Vidit Nanda

people.maths.ox.ac.uk/nanda
nanda@maths.ox.ac.uk

Mathematical Institute, University of Oxford
Andrew Wiles Building, Radcliffe Observatory Quarter
Oxford, OX2 6GG UK

Employment

- **The University of Oxford** — Oxford, UK
  Associate Professor, Mathematical Institute + *Fellow*, Pembroke College — Sep 2018 – Present
- **The Institute for Advanced Study** — Princeton, USA
  Friends of the Institute Member, School of Mathematics — Sep 2017 – Aug 2018
- **The Alan Turing Institute** — London, UK
  Turing Research Fellow — Oct 2016 – Aug 2017
- **The University of Pennsylvania** — Philadelphia, USA
  Post-Doctoral Research Fellow, Mathematics — Sep 2012 – Aug 2016

Education

- **Rutgers University** — New Brunswick, USA
  Ph.D. in Mathematics — Aug 2006 – Aug 2012
- **Georgia Institute of Technology** — Atlanta, USA
  M.S. in Mathematics + B.S. in Computer Engineering — Aug 2000 – May 2006

Awards

US AFOSR **Research Grant** (USD 750k) joint with M Helmer, 2022 – 2027

SMRI **International Visitorship** at the University of Sydney, 2020

DSTL **Research Grant** (GBP 250k) joint with P Skraba, 2019 – 2021

MSI **Distinguished Visitorship** at the Australian National University in Canberra, 2019

Simons Scholarship at the Centre De Recherches Mathématiques in Montreal, 2019

PNNL High Performance **Data Analytics Contract**, 2015 – 2016

Penn Math **Good Teaching Awards**, Spring 2014 and Fall 2015

Preprints

7. *Harder-Narasimhan Filtrations and Zigzag Persistence* (with M Fersztand and U Tillmann)
   Preprint, arXiv:2211.07553 [math.RT] (2022)
6. *Topological inference of the Conley index* (with K M Yim)
   Preprint, arXiv:2206.10198 [math.DS] (2022)
5. *Morse theory for complexes of groups* (with N Yerolemou)
   Preprint, arXiv:2203.00539 [math.GR] (2022)
4. *A topological approach to mapping space signatures* (with C Giusti, D Lee and H Oberhauser)
   Preprint, arXiv:2202.00491 [math.FA] (2022)
3. *Multivariate central limit theorems for random clique complexes* (with T Temčinas and G Reinert)
   Preprint, arXiv:2112.08922 [math.PR] (2022)
2. *Tangent space and dimension estimation with the Wasserstein distance* (with U Lim and H Oberhauser)
   Preprint, arXiv:2110.06357 [math.ST] (2021)
1. *Complex links and Hilbert-Samuel multiplicities* (with M Helmer)
   Preprint, arXiv:2006.10452 [math.AG] (2021)

Publications

20. *The space of barcode bases for persistence modules* (with E Jacquard and U Tillmann)
    Journal of Applied and Computational Topology, DoI: 10.1007/s41468-022-00094-6 (2022)
19. *Conormal spaces and Whitney stratifications* (with M Helmer)
    Foundations of Computational Mathematics, DoI: 10.1007/s10208-022–09574-8 (2022)

18. *Principal components along quiver representations* (with A Seigal and H Harrington)
Foundations of Computational Mathematics, DoI: 10.1007/s10208-022-09563-x (2022)
17. *Dist2Cycle: a simplicial neural network for homology localization* (with A Keros and K Subr)
Proceedings of the 36th AAAI Conference on Artificial Intelligence.
16. *Equivariant simplicial reconstruction* (with L Carbone and Y Naqvi)
SIAM Journal on Applied Algebra and Geometry, 4(4), 532–552 (2020)
15. *Geometric anomaly detection in data* (with H Harrington, B Stolz and J Tanner)
Proceedings of the National Academy of Sciences, 117 (33) 19664–19669 (2020)
14. *Canonical stratifications along bisheaves* (with A Patel)
Proceedings of the 2018 Abel Symposium *Topological Data Analysis*, eds. NA Baas et al, 391–403, Springer (2020)
13. *Local cohomology and stratification*
Foundations of Computational Mathematics, 20(2), 195–222, (2020)
12. *Discrete Morse theory and localization*
Journal of Pure and Applied Algebra 223(2), 459–488 (2019)
11. *Persistence paths and signature features in topological data analysis* (with I Chevyrev and H Oberhauser)
IEEE Transactions on Pattern Analysis and Machine Intelligence, 42(1), 192–202, (2018)
10. *Discrete Morse theory and classifying spaces* (with D Tamaki and K Tanaka)
Advances in Mathematics, 340, 723–790 (2018)
9. *Topological signals of singularities in Ricci flow* (with P Alsing et al)
Axioms 6(3) Article 24 (2017)
8. *Higher interpolation and extension for persistence modules* (with P Bubenik and V de Silva)
SIAM Journal on Applied Algebra and Geometry 1(1), 272–284 (2017)
7. *Discrete Morse theory for computing cellular sheaf cohomology* (with J Curry and R Ghrist)
Foundations of Computational Mathematics 16(4), 875–897 (2016)
6. *A topological measurement of protein compressibility* (with M Gameiro et al)
Japan Journal of Industrial and Applied Mathematics 32(1), 1–17 (2015)
5. *Reconstructing functions from random samples* (with S Ferry and K Mischaikow)
Journal of Computational Dynamics 1(2), 233–248 (2014)
4. *Simplicial models and topological inference in biological systems* (with R Sazdanović)
Chapter 6 of **Discrete and Topological Models in Molecular Biology**, Springer (2014)
3. *Discrete Morse theoretic algorithms for computing homology of complexes and maps* (with S Harker et al)
Foundations of Computational Mathematics 14(1), 151–184 (2014)
2. *Geometry in the space of persistence modules* (with V de Silva)
Proc. 23rd Annual Symposium on Computational Geometry, 397–404 (2013)
1. *Morse theory for filtrations and efficient computation of persistent homology* (with K Mischaikow)
Discrete and Computational Geometry 50(2), 330–353 (2013)

Talks

(2022)

Mar *Department Colloquium*, University of Denver, USA (online)
Mar *Algebraic Topology Seminar*, Princeton University, USA (online)
Feb *Topology Seminar*, University of Southampton (online)

(2021)

Nov *TDA Seminar*, University of Oxford, UK (online)
Sep *Chennai Mathematical Institute — Tessellate Fest*, India (online, public lecture)
Aug *Beyond TDA Workshop*, Nanyang Technological University, Singapore (online)
Aug *SIAM Conference on Applied Algebraic Geometry* (online)
Aug *Topics in Topological Data Analysis Workshop*, Shinshu University, Japan (online)
Apr *Topological Data Analysis Workshop*, Institute for Mathematical and Statistical Innovation, USA (online)
Apr *Applied Combinatorics, Algebra, Topology & Statistics Seminar*, Kungliga Tekniska Högskolan, Sweden (online)
Apr *IAS+Penn+Rutgers Topology Workshop*, USA (online)
Feb *Informal Geometry Seminar*, University of Oxford, UK (online)
Jan *Joint Mathematics (Virtual) Meeting*

(2020)

Nov *Geometry and Analysis Seminar*, University of Oxford, UK (online)
Nov *Workshop on Topological Data Analysis and Beyond*, NeurIPS 2020 (online)
Nov *Geometry and Topology Seminar*, Oregon State University, USA (online)
Oct *Topology, Geometry and Data Analysis Seminar*, Ohio State University, USA (online)
Oct *Cognitive and Data Science Lab Seminar*, Rutgers University-Newark, USA (online)
Oct *IMA-LMS Joint Meeting*, University of Edinburgh, UK (online)
Sep *2nd Symposium on Machine Learning and Dynamical Systems*, Fields Institute, Canada (online)
Aug *DataSig Seminar*, University of Oxford, UK (online)
Mar *Balliol Undergraduate Mathematics Society*, University of Oxford, UK

(2019)

Sep *Australian Category Seminar*, Macquarie University, Australia
Aug *Mathematics Department Colloquium*, Macquarie University, Australia
Aug *Public Lecture*, Australian National University, Australia
Aug *Mathematics Department Colloquium*, Australian National University, Australia
Aug *Algebra and Topology Seminar*, Australian National University, Australia
Aug *Sydney Dynamics Group Seminar*, University of Sydney, Australia
Jul *Young Topologists' Meeting* (four lectures) École Polytechnique Fédérale de Lausanne, Switzerland
May *Geometry and Topology Seminar*, University of Sydney, Australia
Apr *Workshop on Dynamics and Data*, Centre de Recherche de Mathematique, Montreal, Canada
Mar *School of Computing Seminar*, University of Buckingham, UK
Feb *Hilary Term Physics Event*, Pembroke College – Oxford, UK
Feb *Numerical Analysis Internal Seminar*, University of Oxford, UK
Jan *Pure Mathematics Colloquium*, Université Libre de Bruxelles, Belgium

(2018)

Nov *Oxford-Berlin Young Researchers Meeting on Applied Stochastic Analysis*, University of Oxford, UK
Nov *Data Science Seminar*, University of Cardiff, UK
Oct *Numerical Analysis Internal Seminar*, University of Oxford, UK
Oct *GEOTOP-A*, online seminar hosted by Centro de Investegación en Matemáticas (CIMAT), Mexico
Jun *Abel Symposium on Topological Data Analysis*, Geiranger, Norway
May *Masterclass on Topological Data Analysis* (four lectures), Utrecht University, Netherlands
Apr *Deformation Theory Seminar*, University of Pennsylvania, USA
Mar *Fourth Annual Informatics Symposium*, University of Florida, USA
Mar *Mathematics Department Colloquium*, University of Florida, USA
Mar *Algebraic Topology Seminar*, Princeton University, USA
Mar *Algebra/Topology Seminar*, State University of New York-Albany, USA
Feb *Applied Topology Seminar*, University of Pennsylvania, USA

(2017)

Aug *Applied Algebraic Topology Workshop*, Hokkaido University, Japan
Jul *Foundations of Computational Mathematics Conference*, Universitat Barcelona, Spain
Jul *Institute of Perception, Action and Behaviour (IPAB) Seminar*, University of Edinburgh, UK
Jun *Mathematical Underpinnings of Data Analysis Session*, Alan Turing Institute, UK
Apr *Pure Mathematics Colloquium*, University of Sheffield, UK
Apr *3C in G Workshop on Computational Algebra*, University of Cambridge, UK
Mar *Geometry Seminar*, (King's + University) College London, UK
Mar *Research Fellow Short Talk*, Alan Turing Institute, UK (video)
Mar *Algebraic and Symplectic Geometry Seminar*, University of Oxford, UK
Feb *Mathematics Department Colloquium*, Wesleyan University, USA
Feb *Mathematics Department Colloquium*, Penn State University, USA
Feb *Topology Seminar*, University of Aberdeen, UK
Jan *Topology Seminar*, University of Oxford, UK

(2016)

Aug *Alpine Algebraic and Applied Topology Conference*, Saas Almagell, Switzerland
May *Topology, Geometry and Data Analysis Conference*, Ohio State University, USA
Apr *IAS + Penn + Rutgers Topology Workshop*, University of Pennsylvania, USA
Mar L^2 *Geometry and Topology Seminar*, Lafayette College + Lehigh University, USA
Mar *New York Applied Topology Seminar*, Columbia University, USA
Mar *The MacPherson Seminar*, Institute for Advanced Study, USA

Feb *Mathematics Department Colloquium*, San Francisco State University, USA
Jan *Joint Mathematics Meetings*, Seattle, USA

(2015)

Dec *Canadian Mathematical Society (Winter) Meeting*, University du Québec à Montréal, Canada
Nov *Geometry and Topology Seminar*, University of Florida, USA
Sep *The Alan Turing Institute Scoping Workshop*, University of Oxford, UK
Sep *Computational Applied Topology (CAT) School* (three lectures), University of Oxford, UK
Aug *Applied Topology and High-Dimensional Data Analysis Workshop*, University of Victoria, Canada
Apr *Applied Algebraic Topology Research Network*, Online Seminar hosted by University of Minnesota, USA
Jan *Mathematics Department Colloquium*, Michigan State University, USA

(2014)

Nov *AMS Graduate Student Chapter Seminar*, Rutgers University, USA
Nov *Discrete, Computational and Algebraic Topology*, University of Copenhagen, Denmark
Oct *Workshop on Persistent Homology for the Biosciences*, Michigan State University, USA
Jul *SIAM Annual Meeting*, Chicago, USA
Jul *DIMACS REU Semniar*, Rutgers University, USA

(2013)

Oct *Geometry, Topology and Data Seminar*, Ohio State University, USA
Jul *29-th Annual Symposium on Computational Geometry*, UniRio, Brazil.
Jun *Workshop on Topology and Dynamics*, Kyoto University (RIMS), Japan
Apr *Geometry and Topology Seminar*, University of Pennsylvania, USA
Mar *Mathematics Department Colloquium*, Cleveland State University, USA

(2012)

Dec *The MacPherson Seminar*, Institute for Advanced Study, USA
Nov *Applied Topology Seminar*, Shinshu University, Japan
Jan *Topology and Geometry Seminar*, Rutgers University, USA

(2011)

Sep *International Symposium on Nonlinear Theory and Applications*, Kobe, Japan
Aug *Workshop on Applied Topology*, Kyushu University, Japan
Jun *DIMACS REU Semniar*, Rutgers University, USA

Students

Alexander	**Tanaka**	PhD	Oxford	2022 – Present	with A Asaad
Tommi	**Muller**	PhD	Oxford	2022 – Present	with F Kirwan
Marc	**Fersztand**	PhD	Oxford	2021 – Present	with U Tillmann
Otto	**Sumray**	PhD	Oxford	2020 – Present	with H Harrington
Emile	**Jacquard**	PhD	Oxford	2020 – Present	with U Tillmann
Mario	**Lezcano-Casado**	PhD	Oxford	2019 – 2021	with R Hauser
Ka Man	**Yim**	PhD	Oxford	2019 – 2022	with P Grindrod
Uzu	**Lim**	PhD	Oxford	2019 – Present	with H Oberhauser
Tadas	**Temčinas**	PhD	Oxford	2019 – Present	with G Reinert
Naya	**Yerolemou**	PhD	Oxford	2018 – 2022	with U Tillmann
Oliver	**Vipond**	PhD	Oxford	2017 – 2021	with U Tillmann

Postdocs

Leon	**Lampret**	QMU London	2019 – 2021	with P Skraba
Barbara	**Mahler**	Oxford	2019 – 2021	with P Skraba

Service

Michaelmas 2021 – Present : Investment Committee, Pembroke College.

Michaelmas 2021 – Present : Department Committee, Mathematical Institute.

Michaelmas 2020 – Present : Projects Committee, Mathematical Institute.

Michaelmas 2018 – Trinity 2021 : Organizer of the *Data Science Seminar* at Oxford.

Mar 2018 : Co-organizer of the *Workshop on Topology* at the IAS.

Sep 2017 – Jan 2020 : Co-organizer of the **Theory & Algorithms in Data Science** seminar at the Turing Institute.

Hilary 2017 – Trinity 2017: Member of the **Early Career Researchers Committee** at Oxford

Fall 2015 – Spring 2016: Member of the **Putnam Prize Commitee** at Penn

Fall 2014 – Spring 2016: Co-organizer of the **Applied Topology Seminar** at Penn

Teaching

(Oxford)

Hilary 2022: Lecturer for *Computational Algebraic Topology*
Hilary 2021: Lecturer for *Computational Algebraic Topology*
Trinity 2020: Lecturer for *Constructive Mathematics*
Hilary 2020: Lecturer for *Computational Algebraic Topology*
Michaelmas 2019: Coordinator for *Computational Mathematics*
Trinity 2019: Lecturer for *Constructive Mathematics*
Hilary 2019: Lecturer for *Computational Algebraic Topology*
Michaelmas 2018: Coordinator for *Computational Mathematics*

(Penn)

Fall 2015: Instructor for *Single-variable calculus for engineers*
Summer 2014: Co-instructor for the *Pre-freshman program*
Spring 2014: Instructor for *Advanced linear algebra*
Spring 2013: Lead Teaching Assistant (TA) for *Calculus in a single variable*, on Coursera

(Rutgers)

Summer 2011: Instructor for *Multivariable calculus*
Fall 2010: TA for *Multivariable calculus*
Spring 2010: TA for *Multivariable calculus*
Fall 2009: TA for *Multivariable calculus*