

ANNA HAENSCH

CONTACT

currently working from home
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<https://www.annahaensch.com>

EDUCATION

Wesleyan University, Middletown, CT
Ph.D. Mathematics, May 2013, Thesis Advisor: Wai Kiu Chan.
Thesis Title: On almost universal ternary inhomogeneous quadratic polynomials.

State University of New York at New Paltz, New Paltz, NY
B.S. Mathematics, May 2007, Magna Cum Laude.

PROFESSIONAL APPOINTMENTS

Data Intensive Studies Center, Tufts University, Medford, MA
Senior Data Scientist, January 2021 – Present.

Tagup Inc., Somerville, MA
Research Data Scientist, September 2019 – December 2020.

ACADEMIC APPOINTMENTS

Duquesne University, Pittsburgh, PA
Associate Professor, August 2020 – Present.
Assistant Professor, August 2013 – August 2020.

Max Planck Institute for Mathematics, Bonn, Germany
Visiting Researcher, Jan. 2018 – April 2018.
Visiting Researcher, Jan. 2014 – May 2014.

University of Vermont, Burlington, VT
Adjunct Research Professor, July 2017 – Dec. 2017.

Wesleyan University, Middletown, CT
Van Vleck Visiting Researcher, June 2017.

University of Hong Kong, Pokfulam, Hong Kong
Visiting Researcher, June 2015.

WORKS IN PROGRESS

(with I. Ljungberg and W. Vega Brown) *A dynamic Bayesian network approach to analytics for offshore wind.*

PUBLICATIONS

10. (with M. Dutour Sikirić, J. Voight and W. van Woerden) *A canonical form for positive definite matrices*, Proceedings of the Fourteenth Algorithmic Number Theory Symposium, ANTS-XIV, Mathematical Sciences Publishers, 2020 (final version at arXiv:2004.14022).

9. (with A. G. Earnest) *Classification of one-class spinor genera for quaternary quadratic forms*, Act Arith. **91** 3 (2019) 259 – 287, (final version at arXiv:1803.03028).
8. (with B. Kane) *An algebraic and analytic approach to spinor exceptional behavior in translated lattices*, Automorphic Forms and Related Topics, Contemp. Math., **732**, 2019, Amer. Math. Soc., Providence, RI, (final version pdf available here).
7. (with A. G. Earnest) *Completeness of the list of spinor regular ternary quadratic forms*, Mathematika, **65** (2019), 213–235, (final version at arXiv:1711.05811).
6. (with B. Kane) *Almost universal ternary sums of polygonal numbers*, Res. number theory (2018) 4: 4. <https://doi.org/10.1007/s40993-018-0098-x>
5. (with A. Feaver, J. Liu, G. Nebe) On Kneser-Hecke operators for codes over finite chain rings, *Directions in Number Theory: Proceedings of the 2014 WIN3 Workshop*, Association for Women in Mathematics Series, Springer-Verlag, (2016).
4. *A characterization of almost universal ternary inhomogeneous quadratic polynomials with conductor 2*, J. Number Theory, **156** (2015), 247–262.
3. *A characterization of almost universal ternary quadratic polynomials with odd prime power conductor*, J. Number Theory, **141** (2014), 202–213.
2. (with W. K. Chan) *Almost universal ternary sums of squares and triangular numbers*, *Quadratic and Higher Degree Forms*, Developments in Mathematics, Springer-Verlag, (2013).
1. (with K. Doerksen) Primitive prime divisors in zero orbits of polynomials, *INTEGERS: The Online Journal of Combinatorial Number Theory*, **12** (2012).

FELLOWSHIPS & GRANTS

- Key Personnel, Department of Defense SBIR Award N68335-20-F-0459, *LAV25 Logistics Optimization using Machine Learning*, \$1,593,070, May 2020.
- US Junior Oberwolfach Fellow, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany, status: awarded, \$1,000, April 2019.
- PI, NSF Conference Grant DMS-1854113, *Workshop on Automorphic Forms and Related Topics*, status: awarded, \$14,987, March 2019.
 - Co-PIs: Ben Kane, Djordje Milićević, and Howard Skogman.
- PI, NSA Conference Grant, *33rd Automorphic Forms Workshop*, \$12,234, March 2019.
 - Co-PIs: Ben Kane, Djordje Milićević, and Howard Skogman.
- Awardee, AMS-Simons Travel Grant, \$4,000, May 2017.
- Awardee, Duquesne University Wimmer Foundation Grant, *Research in Inquiry Based Learning in Number Theory*, \$1,920, May 2015.
- Awardee, Duquesne University Faculty Development Fund Grant, *A study of sums of triangular numbers*, \$2,981, 2015.
- Project NeXT Fellow, 2014-2015.
- Mass Media Fellow, American Association for the Advancement of Science, 2013.

- Host Site: National Public Radio, Washington, D.C.
- Sponsor: American Mathematical Society

STUDENTS ADVISED/MENTORED

Master’s Thesis Advisor:

- Industry co-advisor to Isabel Ljungberg, Chalmers University of Technology, Gothenberg, Sweden, summer 2020 – present.

Undergraduate Research Advisor:

- *Methods in Analytic Number Theory*, Tyler Gaona, Fall 2016, Spring 2017.
- *Computing explicit isometries for quadratic forms*, Tyler Gaona, Fall 2015.
- *Basic quadratic forms*, Duquesne honors directed reading, C. Thomas Dean, Fall 2014.

OPEN-SOURCE SOFTWARE

L-Functions and Modular Forms Database.

- Performed lattice computations using Sagemath and Magma to build tables of lattices with small discriminant and class number. Maintained the lattice database for the L-functions and Modular Forms Database (LMFDB), a centralized and searchable database of mathematical objects. Available at <http://www.lmfdb.org/Lattice/>

Sagemath computer algebra system

- Developed and wrote Python based functions for existing quadratic forms modules including evaluation of bilinear maps, rational isometry testing, and quadratic form invariants over number fields. Enhanced formatting with Sphinx/ReST markup, and added documentation to the existing module for quadratic forms. Participated in all stages of the development processes through sagetrap using git and mercurial. Available at <http://www.sagemath.org>

PROFESSIONAL ACTIVITIES

Invited Lectures:

- Algebra Seminar, *Computational and algorithmic approaches to the local-global problem for quadratic lattices*, University of North Texas, March 26, 2021.
- *From Riemann Zeta to Big Data: A journey through mathematics and the lessons learned along the way*
 - Colloquium, California State University San Bernardino, San Bernardino, CA, March 2021.
 - Pi Mu Epsilon Induction Ceremony Invited Address, Salve Regina University, Newport, RI, April 2021.
- *Problems of enumeration and computation with quadratic form*, Mini-Workshop: Reflection Groups in Negative Curvature, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany, April 2019.
- *Classification of one-class spinor genera for quadratic forms*, Conference on the Arithmetic Theory of Quadratic Forms, Seoul National University, Seoul, South Korea, January 2019.
- Plenary Speaker, *Some results on class numbers for quadratic forms*, Upstate Number Theory Conference, University of Buffalo, Buffalo, NY, April 2018.

- *Quadratic forms and the representation problem*,
 - Langenhop Lecture and SIU Mathematics Conference, Southern Illinois University, Carbondale, IL, May 2019.
 - Oberseminar, Max Planck Institute for Mathematics, Bonn, Germany, March, 2018.
- *Spinor regular ternary quadratic forms*
 - Workshop on Computational Challenges in the Theory of Lattices, ICERM, Providence, RI, April 2018.
 - Utrecht Geometry Center Seminar, Utrecht, Netherlands, April 2018.
 - Algebra and Number Theory Seminar, University College Dublin, Dublin, Ireland, March 2018.
 - Number Theory Seminar, Universität zu Köln, Feb. 2018.
- *Bridging the algebraic and analytic theory of the representation problem for quadratic polynomials*
 - AGeNTS, Tufts University, Medford, MA, Sept. 2018.
 - Number Theory Lunch Seminar, Max Planck Institute for Mathematics, Bonn, Germany, Jan. 2018.
 - Quebec Vermont Number Theory Seminar, Concordia University, Montreal, QC, Dec. 2017.
- *Is This polynomial solvable?*, Colloquium Series, University of Vermont, Burlington, VT, Dec. 2017.
- *Almost universal ternary sums of polygonal numbers*
 - Salah Mohammed Memorial Colloquium Series, Southern Illinois University, Carbondale, IL, Nov. 2017.
 - un-Quebec Vermont Number Theory Seminar, University of Vermont, Burlington, VT, Sept. 2017.
- *An introduction to lattices and the representation problem*, un-Quebec Vermont Number Theory Seminar, University of Vermont, Burlington, VT, Sept. 2017.
- *Integral representations by sums of polygonal numbers*, Langenhop Lecture and SIU Mathematics Conference, Southern Illinois University, Carbondale, IL, May 2016.
- *The representation problem for ternary quadratic polynomials*, Algebra, Geometry and Combinatorics Seminar, University of Pittsburgh, April 2016.
- *Kneser-Hecke operators for codes over finite chain rings*
 - AWM Workshop at the 2017 JMM, Atlanta, GA, Jan. 2017.
 - Number Theory Seminar, CU Boulder, March 2016.
 - Algebra Seminar, SUNY Buffalo, Oct. 2015.
 - Algebra Seminar, Wesleyan University, May 2015.
- *Kneser-Hecke operators for quaternary codes*
 - AWM Research Symposium, University of Maryland, April 2015.
 - AMS Spring Southeastern Sectional Meeting, University of Alabama, March 2015.
- *Quadratic lattices in the classical setting and the theory of self-dual code*, IBM Department of Mathematical Sciences, Yorktown Heights, NY, Feb. 2015.
- *A characterization of almost universal inhomogeneous quadratic polynomials*
 - Number Theory Seminar, Universität zu Köln, May, 2014.

- Number Theory Seminar, Universität des Saarlandes, May, 2014.
- Number Theory Seminar, University College Dublin, April, 2014.
- Number Theory Lunch Seminar, Max Planck Institute for Mathematics, March 2014.
- *The representation problem for positive-definite quadratic polynomials*, Oberseminar, Max Planck Institute for Mathematics, Feb. 2014.
- *Finding a local-global principle for inhomogeneous quadratic polynomials of rank 3*, AMS Fall Western Sectional Meeting, UC Riverside, Nov. 2, 2013
- *Almost universal ternary sums of squares and $(2p + 2)$ -gonal numbers*, AWM poster session, JMM San Diego, Jan. 2013.
- *On almost universal ternary inhomogeneous quadratic polynomials*, AMS special session on arithmetic theory of quadratic forms and lattices, JMM San Diego, Jan. 2013.
- *The representation problem for inhomogeneous quadratic polynomials*
 - Colloquium, Central Connecticut State University, April 2012.
 - UBC-SFU Number Theory Seminar, Simon Fraser University, Burnaby, Canada, March 2012.
- *Almost universal ternary sums of polygonal numbers*, Number Theory Seminar, City University of New York Graduate Center, Dec. 2011.
- *Solutions and representations of polynomials*, Math Club Invited Speaker, State University of New York at New Paltz, May 2011.
- *Almost universal ternary sums of triangular numbers*
 - AMS-SOMACHI Joint Meeting, Pucón, Chile, Dec. 2010.
 - Algebra Seminar, Wesleyan University, Oct. 2010.
- *Primitive prime divisors in orbits of quadratic polynomials*, Algebra Seminar, Wesleyan University, April 2010.

Contributed talks:

- *Spinor Regular Ternary Quadratic Forms*,
 - Ninth Upstate Number Theory Conference, Cornell University, Ithaca, NY, April 2019.
 - Mid-Atlantic Seminar on Numbers III, James Madison University, Harrisonburg, VA, Feb. 2019.
- *Almost universal ternary sums of polygonal numbers*, Maine/Quebec Number Theory Conference University of Maine, Orono, ME, Oct. 2017.
- *Integral representations by sums of polygonal numbers*,
 - Seventh Upstate Number Theory Conference, Binghamton University, Binghamton, NY, May 2017.
 - 31st Automorphic Forms Workshop, East Tennessee State University, Johnson City, TN, March 2017.
 - Workshop on Automorphic Forms and Related Topics, University of Sarajevo, Sarajevo, BIH, July 2016.
- *Lattices which are spinor regular but not regular*, Southern New England Conference on Quadratic Forms and Modular Forms, Wesleyan University, June, 2016.
- *Connected Graphs for Operators on Quaternary Codes*, Automorphic Forms Workshop, Michigan State University, March 2015.

- *The Hardy-Littlewood circle method*, Summer School on Apollonian Circle Packings, Mittag-Leffler Institute, Stockholm, Sweden, July 2014.
- *Towards an approximation property for ternary quadratic lattices*, 27th Automorphic Forms Workshop, UCD, Dublin, Ireland, March 2013.
- *On almost universal inhomogeneous quadratic polynomials*, Quebec/Maine Number Theory Conference, Université Laval, Oct. 2012.
- *The representation problem for inhomogeneous quadratic polynomials*, Upstate Number Theory Conference, University of Rochester, April 2012.
- *Almost universal ternary sums of squares and triangular numbers*
 - Illinois Number Theory Conference, University of Illinois at Urbana-Champaign, May 2011.
- *Primitive prime divisors in orbits of quadratic polynomials*, Arizona Winter School, University of Arizona, April 2010
- *A brief introduction to p -adics*, Women in Mathematics in New England, Smith College, Sept. 2009.

Workshops Attended:

- *Women in Data Science - Cambridge*, Virtual, March 2021.
- *Mathematical and Computational Approaches to Social Justice*, ICERM, Providence, RI, March 2021.
- *Mini-Workshop: Reflection Groups in Negative Curvature*, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany, April 2019.
- *33rd Automorphic Forms Workshop*, Duquesne University, Pittsburgh, PA, March 2019.
 - co-organizer with B. Kane, D. Milićević, and H. Skogman
- *Sage Days 90: Women in Sage*, Harvey Mudd College, Claremont, CA, Oct. 2017.
 - Project group leader: Local-global algorithms in number theory
 - co-organizer with A. Deines, B. Thompson, U. Whitcher.
- *Building Bridges: 3rd EU/US Summer School + Workshop on Automorphic Forms and Related Topics*, University of Sarajevo, Sarajevo, BIH, July 2016.
- *Southern New England Conference on Quadratic Forms and Modular Forms*, Wesleyan University, Middletown, CT, June 2016.
 - co-organizer with J. Beineke, W. K. Chan, G. Davidoff, and D. Pollack.
- *Re:boot Intensive Number Theory Research Workshop*, Duke University, Durham, NC, March 2016.
- *Computational Aspects of L-Functions*, ICERM, Providence, RI, November 2015.
- *Computational Representation Theory in Number Theory*, Oregon State University, July 2015.
- *Advances and Applications in Automorphic Forms*, CIRM, Luminy, France, May 2015.
- *Sage Days 62: Women in Sage 5*, Welches, OR, August 2014.
 - co-organizer with L. Thompson.
- *Summer School on Apollonian Circle Packings*, Mittag-Leffler Institute, Stockholm, Sweden, July 2014.

- *Women in Number Theory: 3*, BIRS, Banff, Canada, April 2014.
- *Summer School in Computational Algebraic Number Theory*, University of North Carolina, Greensboro, NC, May 2013.
- *27th Automorphic Forms Workshop*, UCD, Dublin, Ireland, March 2013.
- *Sage Days 42: Women in Sage 3*, Seattle, WA, July 2012.
- *Career Mentoring Workshop for Women*, Wheaton College, June 2012.
- *Diophantine Methods, Lattices, and Arithmetic Theory of Quadratic Forms*, BIRS, Banff, Canada, Nov. 2011.
- *Maine/Quebec Number Theory Conference*, University of Maine, Orono, ME, Oct. 2011.
- *Illinois Number Theory Conference*, University of Illinois, Urbana-Champaign, IL, May 2011.
- *Workshop on the Arithmetic of Quadratic Forms and Integral lattices*, Lake Rancho, Chile, Dec. 2010.
- *Sage Days 22: Computing with Elliptic Curves*, MSRI, Berkeley, CA, June 2010.
- *Program for Women and Mathematics: p-adic Langlands*, The Institute for Advanced Study, Princeton, NJ, May 2010.
- *Arizona Winter School: Number Theory and Dynamics*, Tucson, Arizona, April 2010.

MEDIA OUTREACH

- Invited Speaker, *17 Weird Facts About Science Writing That Will Totally Blow Your Mind*
 - Mathematics Colloquium, Tufts University, Medford, MA, Sept. 2018.
 - Undergraduate Mathematics Colloquium, University of North Texas, Denton, TX, Nov. 2017.
 - University of Colorado Boulder, Boulder, CO March, 2016.
 - AWM Lecture Series, University at Buffalo, Buffalo, NY, March 2016.
 - Joint Seminar of the Math Club and Writing Center, Wesleyan University, Middletown, CT, April 2015.
- Guest, *As It Happens*, CBC Radio One, June 2017.
- Guest, *Press Play with Madeleine Brand*, KCRW the NPR station out of Santa Monica, CA, March 2017.
- Panelist, *Outside the Equation*, Joint Math Meetings, Atlanta, GA, Jan. 2017.
- Guest, *Essential Pittsburgh*, WESA Pittsburgh's NPR News Station, May 2016.
- Invited Speaker, *Math And...Social Justice?*, Science and Brews, The Citizen Science Lab, Pittsburgh, PA, November, 2015.
- Co-host, *The Other Half*, a podcast about math, available on iTunes, May 2015-present.
- Social Media Coordinator, Association for Women in Mathematics, March 2015-present.
- Editor/Contributor, AMS Blog on Math Blogs, Feb. 2015-present.
- Invited Speaker, *Math and Media*, BIRS, Banff, Canada, April 2014.
- Contributor, AMS Math Digest, March 2014-December 2014.

- Blogger, AMS Joint Math Meetings Blog, 2014, 2015, 2017, 2019.

PROFESSIONAL SERVICE

Expository Publications:

- *Foolproof and Other Mathematical Meditations*, by Brian Hayes., Math Horizons (2018) 25:4, 29–29.
- *The Blog on Math Blogs*, Notices of the AMS (2016) 63:6, 643–644.
- *My Summer at NPR*, Notices of the AMS (2013) 60:11, 1477–1478.

Extramular Service:

- Panelist, *Professional Development Panel*, Ninth Upstate Number Theory Conference, Cornell University, Ithaca, NY, April 2019.
- Organizer (with B. Kane, D. Milićević, and H. Skogman) *33rd Automorphic Forms Workshop*, Duquesne University, Pittsburgh, PA, March 2019.
- Invited Speaker, *Here's What It's Going To Be Like On The Academic Job Market*, Colloquium, University of North Texas, Denton, TX, Nov. 2017.
- Organizer (with A. Deines, B. Thompson, U. Whitcher), *Sage Days 90: Women in Sage*, Harvey Mudd College, Claremont, CA, Oct. 2017.
- Organizer (with A. Deines), *Special Session on Women in Sage*, 2017 AWM Research Symposium, UCLA, Los Angeles, CA, April 2017.
- Panelist, *Navigating the Job Market*, 31st Automorphic Forms Workshop, East Tennessee State University, Johnson City, TN, March 2017.
- Organizer (with A. Salerno), *Special Session on Discrete Structures in Number Theory*, 2017 Joint Math Meetings, Atlanta, GA, Jan. 2017.
- Organizer (with J. Beineke, W.K. Chan, G. Davidoff, and D. Pollack), *Southern New England Conference on Quadratic Forms and Modular Forms*, Middletown, CT, June 2016.
- Panel Organizer/Moderator, *Preparing a Successful Grant Application*, Joint Math Meetings, San Antonio, TX, Jan. 2015.
- Judge, *MAA Undergraduate Student Poster Session*, Joint Math Meetings, San Antonio, TX, Jan. 2015.
- Organizer (with L. Thompson), *Sage Days 62: Women in Sage 5*, Welches, OR, August 2014.
- Contributor, AMS Mathematical Reviews, June 2014-present.
- Panelist, *Applying to Graduate School*, Conference for Women in Math in New England, Smith College, Sept. 2010.
- Panel Organizer, *The Next Step: Applying to and Surviving Grad School and Post Docs*, The Institute for Advanced Study, Princeton, NJ, May 2010.

Service at Duquesne University:

- Member, Dept. Steering Committee, 2019.
- Member, Dept. Prize Committee, 2019.
- Organizer, Dept. of Math and Computer Science Seminar Series, 2016 – 2017 academic year.

- Faculty Advisor, Math Contest in Modeling (with S. Tierney), 2015 – 2016.
- Faculty Advisor, Putnam Math Competition (with S. Levine), 2014 – 2018.

PEDAGOGY DEVELOPMENT

Pedagogy Workshops Attended:

- CTE Inspired Teaching Retreat, Bethel Park, PA, May 2017.
- *Project NExT/MAA MathFest*, Washington, D.C., August 2015.
- IBL Workshop, San Luis Obispo, CA, July 2015.
- *Project NExT/MAA MathFest*, Portland, OR, August 2014.

Courses Taught for Duquesne University:

- MATH 100, Calculus I with Algebra
- MATH 115, Calculus I
- MATH 116, Calculus II
- MATH 135, Discrete Math
- MATH 250, Foundations of Mathematics
- MATH 310, Linear Algebra
- MATH 311, Number Theory
- MATH 340, Problem Solving Seminar
- MATH 411, Abstract Algebra
- MATH 420, Complex Variables