MADHURI NAGARE

✉ mnagare@purdue.edu LinkedIn | Webpage

Summary

- Proficiency in Image Processing (medical CT and satellite images), Computational Imaging, Machine Learning
- Skilled in implementing deep learning framework
- 8 years of research experience in industry and academia leading to publications and patents
- Successful collaborations with cross-cultural and interdisciplinary teams

Education

May 2024 (Expected)	Ph.D. in Electronics and Computer Engineering Advisor: Prof. Charles A. Bouman | CGPA: $3.93/4$ | Purdue University, West Lafayette, USA
June 2015	Master of Technology in Geoinformatics and Natural Resources Engineering CGPA: $9.86/10$, Department **rank** 1 | Indian Institute of Technology Bombay (IITB), India
June 2013	Bachelor of Technology in Electronics and Telecommunication Engineering CGPA: $9.44/10$, Department **rank** 1 | College of Engineering, Pune (COEP), India

Publications

- **M. Nagare**, J. Tang, O. Rahman, B. Nett, R. Melnyk, K. D. Sauer, and C. A. Bouman. A noise preserving sharpening filter for CT image enhancement. In *ICIP - IEEE International Conference on Image Processing*, 2022
- **M. Nagare**, R. Melnyk, O. Rahman, K. D. Sauer, and C. A. Bouman. A bias-reducing loss function for CT image denoising. In *ICASSP - IEEE International Conference on Acoustics, Speech and Signal Processing*, 2021
- O. Rahman, **M. Nagare**, K. D. Sauer, C. A. Bouman, R. Melnyk, B. Nett, and J. Tang. MBIR training for a 2.5D DL network in x-ray CT. In *16th Intl. Meeting on Fully 3D Image Recon. in Radiology and Nuclear Medicine*, 2021
- **M. Nagare**, E. Kaneko, M. Toda, H. Aoki, and M. Tsukada. Cloud shadow removal based on cloud transmittance estimation. In *IGARSS - IEEE International Geoscience and Remote Sensing Symposium*, 2018
- **M. Nagare**, H. Aoki, and E. Kaneko. A unified method of cloud detection and removal robust to spectral variability. In *IGARSS - IEEE International Geoscience and Remote Sensing Symposium*, 2017
- P. P. Shingare, **M. Nagare**, and C. P. Joshi. Improved active contour model for satellite images. In *ICIIP - IEEE Second International Conference on Image Information Processing*, 2013

Technical Skills

Programming Languages:	Python, C, Matlab, Swift
Libraries:	Keras, TensorFlow, NumPy, SciPy, OpenCV
Key Courses:	Computer Vision, Model Based Image Processing, Topics in Machine Learning, Digital Image Processing, Signals and Systems, Optimization Methods, Random Signals and Stochastic Processes, Estimation Theory

Academic Research

Sep. 2018-Ongoing

Bias Reducing Methods for Enhancement of Clinical X-ray Computed Tomography (CT) Images
Advisor: Prof. Charles A. Bouman (Purdue University, USA)

- Analyzed a limitation of machine learning approaches of producing over-smooth (biased) results lacking texture and proposed solutions to retain texture while denoising and deblurring
- Developed a **bias-reducing loss function** that allows to train a deep neural network denoiser so that the amount of texture and detail retained can be controlled through an adjustable parameter
- Proposed a **noise preserving sharpening filter** to deblur CT images while maintaining good texture
- Proposed a **generative model** to produce desired texture while denoising and deblurring
- **Collaborated** with **interdisciplinary** teams of researchers, engineers and clinicians

Jul. 2014-Jun. 2015

Decision Tree Classifiers (DTC) for Satellite Images (Master's Thesis)
Advisor: Prof. B. Krishna Mohan (IITB, India)

- Proposed a DTC optimized with a genetic algorithm to extract **nonlinear** class boundaries in a feature space by utilizing a unique set of a classifier and features at each node of the tree
- Achieved higher accuracy for land use classification than the conventional algorithm

Jul. 2012-Jun. 2013

Improved Active Contour Model (ACM) for Edge Detection in Satellite Images (Bachelor's Thesis)
Funded by Indian Space Research Organization (ISRO)
Advisor: Prof. Pratibha Shingare (COEP, India)

- Devised pre- and post-processing techniques for reducing the ACM's sensitivity to initialization, noise, and the number of objects in an input image
- Detected edges **1.6** times faster as compared to conventional techniques

Industrial Research

May 2019- Aug. 2019 | **Ph.D. Intern**
GE Healthcare, Waukesha, USA
- Studied concepts of medical imaging systems and reconstruction algorithms
- Improved robustness of a deep learning based **reconstruction** method by adding noise while training
- Achieved on an average 1.5 dB gain in the peak signal-to-noise ratio
- **Coordinated with clinicians** for the real-world evaluation of proposed solutions

Oct. 2015- Aug. 2018 | **Assistant Researcher**
NEC Corporation, Tokyo, Japan
- Developed a technique to remove thin clouds from an image based on the radiometric transfer model and a spectral **unmixing** technique while accommodating for **variability** in a cloud **spectrum**
- Achieved **22%** higher accuracy than the state-of-the-art method for cloud removal
- Proposed a method to derive attenuation factors of direct solar irradiance, a key component required to be estimated for cloud shadow removal
- Improved accuracy of the shadow removal by **5%** as compared to the existing de-shadowing method
- **Implemented** codes for NEC's atmospheric correction **software** module
- Adapted to the cross-cultural professional and social environment

Patents

- USPTO Application Number 17/807,779, Filed Jun. 2022, *Resolution recovery of CT images*
- USPTO Application Number 17/662,161, Filed May 2022, *Denoising of CT images*
- US 10,650,498 B2, Published Feb. 2020, *Cloud removal*
- WO2019150453A1, US 2020/0364835 A1, Published Aug. 2019, *Cloud removal*
- WO2019049324A1, US 11,227,367 B2, Published Mar. 2019, *Cloud shadow removal*
- WO2018116367A1, US 11,017,507 B2, Published June. 2018, *Cloud removal*

Leadership

Apr. 2021- Apr. 2022 | **International Student Ambassador | International Students and Scholars (ISS), Purdue University**
- Organized and led various activities in the weeks-of-welcome for incoming international students

Aug. 2019- Dec. 2019 | **Treasurer | Indian Graduate Students at Purdue, Purdue University**
- Secured funding from the Student Organization Grant Allocation Board for cultural events

Nov. 2016- May 2017 | **Group leader | Machine Learning Reading Group, NEC Corporation**
- Took initiative to form a group of colleagues interested in learning concepts of machine learning

Jun. 2014- Jun. 2015 | **Executive Member | Graduate Academic Council, IITB**
- Led a team of 15 coordinators to organize the institute-wide orientation for 1300+ graduate freshmen

Jul. 2013- Jun. 2014 | **Graduate Cultural Coordinator | Graduate Cultural Council, IITB**
- Coordinated with 10 members to organize a cultural fest for 3500+ students

Mentorship

Fall 2018 | **Teaching Assistant** for Probabilistic Methods at Purdue University
- Mentored a class of 80 students in understanding the concepts of probability

Fall 2014 | **Teaching Assistant** for Satellite Image Processing at IITB
- Conducted MATLAB training sessions for a batch of 27 students

Achievements

- Awardee of the **Institute Silver Medal** for securing the departmental rank 1 in the Master's degree
- Awardee of the **Institute Gold Medal** for securing the departmental rank 1 in the Bachelor's degree
- Secured **Rank 4** in the 2009 Maharashtra Health and Technical Common Entrance Test among 216725 candidates
- Won honorable mention for poster presentation at Purdue Engineering Graduate Showcase 2021

Professional Communities

- Reviewer for IEEE International Conference on Image Processing, Journal of the Indian Society of Remote Sensing
- Member of IEEE Eta Kappa Nu (HKN)

Extracurricular

- Contributed in the Guinness World Record of 'Most people solving Rubik's Cube'
- Cleared two exams of the classical Kathak Nrutya Dance