

BHARGAV SACHIN GHANEKAR

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EDUCATION

Rice University

Houston, TX

PhD candidate in Electrical and Computer Engineering

CGPA: 3.95/4.00

Carnegie Mellon University

Pittsburgh, PA

Master of Science in Electrical and Computer Engineering

Dec 2019

CQPA: 3.92/4.00

Indian Institute of Technology Madras

Chennai, India

Bachelor of Technology in Engineering Physics

Jul 2018

CGPA: 9.37/10.00

PUBLICATIONS

"PS²F: Polarized Spiral Point Spread Function for single-shot 3D sensing" [Accepted to ICCP 2022]

Ghanekar, Bhargav, and Uday K. Khankhoje. "Phase unwrapping of coarsely sampled maps using higher-order methods." *IEEE Transactions on Geoscience and Remote Sensing* (2021).

Ghanekar, Bhargav, Dipak Narayan, and Uday Khankhoje. "An irrotationality preserving total variation algorithm for phase unwrapping." *2018 Twenty Fourth National Conference on Communications (NCC)*. IEEE, 2018.

ACADEMIC RESEARCH WORK

Snapshot 3D sensing for fiber-based endoscopy

May 2021-ongoing

Research Assistant, Computational Imaging Lab, ECE Rice

Guide: Prof. Ashok Veeraraghavan, ECE Rice

- Developing lensless, mask-based solutions and associated computational algorithms to enable 3D sensing in the space of fiber-based endoscopy

Monocular, snapshot imaging for depth sensing and 3D microscopy

Sep 2020-ongoing

Research Assistant, Computational Imaging Lab, Rice University

Advised by: Prof. Ashok Veeraraghavan, ECE Rice and Prof. Aswin Sankaranarayanan, ECE CMU

- Analyzed rotating PSFs to develop phase masks for depth sensing
- Leveraging polarization, created a novel engineered PSF based on a polarizer-phase mask encoding that enables better reconstruction of 3D extended, linear structures
- Demonstrated effectiveness of proposed method in simulations and in a prototype experimental setup

Phase Mask design for depth sensing and 3D microscopy

Feb 2019-Dec 2019

Research Assistant, Image Science Lab, CMU

Advised by: Prof. Aswin Sankaranarayanan, ECE CMU

- Analyzed rotating PSFs to develop phase masks for depth sensing
- Performed a Fisher information based analysis of the Double-Helix rotating PSF and the Standard PSF, and demonstrated its ineffectiveness for edge depth sensing

Total Variational methods for 2-D phase unwrapping

Aug 2017-May 2018

B.Tech. Final Year Project

Guide: Dr. Uday Khankhoje – Department of Electrical Engineering, IIT Madras

- Investigated 2-D phase unwrapping techniques for interferometric radar imaging
- Implemented existing phase unwrapping algorithms based on traditional methods; tested them successfully
- Developed a new irrotationality-preserving phase unwrapping algorithm based on total variation (TV) denoising principle
- Follow-up paper on performing phase unwrapping using higher-order phase derivative information also submitted and accepted in IEEE TGRS journal

WORK EXPERIENCE

NPI Vision Software Engineer Intern

May-Aug 2019, Feb-Aug 2020

Internship at Intuitive Surgical, Sunnyvale CA

- Explored deep learning and computer vision-based methods for performance evaluation of color stereo-vision systems
- Developed software fixture tools and software for performance evaluation of endoscope camera systems

Machine Vision and Learning Intern

May – July 2017

Summer Internship at Barla Sensor Technologies Pvt. Ltd, Chennai, India

- Worked on a novel method in which milk adulteration levels and milk fat concentration levels were estimated based on images of paper chips using image processing and machine learning techniques.
- Scripted Python codes for detection of color blobs and training of linear regression models for estimation of adulterant and fat concentrations.

COURSEWORK

Graduate coursework:

Computational Imaging/Vision – Image and Video Processing, Computer Vision, Computational Photography

Machine Learning – Machine Learning, Deep Learning

Hardware/Systems – Computer Systems, Embedded Systems, How To Write Fast Code

Undergraduate coursework:

EECS – DSP, Multi-rate DSP, Communication Systems, Digital Systems, Data Structures and Algorithms

Physics – Optics, Electromagnetics, Quantum Mechanics

Mathematics – Linear Algebra, Probability and Statistics, Complex Analysis, Theory of Computation

RELEVANT ACADEMIC PROJECTS

Exploring methods to stabilize GAN training

Oct 2021-Dec 2021

Optimization course project, Rice University

Explored recent literature regarding methods for improving GAN training, which is a well-known issue. Implemented codes for the respective methods and compared them across various datasets and architectures and GAN types.

Deep Learning for remote PPG

Oct 2020-Dec 2020

Deep Learning course project, Rice University

Explored attention-based deep learning models for performing remote PPG – i.e. estimating heart rate from face videos

3D Reconstruction of mirrors from two-bounce light path information

Sep 2019-Dec 2019

18980 MS research project, CMU (Prof. Matthew O'Toole)

- Worked on modifying the pbrt software, and then using the software to simulate transient imaging and DVS sensor outputs to enable 3D reconstruction of specular objects and mirrors from multi-bounce light paths

HDR Imaging from burst photography

Oct 2019-Dec 2019

15663 Computational Photography course project, CMU

- Implemented HDR imaging using a burst of under-exposed images, based on Google's SIGGRAPH 2015 Paper

Optimization of Stereo Global Matching (SGM) Algorithm

Oct 2019-Dec 2019

18645 How To Write Fast Code course project, CMU

- Designed kernels to write high-performance code for the SGM algorithm for the stereo correspondence matching problem.

Wasserstein Autoencoders for Cross-domain mapping

Feb 2019-May 2019

10707 Deep Learning course project

- Investigated new models for non-adversarial mappings between domains using Wasserstein autoencoders
- Implemented a new model involving two coupled Wasserstein autoencoders, giving reasonable mappings as seen between the two domains in the *Edges2Shoes* dataset.

Deep Learning for Shoeprint Recognition

Oct 2018-Dec 2018

10701 Machine Learning course project

- Investigated deep learning methods such as autoencoders and GANs for the problem of footprint recognition

SKILLS

Programming: C/C++, Python

Softwares: MATLAB, OpenCV, PyTorch, TensorFlow, pbrt, CUDA (basic proficiency)

Experimental: Optics, Spatial Light Modulators, Two-photon lithography

AWARDS

Sri Jandhyala Lakshmi Kantam and Srimati Sitamahalakshmi Prize

Awarded by Indian Institute of Technology Madras for Second Best Academic Record in B.Tech. Engineering Physics

EXTRA-CURRICULAR ACTIVITIES

Mentor for PATHS-UP Young Scholars Program (Summer 2021)

Mentor at Avanti Fellows, during 2015-16, where I taught under-privileged Class XI and XII students the subjects of Physics, Chemistry, and Mathematics