

Hitesh Gakhar

POSTDOCTORAL ASSOCIATE, DEPARTMENT OF MATHEMATICS, THE UNIVERSITY OF OKLAHOMA

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Employment

Department of Mathematics, The University of Oklahoma

POSTDOCTORAL ASSOCIATE

Norman, OK, United States

August 2020 - present

Department of Mathematics, Michigan State University

GRADUATE ASSISTANT

East Lansing, MI, United States

August 2014 - May 2020

Education

Michigan State University

PH.D. IN MATHEMATICS

- Advisor: Jose Perea
- Dissertation: A topological study of toroidal dynamics

East Lansing, MI, United States

August 2014 - May 2020

Indian Institute of Science Education and Research - Mohali

B.S.-M.S. IN MATHEMATICS

- Advisor: Lingaraj Sahu
- Dissertation: Analysis of self adjoint operators

Mohali, Punjab, India

August 2009 - May 2014

Awards, Scholarships, & Grants

AWARDS & SCHOLARSHIPS

8. *Audience Choice Award*, Graduate & Postdoc Research Symposium, The University of Oklahoma, April 2022
7. *Dissertation Completion Fellowship*, College of Natural Science, Michigan State University, Spring 2020
6. *Writing Fellowship*, The Graduate School, Michigan State University, September 2019
5. *Research Enhancement Award*, The Graduate School, Michigan State University, July 2019
4. *TA Award for Excellence in Teaching*, Department of Mathematics, Michigan State University, April 2019
3. *Dr. Paul and Wilma Dressel Endowed Scholarship*, Department of Mathematics, Michigan State University, April 2019
2. *IAS-INSANA-NAS Summer Research Fellowship*, May-July 2012, Granted by: Indian Academy of Sciences, Indian National Science Academy, & The National Academy of Sciences, India
1. *INSPIRE Fellowship*, August 2009-May 2014, Granted by: Department of Science and Technology, Ministry of Science and Technology, India

TRAVEL GRANTS

3. *Travel Grant to the JMM 2020*, American Mathematical Society, November 2019
2. *Travel Award*, The Graduate School, Michigan State University, October 2019
1. *Travel Grant to the AMS Sectional Meeting*, American Mathematical Society, August 2019

Publications

PREPRINTS

1. **Hitesh Gakhar** and Jose A. Perea, *Sliding window persistence of quasiperiodic functions*, In: (March 08, 2021). [Preprint, arXiv:2103.04540](#), [math.AT, cs.CG, math.DS]
2. Joseph M. Melby, **Hitesh Gakhar**, and Jose A. Perea, *Persistent Lifts to p -Primary Coefficients*, Submitted
3. **Hitesh Gakhar** and Jose A. Perea, *Künneth Formulae in Persistent Homology*, In: (October 12, 2019). [Preprint, arXiv:1910.05656](#), [math.AT, cs.CG]

IN PREPARATION

1. **Hitesh Gakhar**, Joshua L. Mike, Jose A. Perea, and Luis Polanco, *Stability of sparse circular coordinates*, in preparation
2. **Hitesh Gakhar**, Joshua L. Mike, Jose A. Perea, and Luis Polanco, *Stability of multiscale $K(G,1)$ coordinates*, in preparation
3. Sean M. Crowell, **Hitesh Gakhar**, Nathan Jones, Vishnu Kadiyala, William Keely, and Miroslav Kramar, *Detecting Methane Emissions using Topology and Machine Learning*, in preparation
4. Johnathan Bush, **Hitesh Gakhar**, Jose Perea, Tatum Rask, Nikolas Schonsheck, Luis Scoccola, Ling Zhou, *Geometrically Independent Circular Coordinates Via Lattice Reduction*, in preparation

Talks & Posters

Total talks and posters = 10 + 15 + 11 + 6 = 42

INVITED TALKS

10. *What is topology and how is it used in data science?*, Graduate Student Seminar, Department of Mathematics, The University of Oklahoma, October 24, 2022
9. *Stability of Eilenberg-MacLane Coordinates*, Applied Algebraic Topology Research Network Seminar, October 12, 2022
8. *What is topology and how is it used in data science?*, Math Club, The University of Oklahoma, March 03, 2022
7. *Shapes, Products, and Data*, Math Alumni Seminar Series, IISER Mohali, January 29, 2022
6. *Persistent Künneth Formulae and Applications*, Seminars on Geometry and Topology, India, July 30, 2021
5. *An Introduction to Persistent Homology*, Seminars on Geometry and Topology, India, July 23, 2021
4. *Künneth Formulae in Persistent Homology*, Redbud Topology Conference, The University of Oklahoma, November 8, 2020
3. *A topological analysis of quasiperiodicity using persistent Künneth formulae*, Machine Learning Seminar, University of Ottawa, February 28, 2020
2. *Persistent homology and quasi-periodicity in time series data*, Topology, Analysis and Geometry Seminar, Central Michigan University, October 11, 2019
1. *Quasiperiodicity, Sliding Window Embeddings and the Künneth theorems*, Topology, Geometry and Data Analysis Seminar, The Ohio State University, Columbus, October 1, 2019

CONTRIBUTED TALKS: CONFERENCES AND WORKSHOPS

15. *Stability of sparse circular coordinates*, Western AMS Sectional Meeting, Virtual, May 15, 2022
14. *Stability of sparse circular coordinates*, Spring 2022 OK-AR MAA Meeting, April 08, 2022

13. *How to find the shape of planar curves using graph paper!*, Graduate and Postdoctoral Research Symposium, The University of Oklahoma, March 04, 2022
12. *Sliding window persistence of quasiperiodic functions*, Topological Data Analysis Workshop, The Institute for Mathematical and Statistical Innovation, Chicago, April 30, 2021, ([Video Available Here](#))
11. *A theoretical analysis of quasiperiodicity using persistent Künneth formulae*, AATRN-ATMCS, January 12, 2021, ([Video Available Here](#))
10. *A theoretical analysis of quasiperiodicity using persistent Künneth formulae*, Algebraic Topology: Methods, Computation, and Science (Canceled due to COVID-19), The Ohio State University, Columbus, June 2020
9. *Sliding Window Embeddings of quasiperiodic functions*, AMS Contributed Paper Session on Topology and Knot Theory, Joint Mathematics Meeting, Denver, January 16, 2020
8. *Sliding Window Embeddings of quasiperiodic functions*, AMS Sectional Meeting, University of Florida, Gainesville, November 3, 2019
7. *Künneth Formulae in Persistent Homology*, AMS Sectional Meeting, University of Wisconsin, Madison, September 15, 2019
6. *Künneth Formulae in Persistent Homology*, First Midwest student conference: Geometry and Topology meet data analysis and machine learning, The Ohio State University, Columbus, June 2, 2019
5. *Künneth Formulae in Persistent Homology*, 17th Graduate Student Topology and Geometry Conference, University of Illinois at Urbana Champaign, March 30, 2019
4. *Künneth Formulae in Persistent Homology*, Knots in Washington XLVII, George Washington University, Washington D.C., January 21, 2019
3. *Künneth Formulae in Persistent Homology*, AMS Contributed Paper Session on General Topology, Algebraic Topology, and Topology of Manifolds, Joint Mathematics Meeting, Baltimore, January 17, 2019
2. *Persistent Künneth Formula (Poster)*, Theory and Foundations of TGDA, The Ohio State University, Columbus, May 21, 2018
1. *Sliding window embeddings of quasiperiodic functions*, 16th Graduate Student Topology and Geometry Conference, University of Illinois at Chicago, April 8, 2018

CONTRIBUTED SEMINARS

11. *Stability of Eilenberg-MacLane Coordinates*, Topology and Data Science Seminar, Department of Mathematics, The University of Oklahoma, October 03, 2022
10. *What are Circular Coordinates?*, Topology and Data Science Seminar, Department of Mathematics, The University of Oklahoma, May 02, 2022
9. *An Introduction to Persistent Homology*, Topology and Data Science Seminar, Department of Mathematics, The University of Oklahoma, September 17, 2021
8. *A topological analysis of quasiperiodicity using persistent Künneth formulae*, Topology and Data Science Seminar, Department of Mathematics, The University of Oklahoma, October 20, 2020
7. *A topological analysis of quasiperiodicity using persistent Künneth formulae*, Graduates Reminisce Online On Topology (GROOT) Summer Seminar, July 31, 2020
6. *Topology and Toroidal Dynamics*, Topological Data Analysis Seminar, Department of Computational Mathematics Science & Engineering, Michigan State University, April 13, 2020
5. *Sliding window embeddings of quasiperiodic functions*, Graduate Student Geometry & Topology Seminar, Department of Mathematics, Michigan State University, March 13, 2019
4. *Künneth Formulae in Persistent Homology*, Graduate Student Geometry & Topology Seminar, Department of Mathematics, Michigan State University, November 14, 2018

3. *Dualities in Persistent Cohomology*, Graduate Student Geometry & Topology Seminar, Department of Mathematics, Michigan State University, January 17 & 24, 2018
2. *Persistent Homology*, Graduate Student Geometry & Topology Seminar, Department of Mathematics, Michigan State University, April 13, 2017
1. *Serre Spectral sequences*, Graduate Student Geometry & Topology Seminar, Department of Mathematics, Michigan State University, November 19, 2015

OTHER TALKS

6. *(Intro to) Sliding Window Persistence*, Tutorial-a-thon, AATRN-WinCompTop, April 2021, ([Video Available Here](#))
5. *A topological study of toroidal dynamics*, Ph.D. Dissertation Defense, Department of Mathematics, Michigan State University, April 20, 2020
4. *Analysis of Self Adjoint Operators (Poster)*, M.S. Thesis Poster Presentations, Indian Institute of Science Education and Research Mohali, April 12, 2014
3. *Analysis of Self Adjoint Operators*, M.S. Thesis Mid-Year Presentation, Indian Institute of Science Education and Research Mohali, November 27, 2013
2. *Dr. Isomorpheus's Introduction to Game Theory (Poster)*, Mathematics Day Celebration, Indian Institute of Science Education and Research–Mohali, October 25, 2013
1. *Google PageRank*, Mathematics Club, Indian Institute of Science Education and Research Mohali, February 14, 2012

Conference Organization

Special Session on Topological Persistence: Theory, Algorithms, and Applications

AMS SECTIONAL MEETING, GEORGIA INSTITUTE OF TECHNOLOGY

Atlanta, GA
March 18-19, 2023

AMS Special Session on Data Science at the Crossroads of Analysis, Geometry, and Topology (a Mathematics Research Communities session)

JOINT MATHEMATICS MEETING 2023

Boston, MA
January 05, 2023

Special Session on Computational Topology and Applications

AMS SECTIONAL MEETING (MOVED ONLINE; ORIGINALLY AT UNIVERSITY OF DENVER)

Denver, CO
May 14-15, 2022

15th Graduate Student Topology and Geometry Conference

MICHIGAN STATE UNIVERSITY

East Lansing, MI
April 8-9, 2017

Undergraduate Advising & Mentoring

- **Anishka Peter** (March 2022 - present) : • Undergraduate Honors Thesis Mentee • To Graduate in December 2022
- **Mark Ramirez** (February 2021 - May 2022): • Undergraduate Honors Thesis Mentee • Graduated in May 2022 • Joined Georgia Institute of Technology's Masters Analytics (Analytical Tools) in Fall 2022

Teaching

COURSES TAUGHT AS THE INSTRUCTOR-OF-RECORD

MATH 3980: Honors Research

FALL 2022, SUMMER 2021

The University of Oklahoma

MATH 3333: Linear Algebra I

FALL 2022, SPRING 2022, SPRING 2021

*The University of Oklahoma***MATH 2443: Calculus and Analytic Geometry IV**

FALL 2021, FALL 2020

*The University of Oklahoma***MTH 299: Transitions**

FALL 2019, FALL 2018, SUMMER 2018

*Michigan State University***MTH 235: Differential Equations**

SUMMER 2016, SPRING 2016

*Michigan State University***MTH 234: Calculus III**

SUMMER 2017

*Michigan State University***MTH 133: Calculus II**

SPRING 2019

*Michigan State University***MTH 132: Calculus I**

SUMMER 2019

*Michigan State University***MTH 124: Survey of Calculus I**

SUMMER 2015

*Michigan State University***COURSES TAUGHT AS THE RECITATION INSTRUCTOR****MTH 299: Transitions**

SPRING 2017

*Michigan State University***MTH 234: Calculus III**

FALL 2016

*Michigan State University***MTH 133: Calculus II**

FALL 2015, SPRING 2015, FALL 2014

*Michigan State University***TEACHING LEADERSHIP****Lead Teaching Assistant, Mathematics Learning Center**

SPRING 2019, SPRING 2017, FALL 2016, SPRING 2016

Michigan State University

Duties: Supervising the Mathematics Learning Center, Observing Under-graduate and Graduate tutors

Lead Teaching Assistant, Center for Instructional Mentoring, Duties

SPRING 2019, SPRING 2018, SPRING 2017, FALL 2016

Michigan State University

Duties: Observing Graduate Teaching Assistants for 'Calculus III' and 'Differential equations', Providing feedback, One on one mentoring, Conducting exam reviews for 'College Algebra'

Teaching Observation Assistant,

FALL 2019, FALL 2018, FALL 2017

Michigan State University

Duties: Observing Undergraduate Learning Assistants & Graduate Teaching Assistants, Providing feedback

Overall coordinator for summer B

SUMMER 2017

Michigan State University

Duties: Supervising instructors teaching 100-level and 200-level courses, One on one mentoring for a first time Graduate Teaching Assistant, Observations & feedback

Academic Service

REFEREEING

1. Boletin de la Sociedad Matematica Mexicana (transl. *Bulletin of the Mexican Mathematical Society*)

SEMINAR ORGANIZATION

2. *Co-Organizer*, Topology and Data Science Seminar, Department of Mathematics, The University of Oklahoma, Fall 2022, Spring 2022, Fall 2021
1. *Co-Organizer*, Graduate Student Geometry & Topology Seminar, Department of Mathematics, Michigan State University, Spring 2018

COMMITTEES

6. *Member*, Interdisciplinary Committee, Department of Mathematics, The University of Oklahoma, September 2020 - present
5. *Member*, Math Club Committee, Department of Mathematics, The University of Oklahoma, September 2020 - present
4. *Member*, Awards Committee, College of Natural Science Student Advisory Council, August 2019 - May 2020
3. *Mathematics Representative*, College of Natural Science Student Advisory Council, August 2019-May 2020
2. *Graduate Student Representative*, Graduate Program Subcommittee, Strategic Planning Committee, Department of Mathematics, Michigan State University, February 2019-April 2019
1. *Graduate Student Representative*, Graduate Studies Committee, Department of Mathematics, Michigan State University, August 2018-July 2019

OUTREACH ACTIVITIES

7. *Mathematics Representative*, Opportunity Cell, IISER Mohali, October 2011 - December 2012 and August 2013 - April 2014
6. *Organizing Team Member*, Mathematical Weekend (To celebrate Galois' birthday), IISER Mohali, 2012 and 2013
5. *Founding Coordinator*, Mathematics Club, IISER Mohali, August 2011-August 2012
4. *Volunteer Presenter*, KVPY Summer Science Camp, IISER Mohali, June 2011
3. *Student Coordinator*, Visual Documentation Workshop, IISER Mohali, March 2011
2. *Science Exhibition Coordinator*, National Science Day, IISER Mohali, February 2011
1. *Volunteer Presenter*, National Science Day, IISER Mohali, February 2010

Professional Affiliations

4. Member of the Applied Algebraic Topology Research Network, December 2018-present
3. Member of the Association of Women in Mathematics, Student Chapter, Michigan State University, February 2018 - May 2020
2. Member of the American Mathematical Society, 2022-present, 2014-2020
1. Member of the Mathematical Association of America, 2015-2016

References

Available on request