

## Brandon Williams

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CONTACT INFORMATION	RWTH Aachen Lehrstuhl A für Mathematik Templergraben 55, 52062 Aachen	<i>E-mail:</i> <a href="mailto:brandon.williams@matha.rwth-aachen.de">brandon.williams@matha.rwth-aachen.de</a> <i>WWW:</i> <a href="http://btw-47.github.io">btw-47.github.io</a>
RESEARCH INTERESTS	<b>Modular forms</b> and their generalizations, including vector-valued modular forms, Jacobi forms, mock modular forms and automorphic forms on more general groups.	
EDUCATION	<b>University of California, Berkeley, CA</b>	
	Ph.D., Mathematics	<b>2013-2018</b>
	<ul style="list-style-type: none"><li>• Thesis title: <i>Computing modular forms for the Weil representation</i></li><li>• Adviser: Prof. Richard Borcherds</li><li>• Area of Study: Automorphic forms</li></ul>	
	<b>Ruprecht-Karls-Universität Heidelberg, Germany</b>	
	M.Sc., Mathematics	<b>2011-2013</b>
	<ul style="list-style-type: none"><li>• Thesis title: <i>On elliptic curves with complex multiplication, L-functions, and p-adic interpolation</i></li><li>• Adviser: Prof. Dr. Otmar Venjakob</li></ul>	
	B.Sc., Mathematics	<b>2009-2011</b>
	<ul style="list-style-type: none"><li>• Thesis title: <i>GARCH(1,1)-models</i></li><li>• Adviser: Prof. Dr. Rainer Dahlhaus</li></ul>	
EMPLOYMENT	<b>RWTH Aachen, Germany</b>	
	Postdoctoral researcher	<b>2020-present</b>
	<ul style="list-style-type: none"><li>• Postdoc mentor: Prof. Dr. Aloys Krieg</li></ul>	
	<b>Technische Universität Darmstadt, Germany</b>	
	Postdoctoral researcher	<b>2018-2020</b>
	<ul style="list-style-type: none"><li>• Postdoc mentor: Prof. Dr. Jan Bruinier</li></ul>	
AWARDS	<ul style="list-style-type: none"><li>• 2018 Ken Ribet – Lisa Goldberg Award in Algebra (department dissertation award)</li><li>• Lehmer Fellowship in Number Theory, Spring 2018.</li></ul>	
PUBLICATIONS	<ul style="list-style-type: none"><li>[1] Williams, B. <i>Poincaré square series for the Weil representation</i>. Ramanujan J. 47 (2018), no. 3, 605–650.</li><li>[2] Williams, B. <i>Vector-valued Hirzebruch–Zagier series and class number sums</i>. Res. Math. Sci. 5 (2018), no. 2, Paper No. 25, 13 pp.</li><li>[3] Williams, B. <i>Rankin–Cohen brackets and Serre derivatives as Poincaré series</i>. Res. Number Theory 4 (2018), no. 4, Art. 37, 13 pp.</li><li>[4] Williams, B. <i>Vector-valued Eisenstein series of small weight</i>, Int. J. Number Theory 15 (2019), no. 2, 265–287.</li></ul>	

- [5] Williams, B. *Poincaré square series of small weight*. Ramanujan J. 48 (2019), no. 3, 585–612.
- [6] Williams, B. *Overpartition  $M_2$ -rank differences, class number relations, and vector-valued mock Eisenstein series*. Acta Arith. 189 (2019), no. 4, 347–365.
- [7] Pribitkin, W. and Williams, B. *Short proof of Rademacher’s formula for partitions*. Res. Number Theory 5 (2019), no. 2, Art. 17, 6 pp.
- [8] Williams, B. *Remarks on the theta decomposition of vector-valued Jacobi forms*, J. Number Theory 197 (2019), 250–267.
- [9] Schwagenscheidt, M. and Williams, B. *Twisted component sums of vector-valued modular forms*, Abh. Math. Sem. Univ. Hamburg 89 (2019), no. 2, 151–168.
- [10] Williams, B. *A construction of antisymmetric modular forms for Weil representations*, Math. Zeitschrift 296 (2020) 391–408.
- [11] Williams, B. *Graded rings of paramodular forms of level 5 and 7*, J. Number Theory 209 (2020) 483–515.
- [12] Williams, B. *The rings of Hilbert modular forms for  $Q(\sqrt{29})$  and  $Q(\sqrt{37})$* , J. Algebra 559 (2020) 679–711.
- [13] Wang, H. and Williams, B. *On some free algebras of orthogonal modular forms*, Adv. Math. 373 (2020), Article 107332.
- [14] Williams, B. *Higher pullbacks of modular forms on orthogonal groups*, Forum Math. 33 (2021), 631–652.
- [15] Wang, H. and Williams, B. *Borcherds products of half-integral weight*, J. Number Theory, in press.
- [16] Williams, B. *Two graded rings of Hermitian modular forms*, Abh. Math. Sem. Univ. Hamburg 91 (2021) 257–285.
- [17] Wang, H. and Williams, B. *Graded rings of Hermitian modular forms with singularities*, to appear in Manuscripta Math.
- [18] Wang, H. and Williams, B. *Projective spaces as orthogonal modular varieties*, 2020, [arXiv:2008.08392](#)
- [19] Wang, H. and Williams, B. *Simple lattices and free algebras of modular forms*, 2020, [arXiv:2009.13343](#)
- [20] Wang, H. and Williams, B. *On weak Jacobi forms of rank two*, 2021, [arXiv:2102.11190](#)
- [21] Wang, H. and Williams, B. *Free algebras of modular forms on ball quotients*, 2021, [arXiv:2105.14892](#)
- [22] Wang, H. and Williams, B. *Siegel modular forms of degree two and level five*, 2021, [arXiv:2110.07241](#)
- [23] Wang, H. and Williams, B. *Modular forms with poles on hyperplane arrangements*, 2021, [arXiv:2112.06524](#)

## CONFERENCES AND SEMINARS

- *Poincaré square series for the Weil representation* in *Trends in modular forms*, Daejeon, South Korea, December 19-22, 2017.
- *Computing obstruction spaces for Borcherds products* in ABKLS seminar, Aachen, Germany, February 14, 2018.
- *Vector-valued Hirzebruch-Zagier series and class number sums* in Emory University Algebra and Number Theory Seminar, April 17, 2018.
- *Class number sums* in Universität Köln Oberseminar Zahlentheorie und Modulformen, June 12, 2018.
- *Hilbert modular forms and Borcherds products* in Chalmers University of Technology, Algebraic Geometry and Number Theory Seminar, November 21, 2018.
- *Hilbert modular forms and Borcherds products* in Darmstadt Algebra Group Winter Seminar, February 22, 2019.
- *Hilbert modular forms and Borcherds products* in Dartmouth College Number Theory Seminar, May 23, 2019.
- *Higher pullbacks of modular forms on orthogonal groups* in Darmstadt Algebra Seminar, February 18, 2020.
- *Higher pullbacks of modular forms on orthogonal groups in Integrable systems and automorphic forms*, Sochi, Russia, February 23-27, 2020.
- *Free algebras of orthogonal modular forms* in Darmstadt Algebra Group Winter Seminar, March 13, 2020.
- *Simple lattices and free algebras of modular forms*, RWTH Aachen, January 18, 2021.
- *Simple lattices and free algebras of modular forms*, Brown University, March 1, 2021.
- *Borcherds products and a ring of Hermitian modular forms*, University of Oregon, May 3, 2021.

## TEACHING EXPERIENCE

### **RWTH Aachen**, Germany

*Teaching assistant*

**2020-present**

- Complex analysis II
- Analytic number theory

### **Technische Universität Darmstadt**, Germany

*Teaching assistant*

**2019-2020**

- Analysis II (English)
- Linear Algebra I (English)

### **University of California, Berkeley**, CA

*Instructor (GSI)*

**Summers 2014-2016**

- Math 16B (Analytic geometry and calculus)
- Math 54 (Linear algebra and differential equations)
- Math 110 (Linear algebra)

	<p><i>Teaching assistant (GSI)</i> <span style="float: right;"><b>2013-2017</b></span></p> <ul style="list-style-type: none"> <li>• Math 16A (Analytic geometry and calculus)</li> <li>• Math 53 (Multivariable calculus)</li> <li>• Math 54 (Linear algebra and differential equations)</li> <li>• Math 55 (Discrete mathematics)</li> <li>• Math H54 (Honors linear algebra and differential equations)</li> <li>• Math 110 (Linear algebra)</li> <li>• Math 185 (Introduction to complex analysis)</li> <li>• Math 250A (Groups, rings, and fields)</li> </ul>
	<p><i>Grader</i> <span style="float: right;"><b>Spring 2014</b></span></p> <ul style="list-style-type: none"> <li>• Math H185 (Honors introduction to complex analysis)</li> </ul>
	<p><b>Ruprecht-Karls-Universität Heidelberg, Germany</b></p> <p><i>Teaching assistant (Tutor)</i> <span style="float: right;"><b>2011-2013</b></span></p> <ul style="list-style-type: none"> <li>• Linear algebra</li> <li>• Algebra 1 (field and Galois theory)</li> <li>• Elementary number theory</li> </ul>
MENTORING	<p><b>Directed Reading Program</b></p> <p>I met weekly with an undergraduate student at UC Berkeley and worked with them on an independent reading project that led to a presentation at the end of the semester.</p> <ul style="list-style-type: none"> <li>• <i>Computing class numbers</i>, Fall 2016.</li> <li>• <i>Elliptic curve cryptography</i>, Spring 2017.</li> <li>• <i>Insolvability of the quintic equation</i>, Fall 2017.</li> <li>• <i>Modular forms</i>, Spring 2018.</li> </ul>
OTHER EXPERIENCE	<p><b>Ruprecht-Karls-Universität Heidelberg, Germany</b></p> <ul style="list-style-type: none"> <li>• <b>Data mining practicum</b> (Summer 2012) Analyzed clusters in graphs of OSM geographic data using a variant of the PageRank algorithm.</li> </ul> <p><b>Heidelberg Collaboratory for Image Processing, Heidelberg, Germany</b></p> <ul style="list-style-type: none"> <li>• <b>Computer vision practicum</b> (Summer 2011) Used histograms of oriented gradients and related image descriptors to analyze illuminated manuscripts.</li> </ul>
SOFTWARE	<p>Programming languages:</p> <ul style="list-style-type: none"> <li>• C++, Python</li> </ul> <p>Mathematical software:</p> <ul style="list-style-type: none"> <li>• Mathematica, MATLAB, SageMath</li> </ul> <p>Other:</p> <ul style="list-style-type: none"> <li>• <math>\text{\LaTeX}</math> (<math>\text{\LaTeX}</math>, <math>\text{\BibTeX}</math>),</li> <li>• Microsoft Office, LibreOffice, Google Docs</li> </ul>
LANGUAGES	<p>English, German (fluent)</p> <p>Dutch, French, Russian (intermediate)</p> <p>Japanese (basic)</p>