Brian Benson

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Interests

Geometric analysis, differential geometry, and topics in PDE, spectral theory, low dimensional topology, and graph theory.

Education

Ph.D. in Mathematics, University of Illinois at Urbana-Champaign, August 2014.
Advisor: Nathan Dunfield.

M.S. in Mathematics, University of Illinois at Urbana-Champaign, December 2010.

B.S. in Applied Mathematics, Georgia Institute of Technology, May 2008.
B.S. in Exercise and Health Science, Kennesaw State University, May 2005.

Employment

Visiting Assistant Professor, Department of Mathematics, University of California, Riverside, July 2017-Present.

Visiting Assistant Professor, Department of Mathematics, Kansas State University, August 2014-August 2017.

Research Papers

Published or Accepted

Cheeger constants of hyperbolic reflection groups and Maass cusp forms of small eigenvalues, with Grant Lakeland and Holger Then, 13 pages, arXiv:1908.00199. *Accepted by* Proc Am Math Soc, 15 pages.

Volume growth, curvature, and Buser-type inequalities in graphs, with Peter Ralli and Prasad Tetali. *To appear in* Int Math Res Not, 49 pages, arXiv:1802.01952, https://doi.org/10.1093/imrn/rnz305.

Mean Value Theorems for Riemannian Manifolds via the Obstacle Problem, with Ivan Blank and Jeremy LeCrone. Journal of Geometric Analysis, 2019, Vol 29, 2752-2775, arXiv:1704.07518, https://doi.org/10.1007/s12220-018-0093-4.

A Note on a Newtonian Approximation in a Schwarzchild Background, with Marcelo M. Disconzi. The African Review of Physics, Vol 13, 2018, 12 pages, http://lamp.ictp.it/index.php/aphysrev/article/view/1569/566.

Torsion and ground state maxima: close but not the same, with R.S. Laugesen, M.L. Minion, B.A. Siudeja, 6 pages, Irish Mathematical Society Bulletin, Number 78, Winter 2016, 81-88, arXiv:1507.01565, http://www.irishmathsoc.org/bull78/Articles/Siudeja/Siudeja.pdf.

Sturm-Liouville Estimates for the Spectrum and Cheeger Constant, Int Math Res Not, Vol. 2015, No. 16, pp. 7510-7551, arXiv:1308.5936, https://doi.org/10.1093/imrn/rnu175.

G-parking functions, acyclic orientations and spanning trees, with Deeparnab Chakrabarty and Prasad Tetali. Discrete Mathematics (2010), no. 8, 1340-1353, arXiv:0801.1114, https://www.sciencedirect.com/science/article/pii/S0012365X10000142.

Preprints

Isoperimetric Problems, the Cheeger Constant, and Hyperbolic Surfaces, 37 pages, arXiv:1509.08993.

In Preparation

Cheeger Constants of Principal Congruence Arithmetic Surfaces with Jeffrey S. Meyer.

The Spanning Tree Modulus and the Laplace Spectrum of a Graph with Nathan Albin and Pietro Poggi-Corradini.

Grants

Applied For

Collaborative Research: Isoperimetric constants and computational geometry of hyperbolic surfaces, National Science Foundation, **Applied on 12/2/2019**, co-PI with Grant Lakeland.

Previously Funded

Achieving the Vision of Excellent Mathematics Teaching and Learning, Kansas State Department of Education MSP Grant, co-PI, $450,000, June 2016 - June 2019.

Invited Research Talks

* indicates a colloquium or special lecture and "SS" denotes *Special Session*

2019: AMS Sectional SS at Univ. of Hawaii, UC-Davis

2018: UCR, CSUSB*

2017: AMS Sectional SS at Indiana Univ., EIU Integrated Conference in Geometry, Dynamics, and Topology*, UCR, Midwest Geometry Conference.

2016: K-State, Vanderbilt, Univ. of Kansas, AIMS Special Session, SIAM Central States Special Session.

2015: AMS Sectional SS at Michigan State, K-State, Univ. of Nebraska.

2014: Indiana Univ., GEAR Junior Retreat, Université de Neuchâtel, K-State.

2013: AMS JMM Special Session, ICERM, CUNY, Caltech.

Prior to 2013: UIUC, Georgia Tech.

Teaching

As a Postdoc

Multivariable Calculus (Winter 2019), Set Theory (Winter 2018, Spring 2019), Calculus (Fall 2017-19, Winter 2018, Spring 2018-19), Intro to Proof (Spring 2016-17), History of Math (Spring 2017 & co-taught Spring 2016 with Andrew Bennett), Real Number Systems (Fall 2015), Mathematics for Elementary Teachers (Spring 2015), Studio College Algebra – *Large Lecture and Recitation/Lab Section* (Fall 2014-16).

As a Graduate Student

Instructor for: A Mathematical World (Spring 2012), Finite Mathematics (Spring 2011)

TA for: Calculus II for Engineers (Fall 2012,2011), Theory of Arithmetic (Fall 2010, Spring 2010), Calculus (Fall 2009, 2008), Calculus III (Spring 2009)

Service and Outreach

Supervisor for three undergraduate research projects/investigations. Topics include *Formulas Relating Curves of Constant Curvature and Distance from an Isotopic Geodesic in Hyperbolic Space* and *Enumeration of Maximal G-Parking Functions via Python*.

Organizer for AMS Special Session *Computational Methods in Hyperbolic Geometry* at AMS Sectional Meeting at UCR, November 2019.

Reading Course Supervision: Differential Geometry, Relating Abstract Algebra to Secondary Ed.

Referee assignments include *Proceedings of the LMS*, *Annales de l'Institut Fourier*, *SIAM Journal on Discrete Mathematics*, *Mathematical Methods in the Applied Sciences*.

KSU Math – Assessment of proof writing of undergraduate mathematics majors and minors – 4 AYs (years ending 2014-17 inclusive).

KSU Math and Ed Depts – Co-taught two week summer mathematics programs for in-service elementary and middle school teachers in summer of 2015 in Manhattan, KS and summers of 2016 and 2017 in Garden City, KS.

KSU Pilots Program (2014-15) – Taught algebra classes specifically for students enrolled in this program. Collaborated with leaders of the program in an effort to improve student learning outcomes.