

## Neil R Hoffman

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CONTACT INFORMATION Assistant Professor | Department of Mathematics  
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Citizenship: USA | *skype* neil.r.hoffman

RESEARCH INTERESTS My primary research interests are in low dimensional topology. More specifically, I consider problems involving triangulations of 3-manifolds, hyperbolic geometry, and knot theory. Currently, I am working on problems related to 3-manifold recognition and rigorous computation of 3-manifold invariants.

EMPLOYMENT Assistant Professor, Oklahoma State, July 2016-present.  
Research fellow, University of Melbourne, September 2013-July 2016.  
Guest Researcher, Max Planck Institute for Mathematics, September 2012-August 2013.  
Visiting Assistant Professor, Boston College, July 2011-June 2012.

INSTITUTES ICERM-Fall Semester Program: Low-dimensional Topology, Geometry, and Dynamics, October, 2013.

EDUCATION Ph.D. Mathematics, University of Texas, May 2011.  
Advisor: Alan Reid  
DISSERTATION: Properties of commensurability classes of hyperbolic knot complements  
B.A. Mathematics with Honors, Williams College, 2004.  
Thesis Advisor: Frank Morgan  
Budapest Semesters in Mathematics, Fall 2002.

AWARDS Department Fellowship - Spring 2011  
Mathematics Teaching Excellence Award - Fall 2010  
Research Training Grant Summer Support 2010  
Research Training Grant Summer Support 2009  
Mathematical Association of America Committee on Undergraduate Research Talk Award - MathFest 2003

CONFERENCES ORGANIZED Interactions between topological recursion, modularity, quantum invariants, and low-dimensional topology (Upcoming 28 Nov- 23 Dec 2016) *together with Norm Do, Craig Hodgson, Motohico Mulase, and Paul Norbury*  
<http://math.okstate.edu/people/nhoffman/Interactions-TR-LDT-2016.html>

PUBLICATIONS

Dunfield, Nathan M., Neil R. Hoffman, and Joan E. Licata. “Asymmetric hyperbolic L-spaces, Heegaard genus, and Dehn filling.” *Mathematical Research Letters* 22.6 (2015).

Hoffman, Neil R., and Genevieve S. Walsh. “The big Dehn surgery graph and the link of  $S^3$ .” *Proceedings of the AMS Series B* (open access), <http://www.ams.org/journals/bproc/2015-02-02/S2330-1511-2015-00020-7/>

Hoffman, Neil R, Kazuhiro Ichihara, Masahide Kashiwagi, Hidetoshi Masai, Shin’ichi Oishi, and Akitoshi Takayasu. “Verified computations for hyperbolic 3-manifolds.” *Experimental Mathematics*, 25(1) 2016.

Baker, Kenneth L., Brandy Guntel-Doleshal, and Neil Hoffman. “On manifolds with multiple lens space fillings.” *Boletín de la Sociedad Matemática Mexicana* 20.2 (2014): 405-447.

Hoffman, Neil R. “Small knot complements, exceptional surgeries and hidden symmetries.” *Algebraic & Geometric Topology* 14, no. 6 (2015): 3227-3258.

Hoffman, Neil R. ”On knot complements that decompose into regular ideal dodecahedra.” *Geometriae Dedicata* 173, no. 1 (2014): 299-308.

Hoffman, Neil. “Commensurability classes containing three knot complements.” *Algebraic & Geometric Topology* 10, no. 2 (2010): 663-677.

PREPRINTS

AVAILABLE ON  
ARXIV:

S. Garoufalidis, C. Hodgson, N. Hoffman and H. Rubinstein, *The 3D-index and normal surfaces*. arXiv preprint arxiv:1604.02688 (2016).

Baker, Kenneth L. appendix by Hoffman, Neil R. *The Poincaré homology sphere, lens space surgeries, and some knots with tunnel number two* arXiv preprint arXiv:1504.06682 (2015).

Hoffman, Neil R., and Jessica S. Purcell. “Geometry of planar surfaces and exceptional fillings.” arXiv preprint arXiv:1504.01471 (2015).

Hoffman, Neil, and Nathan Sunukjian. “Surfaces in 4-manifolds: smooth isotopy.” arXiv preprint arXiv:1310.1838 (2013).

IN

PREPARATION:

K. Baker, N. Hoffman and J. Licata *Unifying Unexpected Exceptional Dehn Surgeries*.

SUPERVISED  
RESEARCH

(together with Craig Hodgson) Dadd, Blake, and Aochen Duan. “Constructing Infinitely Many Geometric Triangulations Of The Figure Eight Knot Complement.” arXiv preprint arXiv:1508.04942 To appear in *Proceedings of the Amer. Math. Soc.*

(together with Craig Hodgson) Emma Kong and Curtis Mustgrave-Evans. “Maximal equal area cusp packings of punctured spheres”

UNDERGRADUATE  
RESEARCH

Corneli, Joseph, Neil Hoffman, Paul Holt, George Lee, Nicholas Leger, Stephen Moseley, and Eric Schoenfeld. "Double bubbles in  $S^3$  and  $H^3$ ." *Journal of Geometric Analysis* 17, no. 2 (2007): 189-212.

TEACHING

Spring 2014 - Linear Algebra (Uni. Melbourne)

Spring 2012 - Instructor Linear Algebra and Ideas in Math (Boston College)

Fall 2011 - Instructor Calculus I (Boston College)

January 2011-May 2011 Department Fellowship (Texas)

January 2010-December 2010 Coordinator of Saturday Morning Math Group (Texas)

Fall 2009 - Teaching Assistant 408K-CNS (Differential Calculus I) (Texas)

Fall 2008-Spring 2009 - Assistant Instructor 505G (Pre-calculus) (Texas)

Fall 2006-Spring 2008 - Supplemental Instructor 408D (Integral and Multi-variable calculus), 408M (Multi-variable calculus) (Texas)

Spring 2006 - Teaching Assistant - Moore Method Introduction to Topology (Texas)

Fall 2004-Fall 2005 - Teaching Assistant 408D (Integral and Multi-variable calculus) (Texas)

INVITED TALKS

Commensurability classes of knot complements, University of Illinois-Chicago, University of Illinois, December 2015

Asymmetric knots with two cyclic surgeries, Knots in Washington, December 2015

Geometry of planar surfaces and exceptional fillings, Flinders University, September 2015

Verified canonical triangulations, University of Sydney, November 2014

Verified computations for hyperbolic 3-manifolds, Australia National University, May 2014

Software presentation: HIKMOT, ICERM, October 2013

Verified computations for hyperbolic 3-manifolds, Maryland, Miami, Wisconsin, Williams, Texas, October 2013

The big Dehn surgery graph and the link of  $S^3$ , AusMS Sydney, 2013

Knot complements and commensurability, Tokyo Institute of Technology, May 2013

3-manifolds, group weight, and Dehn surgeries, Cube complexes and 3-manifolds, University of Illinois at Chicago, May 2013

Verified computations for hyperbolic 3-manifolds, Geometric topology in Cortona, Interactions of quantum topology and hyperbolic geometry, A conference in honor of Riccardo Benedetti for his 60th birthday, June 2013

Generalized Berge knots, Low-dimensional Topology and Geometry in Toulouse, June 2013

On knot complements that decompose into regular ideal dodecahedra, Tufts Topology Seminar, January, 17th, 2013.

Obstructing knot surgeries on geometric 3-manifolds, UCLA Topology Seminar January 9th, 2013

Generalized Berge knots admitting three cyclic fillings, Technion - Israel Institute of Technology, December 6, 2012.

Knots and commensurability, Journées de Géométrie Hyperbolique Hyperbolique, University of Fribourg, November 20, 2012.

Meridians of hyperbolic knot complements, Moab Topology Conference, Moab, May 30th, 2012

Knot complements admitting hidden symmetries and exceptional surgeries, Tufts University, April 12, 2011

Commensurability, 3-orbifolds, and weighted graphs, Budapest Semesters in Mathematics Reunion Conference, June 23, 2010

Commensurability classes containing three knot complements, Santa Barbara Topology Seminar, May 11, 2010

Double bubbles in spherical and hyperbolic Space, MathFest-San Jose, August 5, 2007

## SOFTWARE

Proficient in Python and the more specialized software: Snappy, snap, orb, MAGMA, gap, and sage.

## TALKS

Knot complements and hidden symmetries Junior Topology Seminar, Fall 2010

A family of hyperbolic knot complements with exceptional surgeries, Junior Topology Seminar, Fall 2009

The eight three dimensional geometries, Junior Topology Seminar, Fall 2008

Knot complements and commensurability, Topology Seminar, Spring 2008

Commensurability classes and two-bridge links, Junior Topology Seminar, Fall 2007

Invariant trace fields Part II, Junior Number Theory Seminar, Spring 2006

Invariant trace fields, Junior Topology Seminar, Spring 2006

Determining hyperbolic structures on knot complements, Junior Topology Seminar, Spring 2005

Double bubbles in other universes, Mathfest-Boulder 2003, Boulder, CO

## SERVICE

Assistant Director Vacation Scholars Program Summer 2016 University of Melbourne

Seminar Organizer: Knot Invariants 2015 University of Melbourne

Session organizer: AustMS/NZMS 2014 Special Session on Geometry and Topology  
(similar to an AMS special session)

Website manager - 2014/2015 Maths and Stats. Department Vacation Scholars Program. (Uni. Melbourne)

Participant, University of Melbourne Open Day 2014.

Director, Saturday Morning Math Group, University of Texas 2010.