

# Prashant Shekhar, PhD

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## CONTACT INFORMATION

Embry-Riddle Aeronautical University,  
1 Aerospace Boulevard,  
Daytona Beach, Florida, 32114,  
United States

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## RESEARCH INTERESTS

Interpretable Machine Learning, Data Science, Computer Vision, AI

## EDUCATION

**The State University of New York at Buffalo**, Buffalo, NY, USA

Ph.D., *Computational Data Science*, September 2019

- Title: “Localized Hierarchical Approximations for Data Reduction and Learning” [[Link](#)]
- Advisor: Dr. Abani Patra

**The State University of New York at Buffalo**, Buffalo, NY, USA

M.S., *Mechanical Engineering*, September, 2016

**Indian Institute of Technology**, Kharagpur, WB, India

B.Tech., *Industrial and Systems Engineering*, July, 2014

## PROFESSIONAL EXPERIENCE

***Assistant Professor of Data Science (Tenure Track)***

**Aug. 2021 - present**

Department of Mathematics,  
Embry-Riddle Aeronautical University, Daytona Beach, FL, USA

***Data Scientist/Postdoctoral Scholar***

**Oct. 2019 - July 2021**

Data Intensive Studies Center,  
Tufts University, Medford, MA, USA

***Applied Data Science Lecturer***

**Jan. 2020 - April 2020**

M.S. in Engineering Management Program, Tufts Gordon Institute,  
Tufts University, Medford, MA, USA

***Graduate Research/Teaching Assistant***

**Sept. 2014 - Sept. 2019**

Institute for Computational and Data Sciences ,  
The State University of New York at Buffalo, Buffalo, NY, USA

***Student Assistant***

**May 2013 - July 2013**

Department of Industrial and Systems Engineering,  
The Hong Kong Polytechnic University, Hung Hom, Hong Kong

***Research Intern***

**May 2012 - July 2012**

Indian Institute of Management  
Lucknow, Uttar Pradesh, India

## GRANT SUPPORT

**ERAU: Faculty Innov. Research in Science and Tech. (FIRST), ~\$24,000, 2022-23**

**Title:** *Identifying the Structure and Dynamics of Sub-Glacial Lakes Under Antarctic Icesheet using AI and Machine Learning*

**Role:** *Principal Investigator (Share 100%)*

**Shekhar P.**, Babu M., and Patra A. Hierarchical regularization networks for sparsification based learning on noisy datasets. *Foundations of Data Science*. 2023; doi: 10.3934/fods.2023009 [[Link](#)][[arXiv](#)] [[Code](#)].

Babu, M., Franciosa, P., **Shekhar, P.**, and Ceglarek, D. Object Shape Error Modelling and Simulation During Early Design Phase by Morphing Gaussian Random Fields. *Computer-Aided Design*, 2023; 158, 103481. [[Link](#)]

Parida, S. S., Bose, S., Butcher, M., Apostolakis, G., and **Shekhar, P.**. SVD enabled data augmentation for machine learning based surrogate modeling of non-linear structures. *Engineering Structures*, 2023; 280, 115600. [[Link](#)]

**Shekhar P.** and Patra A., A Forward Backward Greedy Approach for Sparse Multiscale Learning. *Computer Methods in Applied Mechanics and Engineering*. 2022; 400: 115420. [[Link](#)] [[arXiv](#)] [[Code](#)]

Vora, N., **Shekhar, P.**, Esmail, M., Patra, A., and Georgakoudi, I. Label-free flow cytometry of rare circulating tumor cell clusters in whole blood. *Nature Scientific Reports*. 2022 ;12(1): 1-14. [[Link](#)]

**Shekhar P.** and Patra A., Hierarchical approximations for data reduction and learning at multiple scales. *Foundations of Data Science*. 2020;2(2):123-154. [[Link](#)] [[arXiv](#)] [[Code](#)]

**Shekhar P.**, Csathó B., Schenk T., Roberts C. and Patra A., ALPS: A Unified Framework for Modeling Time Series of Land Ice Changes. *IEEE Transactions on Geoscience and Remote Sensing*. 2020 Oct 16. [[Link](#)] [[arXiv](#)] [[Code](#)]

Chan F.T., **Shekhar P.** and Tiwari M.K., Dynamic scheduling of oil tankers with splitting of cargo at pickup and delivery locations: a Multi-objective Ant Colony-based approach. *International Journal of Production Research*. 2014 Dec 17;52(24):7436-53. [[Link](#)]

Vora, N., **Shekhar, P.**, Kwan, J., Esmail, M., Patra, A., and Georgakoudi, I. Meet the clusters: a deep learning approach for label-free detection of circulating tumor cell clusters using flow cytometry. In *Multiscale Imaging and Spectroscopy IV* (p. PC123630A). SPIE. 2023 March. [[Link](#)]

Dasarla Giri Babu, V., Chao, Y., Lopes, N. C., Ricklick, M., **Shekhar, P.**, and Boetcher, S. Impact of Data Representation on Artificial Neural Network Performance in sCO<sub>2</sub> Cooling Applications. In *AIAA SCITECH* (p. 0390). 2023 January. [[Link](#)]

Georgakoudi, I., Vora, N., **Shekhar, P.**, and Patra, A. Label-free flow cytometric detection of circulating tumor cell clusters is enabled in whole blood samples by machine learning-based signal analysis. In *Unconventional Optical Imaging III* (p. PC121360U). SPIE. 2022 May. [[Link](#)]

Vora, N., **Shekhar, P.**, Esmail, M., Patra, A., and Georgakoudi, I. Detection of Rare Circulating Tumor Cell Clusters in Whole Blood Using Label-free, Flow Cytometry. In *Microscopy Histopathology and Analytics* (pp. MW3A-3). Optica Publishing Group. 2022 April. [[Link](#)]

**Shekhar P.**, Csatho B., Schenk T. and Patra A., Localized time series modeling of Greenland ice sheet elevation changes. In *Proceedings of the 8th International Workshop on Climate Informatics: CI 2018* (No. NCAR/TN-550+PROC). doi:10.5065/D6BZ64XQ.

**Shekhar P.**, Patra A. and Csatho B., Multiscale and Multiresolution methods for Sparse representation of Large datasets. *Procedia Computer Science*. 2017 Jan 1;108:1652-61. [[Link](#)]

**Shekhar P.** and Rai R., Anomaly Detection in Complex Spatiotemporal Networks Through Loca-

tion Aware Geospatial Big Data Sets. In *International Design Engineering Technical Conferences and Computers and Information in Engineering Conference* 2016 Aug 21 (Vol. 50190). American Society of Mechanical Engineers. [[Link](#)]

**Shekhar P.**, Patra A and Stefanescu ER., Multilevel methods for sparse representation of topographical data. *Procedia Computer Science*. 2016 Jan 1;80:887-96. [[Link](#)]

#### PROFESSIONAL TALKS

Building Multiscale Representations and Surrogate Using a Greedy Approach, at the *SIAM Conference on Uncertainty Quantification (UQ22)*, Atlanta, USA (April 2022): **Invited Talk**

Ensemble Methods: Boosting, at *Data Science and Machine Learning, Warwick Manufacturing Group*, University of Warwick, Coventry, UK (April 2022): **Invited Talk**

Multiscale Models for Sparsity Constrained Data Reduction, at the *AMS Sectional Meeting: Special Session on Mathematics of Data Science*, Boston, USA (March 2022): **Invited Talk**

Greedy Multiscale Surrogates for Uncertainty Quantification, at the *Annual Fall Meeting for American Geophysical Union*, New Orleans, USA (Dec 2021).

Greedy Multiscale Strategies for Sparse Modeling and Emulation Tasks, at the 16<sup>th</sup> *US National Congress on Computational Mechanics*, (July 2021)

Multiscale models for sparsity constrained data reduction, at the *Department of Biostatistics, Harvard T.H. Chan School of Public Health, Harvard University*, Boston, USA (May 2021)

Hierarchical Regularization and Sparse Representation of Noisy Data sets, at *Data-driven science with uncertainty quantification, machine learning, and optimization, 14th World Congress in Computational Mechanics and ECCOMAS Congress*, Paris (Jan 2021).

Model Selection in Machine Learning, at *Warwick Manufacturing Group*, University of Warwick, Coventry, UK (Nov 2020): **Invited Talk**

A Novel Hierarchical Learning Method for Remote Sensing Data, with Applications of Greenland Ice Sheet Changes from Laser Altimetry, at the *Annual Fall Meeting for American Geophysical Union*, San Francisco USA (Dec 2019).

ALPS: A framework for modeling time series of land ice changes, at *Department of Geology, SUNY Buffalo*, Buffalo, USA (Nov 2019): **Invited Talk**

#### SELECTED PROFESSIONAL PRESENTATIONS

Exploiting the Redundancy in ICESat-2 Geolocated Photon Data (ATL03), a Multiscale Data Reduction Approach, at the *Annual Fall Meeting for American Geophysical Union*, San Francisco USA (Dec 2020)

Hierarchical Regularization Networks for Learning on Noisy Datasets, at *Graduate Student Poster Session, School of Engineering and Applied Sciences*, SUNY Buffalo, Buffalo, NY, USA (April 2019)

A Novel Approach Using Localized Time Series for Modeling Greenland Ice Sheet Elevation Changes from Long-Term Altimetry Record, at the *Annual Fall Meeting for American Geophysical Union*, Washington DC, USA (Dec 2018)

Localized Time Series Modeling of Greenland Ice sheet Elevation Changes, at *8th International Workshop on Climate Informatics: CI 2018*, Boulder Colorado, USA (Sept 2018).

Localized Statistical Modeling for Elevation Change Time Series Data in Parts of Greenland Ice-Sheet, at *International Symposium on Timescales, Processes and Ice Sheet Changes*, Buffalo, NY, USA (June 2018)

Multi-scale Modeling for Data Sparsification, at *Graduate Student Poster Session, School of Engineering and Applied Sciences*, SUNY Buffalo, Buffalo, NY, USA (April 2018)

Multi-Scale approaches for Data Sparsification and Modeling, at *CDSE days, Institute for Computational and Data Sciences*, SUNY Buffalo, Buffalo, NY, USA (April 2018)

#### HONORS AND AWARDS

- Graduate Student Association's conference funding award, *SUNY Buffalo*, 2018.
- Best poster award, annual poster competition, *Institute for Computational and Data Sciences, SUNY Buffalo*, 2018.
- Travel award, Workshop on Distributed and Parallel Data Analysis (DPDA), *Statistical and Applied Mathematical Sciences Institute (SAMSI)*, Research Triangle Park, Raleigh, NC, 2016
- Dean's Graduate Fellowship award, *SUNY Buffalo*, 2014
- Best undergraduate thesis award, *IIT Kharagpur*, 2014
- Travel and research award, *Department of Industrial and Systems Engineering, The Hong Kong Polytechnic University*, 2013

#### COURSES SUPERVISED

**DS 625: Computing for Data Compression, Image and Signal Processing** Spring 2023

Institute: Embry-Riddle Aeronautical University

Role: Course Instructor

**MA 540: Data Mining**

Spring 2022/2023

Institute: Embry-Riddle Aeronautical University

Role: Course Instructor

**MA 432: Linear Algebra**

Spring 2022 and Fall 2021/23

Institute: Embry-Riddle Aeronautical University

Role: Course Instructor

**MA 506: Probability and Statistical Inference**

Fall 2021/22/23

Institute: Embry-Riddle Aeronautical University

Role: Course Instructor

**EM 0212: Applied Data Science**

Spring 2020

Institute: Tufts University

Role: Course Instructor

**Math 190: Uncertainty Quantification for Large Scale Comp. Modeling** Spring 2020

Institute: Tufts University

Role: Supporting Instructor for Dr. Abani Patra,

**Summer Course (15 hrs): Matrix Methods and Machine Learning**

Summer 2020

Institute: Tufts University

Role: Co-instructed with Dr. Abani Patra

**EAS 595: Probability for Machine Learning**

Fall 2017

Institute: SUNY Buffalo

Role: Teaching Assistant

**MAE 364: Manufacturing Processes**

Spring 2015

Institute: SUNY Buffalo

Role: Teaching Assistant

**MAE 376: Applied Mathematics for Mech. and Aero. Engr.**

Fall 2014

Institute: SUNY Buffalo

Role: Teaching Assistant

LEADERSHIP ROLES	<p><i>Vice President</i> Earthquake Engineering Research Institute (EERI), SUNY Buffalo, Buffalo, NY, USA</p> <p><i>General Secretary</i> Radhakrishnan Hall of Residence, IIT Kharagpur, Kharagpur, WB, India</p>	<p><b>2018-2019</b></p> <p><b>2012-2014</b></p>
SUPERVISING COMMITTEES	<ul style="list-style-type: none"> <li>• Jordan Sanders (Chair, MS thesis committee in Data Science)</li> <li>• Shashi Bhushan Jha (Member, PhD dissertation committee in Computer Science)</li> <li>• Vinusha Dasarla Giri Babu (Member, MS thesis committee in Aerospace Engineering)</li> </ul>	
STUDENT RESEARCHERS	<ul style="list-style-type: none"> <li>• Thomas Fiello II (MS in Data Science)</li> <li>• Wairimu Mwangi (MS in Data Science)</li> <li>• Cole Montrose (BS in Computer Science)</li> <li>• Noemi Miguelez-Gomez (PhD in Computer Science)</li> <li>• Ke Feng (PhD in Computer Science)</li> <li>• Juan Ortiz-Couder (PhD in Computer Science)</li> <li>• Justus Renkhoff (PhD in Computer Science)</li> <li>• Aaron Van De Brook (MS in Computer Science)</li> </ul>	
COURSE DEVELOPMENT	<ul style="list-style-type: none"> <li>• MA625 Computing for Data Compression, Image and Signal Processing</li> <li>• MA506 Probability and Statistical Inference (Course Monitor at ERAU)</li> <li>• Matrix Methods and Machine Learning (Summer course at Tufts University)</li> </ul>	
REVIEWING ACTIVITIES	<ul style="list-style-type: none"> <li>• Nature Scientific Reports</li> <li>• Journal of Computational Science (JOCS)</li> <li>• International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, The American Society of Mechanical Engineers (ASME)</li> <li>• International Journal of Production Economics (IJPE)</li> </ul>	
PROFESSIONAL MEMBERSHIPS	<ul style="list-style-type: none"> <li>• Institute of Electrical and Electronics Engineers (IEEE)</li> <li>• Society for Industrial and Applied Mathematics (SIAM)</li> <li>• American Geophysical Union (AGU)</li> </ul>	
COMPUTER SKILLS	<ul style="list-style-type: none"> <li>• <i>Languages</i>: Python, C, C++, MATLAB, with experience in R</li> <li>• <i>HPC skills</i>: MPI, OpenMP and Elemental Distributed Memory Linear Algebra library</li> <li>• <i>Machine Learning Packages</i>: Numpy, Scipy, Statsmodel, Scikit-Learn, Pandas, PyTorch</li> <li>• <i>Big Data Packages</i>: Hadoop and Spark</li> <li>• <i>Data Visualization packages/Softwares</i>: Matplotlib, Plotly, Tableau</li> <li>• <i>Data handling packages</i>: netCDF4, HDF5</li> <li>• <i>Presentation Skills</i>: Powerpoint/Excel/Word or LaTeX for reports, papers and presentations.</li> <li>• <i>Operating Systems</i>: Unix/Linux, Mac and Windows.</li> </ul>	
PROFESSIONAL REFERENCES	<ul style="list-style-type: none"> <li>• Dr. Abani Patra Director, Data Intensive Studies Center Tufts University, Medford, USA <a href="mailto:abani.patra@tufts.edu">abani.patra@tufts.edu</a></li> <li>• Dr. Manoj Babu Assistant Professor, WMG University of Warwick, UK <a href="mailto:m.babu@warwick.ac.uk">m.babu@warwick.ac.uk</a></li> </ul>	