Sourabh Palande

**Address:** East Lansing, MI **|** **Email:** [sourabh.palande@gmail.com](mailto:sourabh.palande@gmail.com) **|** **Phone:** +1(801)898-2083

**LinkedIn:** <https://linkedin.com/in/sourabhpalande> **|** **GitHub:** <https://github.com/sourabhpalande>

**Homepage:** sourabhpalande.github.io

**Summary**

# Data scientist; applied mathematician; theoretical, algorithmic, and applied machine learning researcher. Developed, implemented novel methods leveraging topology and geometry in machine learning and data analysis. Published research articles in leading journals and conferences, spanning a range of topics and applications. Experience working with MRI, fMRI, 3D X-Ray CT scans, RGB images, brain networks, RNA-Seq data sets. Eager to make real-world impact by solving complex problems, advancing scientific and technological capabilities.

# 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.
* Mentored undergraduate and graduate students in computational biology.
* Helped design and publish a novel interactive book introducing python programming to biology students:

Plants & Python **(**<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)

# 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.

# 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.

# Selected Publications

**Preprints**

* 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
* **Sourabh Palande**, Joshua Kaste, Miles Roberts, Kenia Segura Aba, Carly Claucherty 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**

* 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: h[ttps://doi.org/10.1089/brain.2018.0604](https://doi.org/10.1089/brain.2018.0604)

**Conference Proceedings**

* Sarah Percival, Erik J. Amezquita, **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.

# Teaching

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

# Developed price prediction models for securities, commodities using machine learning and time series analysis.

* Designed and implemented automated, high frequency trading strategies.

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

* 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.

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

* 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.

# 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.

# Courses and Certifications

# Deep Learning Specialization | Coursera and deeplearning.ai | May 2019.

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

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

* Algorithms, Data Structures, Introduction to (Functional) Programming, Database Systems

# References

# Dr. Elizabeth Munch | Associate Professor | Departments of CMSE and Mathematics | Michigan State University.

* **Postdoc Advisor**
* **Email:** [muncheli@msu.edu](mailto:muncheli@msu.edu) | **Phone:** +1(517)432-0619 | **Website:** <http://elizabethmunch.com/>

# Dr. Daniel Chitwood | Assistant Professor | Departments of Horticulture and CMSE | Michigan State University.

* **Postdoc Advisor**
* **Email:** chitwoo9[@msu.edu](mailto:beiwang@sci.utah.edu) | **Phone:** +1(517)353-0462

# Dr. Bei Wang | Associate Professor | SCI Institute and School of Computing | University of Utah.

* **PhD Advisor**
* **Email:** [beiwang@sci.utah.edu](mailto:beiwang@sci.utah.edu) | **Phone:** +1(517)432-0619 | **Website:** <https://sci.utah.edu/~beiwang/>