Wöden B. Kusner

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CONTACT INFORMATION

Department of Mathematics
Vanderbilt University
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CITIZENSHIP

USA

RESEARCH INTERESTS

Discrete and Metric Geometry, Optimization, Geometry and Topology of Configuration Spaces, Analysis and Geometric Measure Theory, Integral Geometry, Combinatorics, Representation Theory.

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*

ACADEMIC APPOINTMENTS

Visiting Assistant Professor 8/2017 - Present
Department of Mathematics
Vanderbilt University

Postdoctoral Associate 8/2017 - Present
Center for Constructive Approximation
Vanderbilt University

FWF Postdoctoral Researcher 9/2014 - 8/2017
Institute of Analysis and Number Theory
Graz University of Technology

Visiting Scholar Fall 2014
Erwin Schrödinger International Institute
University of Vienna

Visiting Scholar Spring 2015, Spring 2018
ICERM
Brown University

PAPERS

- with Greg Buck and Rob Kusner. Stopper knots. (*in preparation*).
- with Greg Buck and Rob Kusner. A Length-trading Gordian pair.(*in preparation*), 2018.

- with Giovanni Dietler, Eric Rawdon, Robert Kusner and Piotr Szymczak. Chirality for crooked curves. (*in preparation*), 2018.
- with Johann Brauchart, Peter Grabner and Jonas Ziefle. Hyperuniform point sets on the sphere: probabilistic aspects, 2018.
  https://arxiv.org/abs/1809.02645,
- with Thomas Hales. Packings of regular pentagons in the plane. To appear in *Contemporary Mathematics (Festschrift for W. Kuperberg).*
  https://arxiv.org/abs/1602.07220
- with Rob Kusner, Jeff Lagarias and Senya 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 Johann Brauchart and Peter Grabner. Hyperuniform point sets on the sphere: deterministic aspects. *Constr Approx*, 2018.
  https://arxiv.org/abs/1709.02613
- with Yoav 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

- 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 and the radius function.* 6/2/17
- CEIM, Universidad de Cantabria: Optimal Point Configurations and Orthogonal Polynomials: *Critical packings (in the sphere).* 4/22/17
- JMM Special Session: Discrete Geometry and Convexity: *Critical packings, rigidity, and the radius function.* 1/6/17
- TU Graz, Fall School: Discrete Geometry and Topology: *Critical packings, rigidity, and the radius function.* 9/30/16
- AIM Workshop on Soft Packings, Nested Clusters and Condensed Matter: *Configurations of spheres.* 9/22/16
- ICERM Workshop, Brown 9/16
- ACG Seminar, Pittsburgh: *Configurations of spheres.* 8/25/16
- MCQMC, Stanford: *Configurations of points with respect to discrepancy and uniform distribution.* 8/17/16
- SRP, MSRI: *Critical packings, rigidity, and 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: *Configurations of points with respect to discrepancy and uniform 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 Seminar, Brown: *Can rods pack space more densely than disks pack in the plane?* 4/28/15
- ICERM Seminar, Brown University: *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, Fields Institute. 11/13
- GSS, Pittsburgh: *Some packing problems and an upper bound.* 3/28/13
- A&SGraduate 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. '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

Work 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 2009, '12
Bronze Presidential Service Award for AmeriCorps Volunteer Service '08

Teaching Experience

Vanderbilt University, Nashville, TN USA

Visiting Assistant Professor 8/17 - Present
Certificate In College Teaching: Part I

Instructor for MATH 3641/5641: Statistical Inference	Spring '19
Instructor for MATH 2300: Vector Calculus	Fall '18
Instructor for MATH 1010: Prob. & Stat. Inference I	Fall '18
Mentor/Supervisor for MATH 1010 Undergraduate TAs	Fall '18
Instructor for MATH 3641/5641: Statistical Inference	Spring '18
Instructor for MATH 1011: Prob. & Stat. Inference II	Spring '18
Instructor for MATH 1010: Prob. & Stat. Inference I	Fall '17
Mentor/Supervisor for MATH 1010 Undergraduate TAs	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 student evaluations available upon request

Professional Service

Active referee and reviewer for various journals and scientific bodies.

Dissertation Committee for Oleksandr Vlasiuk (Vanderbilt)

Research Mentor for Jonas Zifle (Graz)

Organizer: Shanks Workshop (Vanderbilt University) ‘19 (upcoming)

Organizer: Computational Analysis Seminar (Vanderbilt University) ‘18 - ‘19

Organizer: From the Fundamental Lemma to Dis. Geo. to Formal Verification ‘18

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. German (AP, B2), Spanish (AP).

References

Please contact me for references.