

Peter Bubenik

Department of Mathematics (216) 687-4688
Cleveland State University (216) 523-7340 (fax)
2121 Euclid Ave. RT 1515 peter.bubenik@gmail.com
Cleveland, OH 44115-2214 http://academic.csuohio.edu/bubenik_p/

ACADEMIC APPOINTMENTS

Associate Professor Fall 2010 – present
Cleveland State University

Assistant Professor Fall 2005 – Spring 2010
Cleveland State University

Postdoctoral Fellow Fall 2003 – Summer 2005
Swiss Federal Institute of Technology at Lausanne (EPFL)

VISITING APPOINTMENTS AND OTHER APPOINTMENTS

Director July 2014 – present
Applied Algebraic Topology Research Network

Scientific Researcher January 2007
Fields Institute, Toronto, Canada

General Member Fall 2006
Mathematical Sciences Research Institute, Berkeley, CA

EDUCATION

Ph.D. in Mathematics 2003
University of Toronto, Canada
Dissertation: “Cell attachments and the homology of loop spaces and differential graded algebras.” Advisor: Paul Selick

M.Sc. in Mathematics 1997
University of Toronto, Canada
Thesis: “A quasi-isomorphism for $\tilde{C}_*(X)$.” Advisor: Steve Halperin

B.Sc. in Mathematics and Physics 1996
University of Guelph, Canada

GRANTS AND AWARDS

Award	Time	Amount
AFOSR Research Award	2013–2016	\$279,430
CSU Faculty Scholarship Initiative Award	2011–2013	\$4,943
NSF/CBMS Regional Conference in the Mathematical Sciences	2009	\$34,108
CSU Faculty Research Development Program Award	2008–2011	\$9,282
Ontario Graduate Scholarship in Science and Technology	2000–2001	\$15,000
NSERC Post-Graduate Scholarship B	1998–2000	\$34,800
NSERC Post-Graduate Scholarship A	1996–1998	\$31,200
NSERC Undergraduate Student Research Award	1994	\$4,000
Canada Scholarship	1992–1996	\$10,000

REFEREED PUBLICATIONS

1. P. Bubenik. Statistical topological data analysis using persistence landscapes. *Journal of Machine Learning Research*, in press.
2. P. Bubenik, V. de Silva and J.A. Scott. Metrics for generalized persistence modules. *Foundations of Computational Mathematics*, in press.
3. P. Bubenik and J.A. Scott. Categorification of persistent homology. *Discrete and Computational Geometry*, **51** (2014), no. 3, 600–627.
4. Y. Baryshnikov, P. Bubenik, and M. Kahle. Min-type Morse theory for configuration spaces of hard spheres. *International Mathematical Research Notices*, **2014** (2014), no. 9, 2577–2592.
5. P. Bubenik. A comment to “A microbiology primer for pyrosequencing”. *Quantitative Bio-Science*, **31** (2012), pp. 85–86.
6. P. Bubenik. Simplicial models for concurrency. *Electronic Notes in Theoretical Computer Science*, **283** (2012), pp. 3–12.
7. P. Bubenik, and L.H. Gold. Graph products of spheres, associative graded algebras and Hilbert series. *Mathematische Zeitschrift*, **268** (2011), no. 3–4, 821–836.
8. P. Bubenik, G. Carlsson, P.T. Kim, and Z. Luo. Statistical topology via Morse theory, persistence, and nonparametric estimation. *Algebraic Methods in Statistics and Probability II. Contemporary Mathematics*, **516** (2010), 75–92.
9. Moo K. Chung, Peter Bubenik, and Peter T. Kim. Persistence diagrams of cortical surface data. *Information Processing in Medical Imaging 2009. Lecture Notes in Computer Science*, **5636** (2009), 386–397.
10. P. Bubenik. Models and van Kampen theorems for directed homotopy theory. *Homology, Homotopy and Applications*, **11** (2009), no. 1, 185–202.
11. P. Bubenik. Context for models of concurrency. *Electronic Notes in Theoretical Computer Science*, **230** (2009), 3–21.
12. G.A. Bubenik and P.G. Bubenik. Palmated antlers of moose may serve as a parabolic reflector of sounds. *European Journal of Wildlife Research*, **54** (2008), 533–535.
13. P. Bubenik. Separated Lie models and the homotopy Lie algebra. *Journal of Pure and Applied Algebra*, **212** (2008), no. 2, 350–369.
14. P. Bubenik, and P. Kim. A statistical approach to persistent homology. *Homology, Homotopy and Applications*, **9** (2007), no. 2, 337–362.
15. P. Bubenik, and J.A.R. Holbrook. Densities for random balanced sampling. *Journal of Multivariate Analysis*, **98** (2007), no. 2, 350–369.
16. P. Bubenik, and K. Worytkiewicz. A model category for local po-spaces. *Homology, Homotopy and Applications*, **8** (2006), no. 1, 263–292.
17. P. Bubenik. Free and semi-inert cell attachments. *Transactions of the American Mathematical Society* **357** (2005), no. 11, 4533–4553.

SUBMITTED PAPERS

18. P. Bubenik and P. Dlotko. A persistence landscapes toolbox for topological statistics. 26pp.
19. V. Kovacev-Nikolic, P. Bubenik, D. Nikolic, and G. Heo. Using cycles in high dimensional data to analyze protein binding. 32pp.

PAPERS IN PREPARATION

20. P. Bubenik, V. de Silva and J.A. Scott. Interleavings of categories and generalized factor persistence.
21. P. Bubenik, V. de Silva and V. Nanda. Persistence geometry and Lipschitz extensions.
22. P. Bubenik and H.L. Tanaka. A general setting for persistence: enrichments of metric and Rips spaces.

OTHER PUBLICATIONS

1. P. Bubenik. Statistical persistent homology. Oberwolfach Report No. 29, 2008, pp. 9–11.
2. P. Bubenik. Context for models of concurrency. In Proceedings of the Workshop on Geometry and Topology in Concurrency and Distributed Computing (Amsterdam, The Netherlands), BRICS Notes NS-04-2, pp. 33–49, 2004.
3. Z. Luo, P. Bubenik, and P.T. Kim. Closed model categories for presheaves of simplicial groupoids and presheaves of 2-groupoids. arXiv:math/0301045 [math.AT].
4. P. Bubenik. Cell attachments and the homology of loop spaces and differential graded algebras. v+108pp. Ph.D. Thesis, University of Toronto, 2003.
5. P. Bubenik. A quasi-isomorphism for $\tilde{C}_*(X)$. 9pp. Master's Thesis, University of Toronto, 1997.
6. J.J. Simpson, P. Bubenik, A. Frumkin, H. Schwarcz, and D.C. Ford. U-series dating of speleothems by gamma spectrometry. 5pp. Manuscript # (GWP)²-NP94-03, 1994.

CONFERENCES AND WORKSHOPS ORGANIZED

1. Applied and Computational Topology Mini-symposium, SIAM Conference on Applied Algebraic Geometry, Fort Collins, CO, August 1–4, 2013 (with Dmitriy Morozov and Mikael Vejdemo Johansson)
2. AMS Special Session on Applied Topology, AMS Sectional Meeting, Akron, OH, October 20–21, 2012 (with Matthew Kahle)
3. NSF/CBMS conference, Algebraic Topology in Applied Mathematics, Cleveland State University, August 3–7, 2009 (with John Oprea)
4. Data Analysis using Computational Topology & Geometric Statistics, Banff International Research Station (BIRS), March 8–13, 2009 (with Gunnar Carlsson and Peter T. Kim)

INVITED LECTURES

Lecture	Location	Date
Complex Networks Program Review	Arlington, VA	Nov 17, 2014
Discrete, Computational and Algebraic Topology	Copenhagen, Denmark	Nov 10, 2014
Applied Algebraic Topology Research Network	WebEx Meeting	Oct 28, 2014
AMS Regional Meeting	Halifax, NS, Canada	Oct 18, 2014
Summer intern seminar	NASA Glenn Research Center	July 9, 2014
Mathematics Colloquium	Univ of Florida	June 16, 2014
Alg Top Methods Comp Sci 6	UBC, Vancouver, Canada,	May 29, 2014
Geom Top and Graph Models in Statistics	Fields Inst, Toronto, Canada	May 23, 2014
SAMSI Workshop on Topological Data Analysis	Research Triangle Park, NC	Feb 3, 2014
Complex Networks Program Review	Arlington, VA	Dec 17, 2013
Topology, Geometry, Data seminar	Ohio State Univ, OH	Nov 15, 2013
IAS/Penn/Rutgers Workshop on Topology	Rutgers Univ, NJ	Nov 6, 2013
Banach Center Conference on Applied Topology	Bedlewo, Poland	July 25, 2013
Applied and Computational Algebraic Topology	Bremen, Germany	July 18, 2013
Mathematics Colloquium	Ohio State University, OH	Feb 5, 2013
BIRS Topological Data Analysis and Machine Learning	BIRS, Banff, Canada	Oct 14, 2012
Stratified Spaces Arising from Biological Problems	MBI, Columbus, OH	May 22, 2012
DARPA Mathematics Summit	Incline Village, NV	Feb 21, 2012
Applied Topology Seminar	University of Pennsylvania, PA	Jan 26, 2012
AMS National Meeting	Boston, MA	Jan 5, 2012
Mathematics Colloquium	Case Western Res. Univ, OH	Nov 5, 2010
Statistics Colloquium	University of Virginia, VA	Oct 15, 2010
Geometry Topology and Data Seminar	Ohio State University, OH	Feb 19, 2010
GETCO Workshop	Aalborg, Denmark	Jan 14, 2010
NSF/CBMS Conference	Cleveland State University, OH	Aug 4, 2009
Topology Seminar	Penn State Altoona, PA	Apr 17, 2009
Topology Seminar	Wayne State University, OH	Apr 7, 2009
BIRS Workshop on Data Analysis	Banff, Canada	Mar 10, 2009
AMS National Meeting	Washington, DC	Jan 26, 2009
Probability Seminar	Duke University, NC	Nov 20, 2008
Topology Seminar	University of Oregon, OR	Nov 11, 2008
AMS sectional meeting	Kalamazoo, MI	Oct 19, 2008
Workshop on Computational algebraic topology	Oberwolfach, Germany	Jun 30, 2008
Mathematics Colloquium	University of Akron, OH	Apr 24, 2008
Geometry/Topology Seminar	John Carroll University, OH	Mar 3, 2008
Geometry/Topology Seminar	John Carroll University, OH	Nov 12, 2007
Mathematics and Computer Science Seminar	University of Guelph, Canada	Aug 15, 2007
MSRI Workshop on Applied Topology	MSRI, Berkeley, CA	Sep 21, 2006
Annual meeting of the Statistical Society of Canada	London, Canada	May 31, 2006
Geometry/Topology Seminar	John Carroll University, OH	Oct 3, 2005
Statistics Seminar	Lausanne, Switzerland	May 10, 2005
Algebra and Topology of Computation	Montpellier, France	Mar 18, 2005
Fields Workshop on Very Large Data Sets	University of Ottawa, Canada	Feb 25, 2005
Fields Workshop on Very Large Data Sets	University of Ottawa, Canada	Feb 24, 2005
Applied Topology Seminar	Stanford University, CA	Feb 18, 2005
Mathematics Colloquium	Cleveland State University, OH	Feb 2, 2005
Mathematics Seminar	University of Guelph, Canada	Nov 16, 2004
Algebraic Topological Methods in Computer Science	UWO, London, Canada	Jul 18, 2004

CONTRIBUTED TALKS AT CONFERENCES AND WORKSHOPS

Lecture	Location	Date
Algebraic Topological Methods in Computer Science	Paris, France	Jul 7, 2008
MSRI Applied Topology Workshop	MSRI, Berkeley, CA	Oct 30, 2006
Fields Workshop on Very Large Data Sets	University of Ottawa, Canada	Feb 25, 2005
Geometric and Topology in Computing	Amsterdam, Netherlands	Oct 13, 2004
Canadian Undergraduate Mathematics Conference	University of Winnipeg, Canada	May 21, 1996

PROFESSIONAL SERVICE

Contribution	Organization
Grant reviewer	Department of Energy
Grant reviewer	Air Force Office of Scientific Research
Grant reviewer	National Sciences and Engineering Research Council of Canada
Grant reviewer	Banff International Research Station
Reviewer	Mathematical Reviews
Reviewer	SpringerBriefs in Mathematics
Referee	Journal of Pure and Applied Algebra
Referee	Proceedings of the American Mathematical Society
Referee	Foundations of Computational Mathematics
Referee	Journal of Multivariate Analysis
Referee	Theoretical Computer Science
Referee	Homology, Homotopy and Applications
Referee	Inverse Problems
Referee	Theory and Applications of Categories
Referee	Discrete and Computational Geometry
Referee	Mathematical Methods in the Applied Sciences
Referee	Journal of Mathematics and Music
Referee	Journal of Homotopy and Related Structures
Referee	Glasgow Mathematical Journal
Referee	Topological Methods in Nonlinear Analysis
Referee	Applicable Algebra in Engineering, Communication and Computing
Referee	Journal of Computational Geometry
Member	American Mathematical Society
Member	Mathematical Association of America

UNIVERSITY SERVICE

Location	Committee	Time
CSU	Dept of Math Undergraduate Program Committee, chair	2013 – present
CSU	Dept of Math Peer Review Committee – Tenure	2013 – present
CSU	College Budget and Planning	2012 – present
CSU	University Research Council	2011 – present
CSU	Graduate Council	2010 – present
CSU	Dept of Math Appointments Committee, chair	2010–11,13–present
CSU	Dept of Math Graduate Program Committee, chair	2009 – 2010
CSU	Dept of Math Graduate Program Committee	2005–06,10–11,13–present
CSU	Dept of Math Appointments Committee	2007 – 2010
CSU	Dept of Math Colloquium Committee, chair	2009 – 2010
CSU	Dept of Math Undergraduate Advising	2007 – 2010
CSU	Dept of Math Library Committee	2007 – 2010
CSU	Dept of Math Computer Needs and Math Lab Committee	2007 – 2008
Toronto	Dept of Math Graduate Committee	1998–1999, 2000–2001

STUDENTS SUPERVISED

Name	Project	Level	Time
Zachary McCarthy	Lie Groups	Undergraduate	2014
Kelton Anderson	Knot Theory	Undergraduate	2014
Luo Yixi	Persistent homology of random polynomials	Graduate	2013–2014
Matthew McDonald	Moiré patterns	Undergraduate	2013–2014
Brian Feister	Topology, Geometry and Brain Imaging	Graduate	2011–2012
Arlist Hunter	Complex Analysis	Undergraduate	2010–2011
Eden Kovacic	Knot Theory	Undergraduate	2010–2011
Daniel Limeer	Probability Theory and Graphs	Undergraduate	2008–2009

COURSES TAUGHT

Location	Course Code	Course Title	Level	Term
CSU	MTH 182	Calculus 2	Undergraduate	Spring 2014
CSU	MTH 415/515	Real Analysis	Undergraduate/Graduate	Fall 2013
CSU	MTH 396	Junior Seminar	Undergraduate	Spring 2013
CSU	MTH 181	Calculus 1	Undergraduate	Spring 2013
CSU	MTH 514	Linear Alg/Fn Sev Vars	Graduate	Fall 2012
CSU	MTH 181	Calculus 1	Undergraduate	Fall 2012
CSU	MTH 181	Calculus 1	Undergraduate	Summer 2011
CSU	MTH 167	Precalculus 1	Undergraduate	Summer 2011
CSU	MTH 181	Calculus 1	Undergraduate	Spring 2011
CSU	MTH 168	Precalculus 2	Undergraduate	Spring 2011
CSU	MTH 493/593	Special Topics - Topology	Undergraduate/Graduate	Fall 2010
CSU	MTH 323	Statistical Methods	Undergraduate	Fall 2010
CSU	MTH 396	Junior Seminar	Undergraduate	Spring 2010
CSU	MTH 168	Precalculus 2	Undergraduate	Spring 2010
CSU	MTH 333	Geometry	Undergraduate	Fall 2009
CSU	MTH 281	Multivariable Calculus	Undergraduate	Fall 2009
CSU	MTH 434/534	Differential Geometry	Undergraduate/Graduate	Spring 2009
CSU	MTH 396	Junior Seminar	Undergraduate	Spring 2009
CSU	MTH 167	Precalculus 1	Undergraduate	Spring 2009
CSU	MTH 182H	Honors Calculus 2	Undergraduate	Fall 2008
CSU	MTH 381	Analysis	Undergraduate	Spring 2008
CSU	MTH 182H	Honors Calculus 2	Undergraduate	Spring 2008
CSU	MTH 333	Geometry	Undergraduate	Fall 2007
CSU	MTH 182H	Honors Calculus 2	Undergraduate	Fall 2007
CSU	MTH 333	Geometry	Undergraduate	Spring 2007
CSU	MTH 182H	Honors Calculus 2	Undergraduate	Spring 2007
CSU	MTH 182H	Honors Calculus 2	Undergraduate	Spring 2006
CSU	MTH 182	Calculus 2	Undergraduate	Spring 2006
CSU	MTH 181	Calculus 1	Undergraduate	Fall 2005
Toronto	MAT 186	Calculus 1	Undergraduate	Fall 2001

PUBLICITY

Venue	Description	Date
Engaged, CSU eDigest	Article on the persistence landscape	May 9, 2014
CSU Office of Research	Featured Researcher video	Apr 1, 2014
Cleveland Stater	Front page article on AFOSR grant	Apr 4, 2013
Engaged, CSU blog	Article on geometry of complex data	Mar 21, 2013
Plain Dealer (Cleveland daily)	Front page article on antlers and sound	Mar 29, 2008
NPR/CBC As it happens	National broadcast on antlers and sound	Mar 26, 2008
Ottawa Citizen	Article on antlers and sound	Mar 22, 2008
National Post (Canadian daily)	Article on antlers and sound	Mar 21, 2008
The Guardian	Article on antlers and sound	Mar 21, 2008
The Independent	Article on antlers and sound	Mar 21, 2008
BBC	Article on antlers and sound	Mar 21, 2008