

Sourabh Palande

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Education

PhD in Computing (Image Analysis), University of Utah, Salt Lake City, UT, Aug 2015 - Jul 2020.

- Thesis: "Utilizing Topological Structures of Data for Machine Learning." Advisor: Dr. Bei Wang-Phillips.

MSc in Applied Mathematics, University of Manchester, Manchester, UK, Sep 2013 - Oct 2014.

- Dissertation: "Analysis of the Source Trajectory in Cone Beam Micro CT." Advisor: Prof. Bill Lionheart.

BSc in Mathematics, University of Pune, Pune, India, Jul 2004 - Oct 2007.

- Specialization in Computational Mathematics, minored in Physics and Statistics.

Awards and Honors

American Mathematical Society (AMS), 2022-2023, Models and Methods for (Hyper) Network Science.

- Invited to participate in Mathematical Research Communities (MRC):
<https://www.ams.org/programs/research-communities/2022MRC-HyperNet>
- Established continued research collaborations to identify and solve open problems in hyper network science.

Simons Institute for Theory of Computing, Fall 2018, Foundations of Data Science.

- Invited to participate as a visiting graduate researcher in the Fall semester program on mathematical foundations of data science: <https://simons.berkeley.edu/programs/datascience2018>

XRadia (Zeiss) and University of Manchester, Summer 2014, Dissertation Award.

- Awarded GBP 3000 in funding to carry out dissertation research with industrial collaborators.

Courses and Certifications

Deep Learning Specialization, Coursera and deeplearning.ai, May 2019.

C++ Programming for Financial Engineering, QuantNet LLC and Baruch College, Oct 2012.

Certified Financial Risk Manager (FRM), Global Association of Risk Professionals (GARP), 2012.

Levels I & II of Chartered Financial Analyst (CFA) designation, CFA Institute, Dec 2010 & Dec 2011.

Graduate Coursework in Computer Applications, University of Pune, Aug 2008 - May 2009.

Skills

Programming : Python, C, C++. Familiar with Matlab, R, Julia. Well versed with Git, LaTeX, HTML/CSS/JS/D3.

Python ML/CV : NumPy, SciPy, NetworkX, Scikit-Learn, PyTorch, OpenCV, Scikit-Image, Matplotlib, Seaborn.

Technical : Complex Data Analysis, Mathematical Modeling, Research, Collaboration, Science Communication.

Research Experience

Postdoctoral Research Associate, CMSE, Michigan State University, East Lansing, MI, Oct 2020 - Present.

- Lead interdisciplinary collaborative projects consisting of mathematicians, computer scientists and biologists.
- Developed image analysis techniques for 3D X-Ray scans and 2D RGB images for applications in plant biology.
- Developed exploratory visual analytics tools to study gene expression data across plant evolution.
- Helped design and publish a novel interactive book introducing python programming to biology students: [Plants & Python](https://plantsandpython.github.io/PlantsAndPython) (<https://plantsandpython.github.io/PlantsAndPython>).

Graduate Research Assistant, SCI Institute, University of Utah, Salt Lake City, UT, May 2016 - Jul 2020.

- Collaborated with neuroscientists, applying advanced data science techniques in autism research.
- Developed and implemented novel machine learning and data analysis methods for brain networks.
- Developed and implemented spectral algorithms for simplicial complexes and hypergraphs.
- Helped design a visualization tool for DNN interpretability: [TopoAct](https://tdavislab.github.io/TopoAct) (<https://tdavislab.github.io/TopoAct>)

Teaching

Guest Instructor, HRT 841: Plants & Python, Michigan State University, Fall 2020.

- Introduced graduate level biology students to topological data analysis and its applications in plant biology.

Teaching Assistant, CS 6170: Computational Topology, University of Utah, Spring 2017.

- Graduate level course. Significant teaching and grading responsibilities. Guided student course projects.
- Trained students in topological data analysis theory, algorithms and applications to real-world data.

Teaching Assistant, CS 6210: Advanced Scientific Computing, University of Utah, Fall 2016.

- Graduate level course. Handled 40% teaching and full grading responsibilities.
- Trained students to implement numerical algorithms and to perform performance and error analysis.

Other Work Experience

Quantitative Analyst, Algoanalytics Financial Consultancy, Pune, India, Jun 2011 - Jun 2013.

- Developed price prediction models for securities, commodities using machine learning and time series analysis.
- Designed and implemented automated, high frequency trading strategies.

Equity Trader and Portfolio Manager, Self Employed, Pune, India, Jan 2009 - Jun 2011.

- Analyzed financial statements and historical market trends to identify trading and investing opportunities.
- Managed a diversified portfolio of securities, delivering 3X returns in 30 months.

Invited Talks

- [The topological shape of gene expression across the evolution of flowering plants](#), SIAM MDS 2022 Minisymposium: Topological Data Analysis with Mapper, Sep 2022.
- [TDA + ML" Utilizing topological structures of data for machine learning](#), MSU TDA Seminar, Oct 2020.

Publications

Preprints

- **Sourabh Palande**, Joshua Kaste, Miles Roberts, Kenia Segura Aba, Carly Claucherty, Jamell Dacon, Rei Doko, Thilani B. Jayakody, Hannah R. Hannah R. Jeffery, Nathan Kelly, Andriana Manousidaki, Hannah M. Parks, Emily M. Roggenkamp, Ally M. Schumacher, Jiaxin Yang, Sarah Percival, Jeremy Pardo, Aman Y. Husbands, Arjun Krishnan, Beronda L. Montgomery, Elizabeth Munch, Addie M. Thompson, Alejandra Rougon-Cardoso, Daniel H. Chitwood, and Rebert VanBuren, et al. "[The topological shape of gene expression across the evolution of flowering plants.](#)" *bioRxiv* (2022).
- Li, Mingzhe, **Sourabh Palande**, Lin Yan, and Bei Wang. "[Sketching merge trees for scientific data visualization.](#)" *arXiv preprint arXiv:2101.03196* (2021).

Journal Articles

- Robert VanBuren, Alejandra Rougon-Cardoso, Erik J. Amézquita, Evelia L. Coss-Navarrete, Aarón Espinosa-Jaime, Omar Andres Gonzalez-Iturbe, Alicia C. Luckie-Duque, Eddy Mendoza-Galindo, Jeremy Pardo, Guillermo Rodríguez-Guerrero, Pablo Y. Rosiles-Loeza, Marilyn Vásquez-Cruz, Selene L. Fernandez-Valverde, Tania Hernández-Hernández, **Sourabh Palande**, and Daniel H. Chitwood, "[Plants & Python: A series of lessons in coding, plant biology, computation, and bioinformatics,](#)" *The Plant Cell*, vol. 34, no. 7, e1–e1, Jul. 2022
- Archit Rathore, Nithin Chalapathi, **Sourabh Palande**, and Bei Wang, "[Topoact: Visually exploring the shape of activations in deep learning,](#)" *Computer Graphics Forum*, vol. 40, no. 1, pp. 382–397, 2021.
- Braxton Osting, **Sourabh Palande**, and Bei Wang, "[Spectral sparsification of simplicial complexes for clustering and label propagation.](#)" *Journal of Computational Geometry (JoCG)*, vol. 11, no. 1, pp. 176–211, 2020, *Authors listed alphabetically.
- **Sourabh Palande**, Vipin Jose, Brandon Zielinski, Jeffrey Anderson, P. Thomas Fletcher, and Bei Wang, "[Revisiting Abnormalities In Brain Network Architecture Underlying Autism Using Topology-Inspired Statistical Inference.](#)" *Brain Connectivity*, vol. 9, no. 1, pp. 13–21, 2019, PMID: 30543119. Eprint: <https://doi.org/10.1089/brain.2018.0604>

Conference Proceedings

- Sarah Percival, Erik J. Amézquita, **Sourabh Palande**, Aman Husbands, Arjun Krishnan, Beronda Montgomery, Elizabeth Munch, and Daniel Chitwood. "[Using Mapper to Reveal Morphological Relationships in Passiflora Leaves.](#)" In *2022 Spring Central Sectional Meeting*. AMS, 2022.
- Archit Rathore, **Sourabh Palande**, Jeffrey Anderson, Brandon Zielinski, P. Thomas Fletcher, and Bei Wang, "[Autism Classification Using Topological Features And Deep Learning: A Cautionary Tale.](#)" in *Medical Image Computing and Computer Assisted Intervention – MICCAI 2019*, Springer International Publishing, Oct. 2019.
- Keri Anderson, Jeffrey Anderson, **Sourabh Palande**, and Bei Wang, "[Topological Data Analysis Of Functional MRI Connectivity In Time And Space Domains.](#)" in *Connectomics in NeuroImaging (CNI) at Medical Image Computing and Computed Assisted Intervention (MICCAI)*, Springer International Publishing, Sep. 2018. * Best Paper Award.
- Eleanor Wong, **Sourabh Palande**, Bei Wang, Brandon Zielinski, Jeffrey Anderson, and P. Thomas Fletcher, "[Kernel Partial Least Squares Regression For Relating Functional Brain Network Topology To Clinical Measures Of Behavior.](#)" in *2016 IEEE 13th International Symposium on Biomedical Imaging (ISBI)*, Apr. 2016.

Service

Organizer, MSU Topological Data Analysis Seminar, Fall 2021 - Present.

Reviewer, Biomedical Signal Processing and Control (BSPC), Summer 2022 - Present.

Sub-reviewer, Mathematical Foundations of Computer Science (MFCS), 2021.

Sub-reviewer, European Symposium on Algorithms (ESA), 2021.