Algebraic Geom., ANT, Sigma, IMRN

Update: August 5, 2020