Wöden Kusner

2023

CITIZENSHIP USA

RESEARCH INTERESTS Applied Geometry and Optimization, Topology of Configuration Spaces, Topological Data Analysis, Approximation Theory, Representation Theory, Statistical Mechanics and Condensed Matter Physics.

EDUCATION **University of Pittsburgh**, Pittsburgh, PA USA

Ph.D., Mathematics, August 2014

Advisor: Professor Thomas C. Hales
Dissertation: *Bounds on packing density via slicing*

M.A., Mathematics, December 2010

Haverford College, Haverford, PA USA

B.S., Mathematics, May 2007

Advisor: Professor John J. Flynn
Thesis: *Results in sphere packing density*

CERTIFICATES **University of Georgia**, Athens, GA USA

Certificate in Diversity and Inclusion, May 2021

Vanderbilt University, Nashville, TN USA

STEM Teaching Specialization, June 2020
Certificate in College Teaching, May 2019

ACADEMIC APPOINTMENTS

Instructor 2023 -
Department of Mathematics
Lawrence University

Assistant Professor (NTT) 2020 - 2022
Department of Mathematics
University of Georgia

Assistant Professor (NTT) 2017 - 2020
Department of Mathematics
Data Science Institute Faculty Affiliate
Vanderbilt University

Postdoctoral Associate 2017 - 2020
Center for Constructive Approximation
Vanderbilt University

FWF Postdoctoral Researcher 2014 - 2017
Institute of Analysis and Number Theory
Graz University of Technology

Visiting Scholar

Fields Institute	2021
ICERM, Brown University	2015, 2018
Erwin Schrödinger International Institute, University of Vienna	2014

Publications

- with G. Buck, R. Kusner. Stopper knots. (*in preparation*).

- with G. Dietler, E. Rawdon, R. Kusner, P. Szymczak. Chirality for crooked curves. (*submitted*). https://arxiv.org/abs/2004.10338

- with R. Kusner. A Gordian pair of links. *Geometriae Dedicata* 2023. https://arxiv.org/abs/1908.05610

- with T. Hales. Packings of regular pentagons in the plane. (*submitted*). https://arxiv.org/abs/1602.07220

- with J. Brauchart, P. Grabner, J. Ziefle. Hyperuniform point sets on the sphere: probabilistic aspects. *Monatshefte für Mathematik*, 2020. https://arxiv.org/abs/1809.02645

- with J. Brauchart, P. Grabner. Hyperuniform point sets on the sphere: deterministic aspects. *Constr Approx*, 2019. https://arxiv.org/abs/1709.02613

- with R. Kusner, J. Lagarias, S. Shlosman. Configuration spaces of equal spheres touching a given sphere: the twelve spheres problem. *Bolyai Society Mathematical Studies: New Trends in Intuitive Geometry*, 2018. https://arxiv.org/abs/1611.10297

- with Y. Kallus. The local optimality of the double lattice packing. *Discrete Comput Geom*, 2016. https://arxiv.org/abs/1509.02241

- On the densest packing of polycylinders in any dimension. *Discrete Comput Geom*, 2016. https://arxiv.org/abs/1405.0497

- An upper bound on packing density for circular cylinders of high aspect ratio. *Discrete Comput Geom*, 2014. https://arxiv.org/abs/1309.6996

Talks and Conferences

- Discrete Geometry and Geometric Optimization (AMS), South Alabama (10/23)
- Geometry and Packing in Material Structure and Biology, INI Workshop (8/23)
- Interplay between Geometric Analysis and Discrete Geometry, BIRS Workshop (*/23)
- Session on Discrete Geometry and Geometric Optimization (AMS) */21 (postponed)
- Veszprém Discrete Mathematics and Applications Conference: *TBA*. */20 (postponed)
- ESI Workshop: *TBA*. */21 (postponed to 1/22)
- Carolina Geometry Seminar *Measuring chirality with the wind.* 4/8/21
- Points Seminar *Measuring chirality with the wind.* 4/7/21
- Auburn University Colloquium *Chirality and hydrodynamics.* 11/13/20
- UGA Geometry Seminar: *Building Gordian unlinks.* 11/06/20
- UGA Topology Seminar: *Chirality and hydrodynamics (à la Lord Kelvin).* 8/31/20
- BIRS–CMO Workshop: *Gordian unlinks* 9/*/19
- 4th International Conference on Packing Problems, Yale. 6/*/19
- Topology and its Applications, WKU: *Gordian configurations* (II). 7/17/18
- ICERM, Brown: *Gordian configurations* (I). 4/11/18
- ICERM, Brown: *Computing discrepancy.* 3/9/18
- Aspen Center for Physics, 6/*/2017
- Montanuniversität Leoben: *Critical packings & the radius function.* 6/2/17

- CEIM, Universidad de Cantabria: *Critical packings (in the sphere).* 4/22/17
- JMM: Dis. Geo. & Con.: *Critical packings, rigidity, & the radius function.* 1/6/17
- TU Graz, Fall School: *Critical packings, rigidity, & the radius function.* 9/30/16
- AIM Workshop: *Configurations of spheres.* 9/22/16
- ICERM Workshop, Brown 9/*/16
- ACG Seminar, Pittsburgh: *Configurations of spheres.* 8/25/16
- MCQMC, Stanford: *Config. of pts w.r.t. discrepancy & unif. distribution.* 8/17/16
- MSRI: *Critical packings, rigidity, & the radius function.* 8/4/16
- MSRI Summer Research */16
- Institut Henri Poincaré Workshop, 6/*/16
- Special Session on New Developments in Discrete and Intuitive Geometry, AMS Spring SE Sectional: *Config. of pts w.r.t. discrepancy & unif. distribution.* 3/6/16
- Advanced Topics Seminar, TU Graz: *Configurations of spheres.* 1/22/16
- Zahlentheoretisches Kolloquium, TU Graz: *Problems with packing periodicity.* 12/11/15
- ICERM, Brown: *Can rods pack space more densely than disks the plane?* 4/28/15
- ICERM, Brown: *Spherical discrepancy.* 4/9/15
- TU Graz: *Computing spherical cap discrepancy: proof of concept.* 1/22/15
- Guest Lecture, TU Graz: *Introduction to packing problems.* 1/19/15
- Large Structures Seminar, Aalto: *Packing density bounds in higher dimensions.* 11/22/14
- ESI Workshop: *A brief analysis of regular pentagon packings in the plane.* 8/27/14
- IAS–PCMI Researcher: Mathematics and Materials. 6/*/14
- Oberwolfach: *Packing polycylinders.* 6/*/14
- Dissertation Defense, Pittsburgh: *Bounds on packing density via slicing.* 5/22/14
- Seminar, TU Graz: *Packing density bounds via slicing.* 5/8/14
- Erdős Memorial Lectures, Memphis: *Polycylinder density in higher dimensions.* 3/14
- Fields Institute: Workshop in Discrete Geometry. 11/*/13
- GSS, Pittsburgh: *Some packing problems & an upper bound.* 3/28/13
- A&S Graduate Expo, Pittsburgh: *Packing cylinders with high aspect ratio.* 3/23/13
- ACG Seminar, Pittsburgh: *An upper bound on packing density for circular cylinders with high aspect ratio.* 2/12/13
- Topological Dynamics Workshop, Newton Institute: *Packing circular cylinders.* 11/*/12
- IMA Summer School in Topological Methods, Penn. 7/*/11
- Graduate Algebra, Combinatorics and Geometry Seminar, Pittsburgh:
  - *The Jones Polynomial and the Kauffman Bracket*
  - *Category Theory V (Representable Functors)*
  - *Category Theory IV (Limits Informally/Formally)*
  - *Category Theory III (Slice and Comma Categories)*
  - *Category Theory II (Products and Limits)*
- Senior Thesis Defense, Haverford: *Results in sphere packing density.* 5/*/07

Other Works

- Untitled Work in *Frayed Knot* at The Museum of Everyday Life, 20
- Cover Art for *New Trends in Intuitive Geometry*, 18

Honors & Awards

- UGA Teaching Academy Fellow, 21-22
- Member of the Instructional Corps for the UGA Department of Mathematics
  2022 Regents' Teaching Excellence Award from the University System of Georgia
  State-wide award to a department or program for excellence in teaching and in service to students.
- Work featured in Die Presse: Science and Innovation 17
- University of Pittsburgh Honors Convocation 13, 14
- Outstanding Lecture/Presentation: University Graduate Expo 13

Award for the best lecture by a graduate student in the Natural Sciences

- K. Leroy Irvis Fellow: University of Pittsburgh 09, 12
  These highly competitive fellowships are designed to meet the critical need to recruit underrepresented minority graduate students to the University of Pittsburgh, to support and retain them, and eventually enhance their presence in the professorate.

- Bronze Presidential Service Award for AmeriCorps Volunteer Service 08
  The President's Volunteer Service Award is a civil award bestowed by the President of the United States.The award was established to honor volunteers that give hundreds of hours per year

Teaching

Lawrence University, Appleton, WI USA

Instructor 8/23 -

- Instructor for MATH103: Preparation for Calculus — Fall 23

University of Georgia, Athens, GA USA

Assistant Professor (NTT) 8/20 - 12/21

- Instructor for MATH 2250: Calculus I (2 sections) — Fall 21
- Instructor for MATH 2260: Calculus II — Spring 21
- Instructor for MATH 2250: Calculus I (2 sections) — Fall 20

Vanderbilt University, Nashville, TN USA

Assistant Professor (NTT) 8/17 - 8/20

- Instructor for MATH 2300: Multivariable Calculus — Spring 20
- Instructor for MATH 2300: Multivariable Calculus (2 sections) — Fall 19
- Supervisor for Undergraduate Summer Research (3 students) — Summer 19
- Instructor for MATH 3641/5641: Mathematical Statistics — Spring 19
- Instructor for MATH 2300: Multivariable Calculus — Fall 18
- Instructor for MATH 1010: Prob. & Stat. Inference I — Fall 18
- Supervisor of undergraduate TAs in MATH 1010 (3 sections) — Fall 18
- Instructor for MATH 3641/5641: Mathematical Statistics — Spring 18
- Instructor for MATH 1011: Prob. & Stat. Inference II — Spring 18
- Supervisor of undergraduate TAs in MATH 1011 (3 sections) — Spring 18
- Instructor for MATH 1010: Prob. & Stat. Inference I — Fall 17
- Supervisor of undergraduate TAs in MATH 1010 (3 sections) — Fall 17

Graz University of Technology, Graz, AT

Lehrbeauftragter 10/14 - 1/15, 3/16 - 6/16

- Instructor for MAT.670: Packings, Lattices and Configurations — Summer 16
- Assistant for MAT.902: Höhere Analysis — Winter 14

University of Pittsburgh, Pittsburgh, PA USA

Teaching Fellow 9/10 - 12/11

- Assistant for Math 0220: Calculus I (2 sections) — Fall 11
- Assistant for Math 2700: Graduate Topology — Fall 11
- Assistant for Math 1700: Topology — Spring 11

- Assistant for Math 1410: Foundations of Mathematics — Spring 11
- Assistant for Math 1250: Abstract Algebra II — Spring 11
- Assistant for Math 0230: Calculus II — Fall 10
- Assistant for Math 0220: Calculus I (2 sections) — Fall 10

Teaching Assistant 9/09 - 8/10

- Instructor for Math 0120: Business Calculus — Summer 10
- Assistant for Math 0120: Business Calculus (3 sections) — Spring 10
- Assistant for Math 0240: Calculus III (3 sections) — Fall 09

Service

Community-focused

- Kettering Foundation Research Exchange 2021
  The Kettering Foundation is a nonprofit operating foundation rooted in the American tradition of cooperative research. Kettering's primary research question is, what does it take to make democracy work as it should?

- Community Data Hub Project/ IFC Data Team (Fox Cities) 2021-2022
  Imagine Fox Cities is an inclusive community-wide initiative created to be intentional (i.e. data driven) about shaping the future of the Fox Cities when it comes to well-being.

- Secretary: Historic Central Neighborhood Committee (Fox Cities) 2021-

- Leadership Committee: Multicultural Alumni Action Group (Haverford) 2020-
  The Multicultural Alumni Action Group exists to ensure an inclusive community where all students and alumni can thrive.

- Co-Organizer: BiPOC Narratives in Medicine (Haverford) 2021

- Representative: Dietrich School of Arts and Sciences Council 2012-2014

- Delegate: Arts and Sciences Graduate Student Organization, 2011-2014

- President: Mathematics Graduate Student Organization, 2013-2014

- Treasurer: Mathematics Graduate Student Organization, 2011-2013

- Treasurer: SIAM University of Pittsburgh Chapter, 2010-2011

Teaching-focused

- Co-organizer: UGA Math Learning and Teaching Seminar 2022

- UGA Calculus Exam Committee 2021

- LS-PAC MODELS Mentor
  The LS-PAC MODELS mentorship program is a nationwide opportunity; anyone belonging to a historically underrepresented group in STEM at an institution with an LSAMP program can participate.

- Supervisor for summer research projects, undergraduate theses and graduate research.

  Research Mentor for Kevin Hu, B.S. Highest Honors 2020 (Vanderbilt)

Honors Thesis Committee for David K. Zhang, B.S., Founders Medal 2019 (Vanderbilt)

Dissertation Committee for Oleksandr Vlasiuk, Ph.D. 2018 (Vanderbilt)

Research Mentor for Jonas Ziefle (Graz)

Research-focused

- Active referee and reviewer for various journals and scientific bodies
  including: BIRS, ESF, NSF, NWO; Constr. Approx., DCG, Exp. Math, GCOM, IMRN , JKTR, SIAM

- Co-organizer: AMS Special Session on Discrete Geometry and Geometric Optimization 2021 (postponed to 2023)

- Website Maintainer: CCA and CA Seminar (Vanderbilt) 2017-2020
  Maintained and updated the website for the Center for Constructive Approximation

- Organizer: Computational Analysis Seminar (Vanderbilt) 2017-2020
  Managed the weekly seminar run out of the Center for Constructive Approximation

- Co-organizer: Shanks Workshop (Vanderbilt) 2019
  Proposed, organized, coordinated, and assisted in funding ($5000-$10000) Shanks Workshop on Computations and Linear Programming Bounds for Energy, Packing and Covering.

- Co-organizer: Fundamental Lemma→Discrete Geometry→Formal Verification 2018
  Proposed, organized, coordinated, and acquired funding ($25000-$50000).

- Organizer: Graduate Seminar in Algebra, Combinatorics and Geometry 2010-2014

Memberships

- AMS, SIAM, AWM, APS, IEEE, NCFDD

Technical Skills Familiarity with TEX (LATEX, BIBTEX), Mathematica, Python, Julia.

Languages English (Native), German (Intermediate), Spanish (Elementary).

References

Please contact me for references.