Wöden B. Kusner

2019

CONTACT INFORMATION

Department of Mathematics
Vanderbilt University
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CITIZENSHIP

USA

RESEARCH INTERESTS

Optimal Geometry, Topology of Configuration Spaces, Probability and Measure Theory, Representation Theory, Statistical Mechanics and Condensed Matter.

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, August 2010

Haverford College, Haverford, PA USA

B.S., Mathematics, May 2007

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

CERTIFICATES

Vanderbilt University, Nashville, TN USA

Certificate in College Teaching, May 2019

ACADEMIC APPOINTMENTS

Visiting Assistant Professor 2017 - Present
Department of Mathematics
Data Science Institute Faculty Affiliate
Vanderbilt University

Postdoctoral Associate 2017 - Present
Center for Constructive Approximation
Vanderbilt University

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

Visiting Scholar 2014
Erwin Schrödinger International Institute
University of Vienna

Visiting Scholar 2015, 2018
ICERM
Brown University

Papers

- with G. Buck and R. Kusner. Stopper knots. (*in preparation*).
- with G. Buck and R. Kusner. A Length-trading Gordian pair. (*in preparation*).
- with G. Dietler, E. Rawdon, R. Kusner and P. Szymczak. Chirality for crooked curves. (*in preparation*).
- with T. Hales. Packings of regular pentagons in the plane. To appear in *Contemporary Mathematics (Festschrift for W. Kuperberg).* https://arxiv.org/abs/1602.07220
- with J. Brauchart, P. Grabner and J. Ziefle. Hyperuniform point sets on the sphere: probabilistic aspects, 2018. https://arxiv.org/abs/1809.02645,
- with R. Kusner, J. Lagarias and 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 J. Brauchart and P. Grabner. Hyperuniform point sets on the sphere: deterministic aspects. *Constr Approx*, 2018. https://arxiv.org/abs/1709.02613
- 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

- BIRS-CMO Workshop. 9/*/19
- Topology and its Applications, WKU: *Gordian configurations* (II). 7/17/18
- ICERM Seminar, Brown: *Gordian configurations* (I). 4/11/18
- ICERM Seminar, 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
- SRP, MSRI: *Critical packings, rigidity, & the radius function.* 8/4/16
- 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
- Researcher, IAS – PCMI: 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
- Algebra, Combinatorics and Geometry 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

Honors & Awards

- Featured in Die Presse: Science and Innovation, '17
- University of Pittsburgh Honors Convocation '13, '14
- Outstanding Presentation: University Graduate Expo '13
- University of Pittsburgh Irvis Fellowship '09, '12
- Bronze Presidential Service Award for AmeriCorps Volunteer Service '08

Teaching

Vanderbilt University, Nashville, TN USA

Visiting Assistant Professor 8/17 - Present

- Instructor for MATH 2300: Vector Calculus (2 sections) Fall '19
- Supervisor for Undergraduate Summer Research (3 students) Summer '19
- Instructor for MATH 3641: Statistical Inference Spring '19
- Instructor for MATH 5641: Graduate Statistics Spring '19
- Instructor for MATH 2300: Vector Calculus Fall '18
- Instructor for MATH 1010: Prob. & Stat. Inference I Fall '18
- Supervisor for MATH 1010 Undergraduate TAs (3 sections) Fall '18
- Instructor for MATH 3641: Statistical Inference Spring '18
- Instructor for MATH 5641: Graduate Statistics Spring '18
- Instructor for MATH 1011: Prob. & Stat. Inference II Spring '18
- Supervisor for MATH 1011 Undergraduate TAs (3 sections) Spring '18
- Instructor for MATH 1010: Prob. & Stat. Inference I Fall '17
- Supervisor for MATH 1010 Undergraduate TAs (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 (3 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 2 Spring '11
- Assistant for Math 0230: Calculus 2 Fall '10
- Assistant for Math 0220: Calculus 1 (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 3 (3 sections) Fall '09

Sample material and evaluations available upon request

Professional Service

- Active referee and reviewer for various journals and scientific bodies.
- Honors Thesis Committee for David K. Zhang, B.S. High Honors 2019 (Vanderbilt)
- Dissertation Committee for Oleksandr Vlasiuk, Ph.D. 2018 (Vanderbilt)
- Organizer: Shanks Workshop (Vanderbilt University) '19
- Organizer: Computational Analysis Seminar (Vanderbilt University) '18 - '19
- Organizer: From the Fundamental Lemma to Dis. Geo. to Formal Verification '18
- Research Mentor for Jonas Zifle (Graz)
- Representative: Dietrich School of Arts and Sciences Council, '12 - '14
- Delegate: Arts and Sciences Graduate Student Organization, '11 - '14
- President: Mathematics Graduate Student Organization, '13 - '14
- Treasurer: Mathematics Graduate Student Organization, '11 - '13
- Treasurer: SIAM University of Pittsburgh Chapter, '10 - '11
- Organizer: Graduate Seminar in Algebra, Combinatorics and Geometry, '10 - '11

Technical Skills

TEX (LATEX, BIBTEX). Mathematica, Python, Julia. German (AP, B2), Spanish (AP).

References

Prof. Thomas C. Hales
Andrew Mellon Professor
University of Pittsburgh
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✉ hales@pitt.edu

Univ.-Prof. Peter J. Grabner
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Graz University of Technology
8010 Graz Austria
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