AMIT PATEL

Associate Professor   Born in Chicago, IL, USA
Department of Mathematics
Colorado State University

EDUCATION

Doctor of Philosophy   May 2010
Computer Science, Duke University
Advisor: Herbert Edelsbrunner

Master of Science   May 2003
Computer Science, University of Illinois at Urbana-Champaign
Advisor: Jeff Erickson

Bachelor of Science   May 2001
Computer Science, University of Illinois at Urbana-Champaign

ACADEMIC HISTORY

Associate Professor   July 2022 - current
Department of Mathematics
Colorado State University

Leverhulme Visiting Professor   September 2022 - August 2023
School of Mathematical Sciences
Queen Mary University London

Assistant Professor   July 2016 - June 2022
Department of Mathematics
Colorado State University

Member   September 2014 - June 2016
School of Mathematics
Institute for Advanced Study
Under supervision of Robert MacPherson

Postdoctoral Fellow   September 2013 - August 2014
Institute for Mathematics and its Applications
University of Minnesota
Theme: Scientific and Engineering Applications of Algebraic Topology

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Date: August 2023.

Postdoc and Coadjunct Professor   September 2011 - June 2013
Rutgers University
Department of Mathematics
Under supervision of Konstantin Mischaikow

Postdoctoral Researcher   September 2010 - August 2011
GEOMETRICA
INRIA-Saclay
Under supervision of Frédéric Chazal

Postdoctoral Researcher   May 2010 - August 2010
Institute of Science and Technology Austria
Under supervision of Herbert Edelsbrunner

Visiting Grad Student   August 2009 - January 2010
Institute of Science and Technology Austria
Under supervision of Herbert Edelsbrunner

Visiting Grad Student   August 2007 - July 2008
Berlin Mathematical School
Under supervision of Herbert Edelsbrunner

Intern   May 2006 - August 2006
Lawrence Livermore National Laboratories
Under supervision of Valerio Pascucci

Honors and Awards

2022–2023, Leverhulme Visiting Professorship
The Leverhulme Trust
London, UK

2013–2015, Postdoctoral Fellowship
Institute for Mathematics and its Applications
Minneapolis, MN, USA

Advisees

Alex Elchesen - Departmental Postdoc (2022 –)
Doctor of Philosophy - University of Florida

Jacob Cleveland
Master of Science (expected Spring 2024)

Tatum Rask
Master of Science (Fall 2022)
Doctor of Philosophy (expected Fall 2025)

Alexander McCleary
Doctor of Philosophy (Summer 2021)

Dustin Sauriol
Master of Science (Fall 2018)

Service

Department Executive Committee 2021–2022
Purpose: Advises department chair

Graduate Committee 2023 – current
Purpose: Oversees admissions, recruitment, and other administrative duties

Category Theory Lab 2018–2019 website

Topology Seminar 2017 – current website

Applied Category Theory 2020 – current website

Teaching

Year	Semester	Course	Credit Hours	Enrollment	Total
2023	Fall	M570 Topology I	3	12	36
2023	Fall	DSCI369 Linear Algebra for Data Science	4	120	480
2022	Spring	M571 Topology II	3	15	45
2021	Fall	M570 Topology I	3	10	30
2021	Fall	M235 Intro to Math Reasoning	2	36	72
2021	Spring	M261 Calc for Physical Scientists III	4	28	112
2021	Spring	M567 Intro to Abstract Algebra II	3	6	18
2020	Fall	M566 Intro to Abstract Algebra I	3	11	33
2019	Fall	M261 Calc for Physical Scientists III	4	90	360
2019	Fall	M261 Calc for Physical Scientists III	4	92	368
2019	Spring	M567 Intro to Abstract Algebra II	3	8	24
2018	Fall	M466 Abstract Algebra I	3	17	51
2018	Fall	M566 Intro to Abstract Algebra I	3	15	45
2018	Fall	M699 Thesis	6	1	6
2018	Fall	M798 Research	6	1	6
2018	Spring	M235 Intro to Math Reasoning	2	30	60
2017	Fall	M419 Intro to Complex Variables	3	23	69
2017	Spring	M567 Intro to Abstract Algebra II	3	11	33
2016	Fall	M566 Intro to Abstract Algebra I	3	9	27
Totals			53	533	1863

Research Grants

Title: Mobius Inversions and Persistence Diagrams (Pending)
Sponsor: NSF:Computer and Information Science and Engineering
Amount: $570,447 Proposal Submitted 5/3/2023

Title: Leverhulme Visiting Professorship
Sponsor: The Leverhulme Trust
Amount: £56,480 Start: 9/2021 End: 8/2022

Title: REU Supplement
Sponsor: NSF:Computer and Information Science and Engineering
Amount: $6,000 Start: 6/1/2020 End: 8/1/2020

Title: Reeb Spaces and Parameterized Clustering (sole PI)
Sponsor: NSF:Computer and Information Science and Engineering
Amount: $291,284 Start: 8/15/2017 End: 8/31/2021

Preprints

Amit Patel and Primoz Skraba. *Möbius Homology.* arXiv, 2023. Submitted to Inventiones Mathematicae (8/7/2023).

Dmitriy Morozov and Amit Patel. *Output-sensitive Computation of Generalized Persistence Diagrams for 2-filtrations.* arXiv, 2021. Submitted to Journal of Applied and Computational Topology (5/20/2023).

Amit Patel and Tatum Rask. *Poincaré Duality for Generalized Persistence Diagrams of (co)Filtrations.* arXiv, 2022. To appear in Journal of Applied and Computational Topology.

Brittany Terese Fasy and Amit Patel. *Persistent Homology Transform Cosheaf.* arXiv, 2022. Resubmitting soon.

Publications

Alexander McCleary and Amit Patel. *Edit Distance and Persistence Diagrams over Lattices.* In SIAM Journal on Applied Algebra and Geometry, Volume 6, Issue 2, 2022.

Robert MacPherson and Amit Patel. *Persistent Local Systems.* In Advances in Mathematics, Volume 386, August 2021.

Vidit Nanda and Amit Patel. *Canonical Stratifications along Bisheaves.* Proceedings of the Abel Symposium 2018: Topological Data Analysis, 2020.

Alex McCleary and Amit Patel. *Bottleneck Stability for Generalized Persistence Diagrams.* In Proceedings of the AMS, 2020, Volume 148, Number 7, pp 3149-3161.

Justin Curry, Amit Patel. *Classification of Constructible Cosheaves.* In Theory and Applications of Categories, 2020, Volume 35, Number 27, pp 1012-1047.

Amit Patel. *Generalized Persistence Diagrams.* Journal of Applied and Computational Topology, June 2018, Volume 1, Issue 3–4.

Vin de Silva, Elizabeth Munch, Amit Patel. *Categorified Reeb Graphs.* Journal Discrete & Computational Geometry, June 2016, Volume 55, Issue 4, pp 854-906.

Paul Bendich, Herbert Edelsbrunner, Dmitriy Morozov, Amit Patel. *Homology and Robustness of Level and Interlevel Sets.* In the journal Homology Homotopy Appl., Volume 15, Number 1, 2013, Pages 51 - 72.

Frédéric Chazal, Amit Patel, Primoz Skraba. *Computing well diagrams for vector fields on* $\mathbb{R}^n$. In the journal Applied Mathematics Letters, Volume 25, Issue 11, November 2012, Pages 1725 - 1728.

Herbert Edelsbrunner, Dmitriy Morozov, Amit Patel. *Quantifying Transversality by Measuring the Robustness of Intersections.* Journal Foundations of Computational Mathematics, Volume 11, Issue 3, June 2011.

Herbert Edelsbrunner, Dmitriy Morozov, Amit Patel. *The Stability of the Apparent Contour of an Orientable 2-Manifold.* Topological Methods in Data Analysis and Visualization: Theory, Algorithms, and Applications, eds. V. Pascucci, X. Tricoche, H. Hagen, and J. Tierny. Springer-Verlag, Heidelberg, Germany, 2011.

Amit Patel. *Reeb Spaces and the Robustness of Preimages*, PhD thesis, Duke University, May 2010.

Paul Bendich, Herbert Edelsbrunner, Micheal Kerber, Amit Patel. *Persistent Homology Under Non-Uniform Error.* Proceedings of the 35th International Symposium on Mathematical Foundations of Computer Science, 2010, pp. 12-23.

Paul Bendich, Herbert Edelsbrunner, Dmitriy Morozov, Amit Patel. *Robustness of Level Sets.* Proceedings of the 18th Annual European Symposium on Algorithms, 2010, 1-10.

Herbert Edelsbrunner, John Harer, Amit Patel. *Reeb Spaces of Piecewise Linear Mappings.* Proceedings of the 24th Annual Symposium on Computational Geometry, 2008, 242-250.

Invited Talks

Möbius Inversions and Persistence	March 27 and 28, 2023
London Taught Course Center (LTCC) Intensive Courses	
Department of Mathematics	
University College London	
Möbius Inversions and Persistence	February 16, 2023
Applied Topology Center	
Oxford University	
Algorithms for Generalized Persistence Diagrams	November 1, 2021
Computational Persistence Workshop	
Webinar	
Functoriality of Generalized Persistence Diagrams	October 26, 2021
Topology Seminar	
Northeastern University, Boston, MA	

Edit Distance and Persistence Diagrams Over Lattices   May 1 – May 3, 2021
Topological Data Analysis – Theory and Applications
Webinar

Persistent Local Systems   June 15 – 18, 2020
Workshop on Topological Data Analysis (moved online due to COVID)
Fields Institute, Toronto, ON, Canada

Möbius Inversions and Persistent Homology   December 6 – 9, 2019
Canadian Mathematical Society Winter Meeting
Toronto, ON, Canada

Persistent Homology of Level Sets   August 5 – 9, 2019
Summer School on Persistent Homology and Barcodes
JLU Giessen – Schloss Rauischholzhausen, Germany

Multiparameter Persistent Homology: A New Algebraic Framework   June 17 – 19, 2019
Workshop on Topological Data Analysis
UNESP Campus de Rio Claro, Brazil

Tensors in Multiparameter Persistent Homology   June 3 – 7, 2019
Tensors: Algebra, Computation, and Applications
University of Colorado at Boulder, Boulder, CO

Persistent Local Systems (main talk)
Persistence Diagrams (pre-talk)
February 26, 2019
Algebraic Topology Seminar
University of Colorado at Boulder, Boulder, CO

Topological and Geometric Data Analysis Mini-Course   February 5–7, 2019
Lecture I: *Persistence Beyond Vector Spaces*
Lecture II: *Persistent Local Systems*
Lecture III: *Smoothing Operator on Stratified Spaces*
Department of Mathematics, The Ohio State University

My Time with Herbert Edelsbrunner   June 20–21, 2018
Herbert Edelsbrunner's 60th Birthday Conference
Institute for Science and Technology Austria
Klosterneuburg, Austria

Persistent Local Systems   June 4–8, 2018
Abel Symposium: Topological Data Analysis
Geiranger, Norway

Persistent Local Systems   May 21–25, 2018
Bridging Statistics and Sheaves
Institute for Mathematics and its Applications

Generalized Persistence Diagrams   August 1, 2017
Topological Data Analysis: Developing Abstract Foundations
Banff International Research Station

Generalized Persistence Diagrams   July 10, 2017
Foundations of Computational Mathematics
Barcelona, Spain

Generalized Persistence Diagrams   January 31, 2017
Applied Algebraic Topology Network (webinar)
Sponsored by the Institute for Mathematics and its Applications

Classification of Constructible Cosheaves   January 4–5, 2017
AMS Special Session on Sheaves in Topological Data Analysis
Joint Mathematics Meetings

Semicontinuity of Persistence Diagrams   October 2, 2016
SIAM Central States Section
Little Rock, Arkansas

Semicontinuity of Persistence Diagrams   May 16 - 20, 2016
Topology, Geometry, and Data Analysis @ OSU
Columbus, Ohio

Persistence for Maps   June 15 - 20, 2015
Dynamics, Topology, and Computations
Bedlewo, Poland

Persistent Objects   December 15 - 17, 2014
Foundations of Computational Mathematics Conference
Universidad de la República in Montevideo

The Persistent Homology Group   December 4, 2014
Topology Seminar
Princeton University

Persistence for Maps to Manifolds   September 15 - 19, 2014
Workshop: Generalized Persistence and Applications
American Institute of Mathematics

The Quillen 2-Construction for Persistence   May 26 - 30, 2014
Algebraic Topology - Methods, Computation and Science 6
Pacific Institute for the Mathematical Sciences

Persistent Sheaves for Stratified Maps   April 14, 2014
Topology Seminar
University of Minnesota

Computing Well Diagrams for the Fixed Points of a Vector Field   April 3, 2014
Geometry and Topology Seminar
Tulane University

Persistent Sheaves   February 28, 2014
Topology, Geometry and Data Seminar
Ohio State University

Connecting Persistent Homology Groups   October 7 - 11, 2013
Workshop on Topological Data Analysis
Institute for Mathematics and its Applications

Multidimensional Persistence and Sheaves (series of lectures)   April - May, 2013
MacPherson Seminar
Institute for Advanced Study

Measuring the Stability of Intersections to C^0 Perturbations   August 1 - 4, 2013
Applied and Computational Topology
2013 SIAM Conference on Applied Algebraic Geometry

The Étalage of a Map   October 14 - 19, 2012
Topological Data Analysis and Machine Learning Theory
Bannf International Research Station

Sheaves and Persistence   July 9 - 11, 2012
Applied Algebraic Topology – The Next Generation
SIAM Financial Mathematics and Engineering

Well Groups   June 17 - 20, 2012
Workshop on Computational Topology
Symposium of Computational Geometry

Well Groups for Mappings to Euclidean Spaces   November 7 - 11, 2011
Workshop on Computational Topology
Fields Institute

Algebraic Well Groups   October 6 - 9, 2011
SIAM Conference on Applied Algebraic Geometry

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