

Siddhant Gautam

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Research Interests

Computational Imaging, Medical Imaging, Signal Processing, Machine Learning

Education

- **Michigan State University** East Lansing, Michigan
Ph.D. in Computational Mathematics Science and Engineering Aug.'20 - Present
GPA: 3.78/4.00
Advisor: Dr. Saiprasad Ravishankar
- **Indian Institute of Technology Madras** Chennai, India
M.S. in Electrical Engineering Jul.'17 - Jun.'20
CGPA: 7.58/10
Thesis Title: "Soil Moisture Retrieval Using Sliced Regression Inversion Technique"
Advisor: Dr. Uday K. Khankhoje
- **Motilal Nehru National Institute of Technology Allahabad** Prayagraj, India
B.Tech. in Electronics and Communication Engineering Jul.'13 - Jun.'17
CGPA: 8.60/10
Thesis Title: "Design of microstrip antenna array for energy harvesting"
Advisor: Dr. Yogendra K. Prajapati

Work Experience

- **Dolby Laboratories** Sunnyvale, California
Video Processing Research Intern Jun.'22 - Aug.'22
Project Title: "Residual Encoding Using Neural Field for Image Sequence Modeling"
Advisor: Dr. Guan-Ming Su

Awards and Achievements

- Student paper competition finalist at the Optica Imaging Congress, 14 - 17 August, 2023, Boston, Massachusetts USA
- Awarded the best paper award in the CMSE Research Symposium 2021 held at Michigan State University
- Awarded the IEEE Geoscience and Remote Sensing Society (GRSS) - India, best masters thesis award, presented by the IEEE GRSS-Kerala Chapter in 2020.

Technical Skills

- **Languages:** Python, MATLAB, C++
- **Packages:** Numpy, Scipy, PyTorch, Matplotlib, Scikit-Learn

Publications

Conference Papers:

1. **Siddhant Gautam**, Angqi Li, and Saiprasad Ravishankar. "Patient-Adaptive and Learned MRI Data Undersampling Using Neighborhood Clustering." ICASSP 2024-2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP). IEEE, 2024.
2. Anustup Choudhary, Guan-Ming Su, and **Siddhant Gautam**. "Residual encoding using neural field for image sequence modeling." 2023 57th Asilomar Conference on Signals, Systems, and Computers. IEEE, 2023.
3. **Siddhant Gautam**, Marc L. Klasky, and Saiprasad Ravishankar. "Scatter Removal in Dynamic X-Ray Tomography using Learned Robust Features." Computational Optical Sensing and Imaging. Optica Publishing Group, 2023.
4. **Siddhant Gautam**, Sakees V. Chidambaram, Niharika Gunturu, and Uday K. Khankhoje. "Retrieval of Soil Moisture Using Sliced Regression Inversion Technique." 2019 Photonics and Electromagnetics Research Symposium-Spring (PIERS-Spring), pp. 1081-1089. IEEE, 2019.

Workshop and Symposium Papers:

1. **Siddhant Gautam**, Angqi Li, Nicole Seiberlich, Jeffrey Fessler, Saiprasad Ravishankar, "**Scan-Adaptive MRI Undersampling Using Neighbor based Optimization**", IMSI Workshop on Computational Imaging 2024, Chicago, IL, USA.
2. **Siddhant Gautam**, Angqi Li, Saiprasad Ravishankar, "**Patient-adaptive and Learned MRI Data Undersampling Using Neighborhood Clustering**", Medical Imaging meets NeurIPS (MedNeurips 2023) workshop at NeurIPS 2023, New Orleans, LA, USA.
3. **Siddhant Gautam**, Angqi Li, Saiprasad Ravishankar, "**Patient-adaptive and Learned MRI Data Undersampling Using Neighborhood Clustering**", Midwest Machine Learning Symposium (MMLS) 2023, Chicago, IL, USA.

Invited Talks

1. **Siddhant Gautam**, Angqi Li, Saiprasad Ravishankar, "**Patient-Adaptive and Learned MRI Data Undersampling Using Neighborhood Clustering**", invited talk at University of Michigan 2024.
2. **Siddhant Gautam**, Marc Klasky, Saiprasad Ravishankar, "**Scatter Removal in Dynamic X-Ray Tomography using Learned Robust Features**", Machine Learning for Scientific Learning (MLSI), Electronic Imaging 2024.

Patents

- "**Residual Encoding and Decoding Using a Neural Field**" with Guan Ming Su and Anustup Choudhary (pending)

Professional Service

Professional Societies

- Institute of Electrical and Electronics Engineers (IEEE)
Student Member (2017–present)

- Optica (Formerly Optical Society of America)
Student Member (2023–present)
- International Society for Magnetic Resonance in Medicine (ISMRM)
Student Member (2023–present)

Reviewing

- Conference reviewer: IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), IEEE International Symposium on Biomedical Imaging (ISBI)
- Journal reviewer: IEEE Transactions on Medical Imaging (TMI)

Selected Work and Research Experience

- **Adaptive Sampling for Dynamic MRI Reconstruction** | PhD Thesis

Advisor: Dr. Saiprasad Ravishankar

Aug.'20 - Present

- Adaptively selecting samples in the Fourier space using signal processing and machine learning techniques
- Fast acquisition time desired which reduces patient discomfort and motion artifact
- Reconstructing image from undersampled MRI measurements using convolutional neural networks (CNNs) based models
- Finding patient adaptive high-quality sampling pattern for knee (fastMRI) and cardiac (OCMR) MRI scans
- Proposed a nearest neighbor-based approach to estimate sampling patterns from undersampled MRI measurements

- **Machine Learning Driven Density Reconstruction and Denoising for Dynamic Tomographic Imaging**

Advisor: Dr. Saiprasad Ravishankar

Aug.'20 - Present

- Incorporating machine-learned models for accurate density reconstruction in dynamic imaging,
- Learned deep neural networks to perform artifact removal in noisy density reconstructions, where the noise is imperfectly characterized.
- Project involves examining the propagation of a shock into a non-uniform density field created by the implosion of a steel shell
- Proposed a robust feature extraction-based approach to reconstruct hydrodynamic densities
- Numerical results show that the models trained in our frameworks can remove significant portions of unknown noise in density time-series data.
- Work funded by and in collaboration with Los Alamos National Lab (LANL)

- **Development of forward solver for 3D electromagnetic scattering problems**

Advisor: Dr. Uday K. Khankhoje

Aug.'19 - Jun.'20

- Built a forward solver to simulate the electromagnetic scattering from a substrate.
- Discretized the computational domain using a tetrahedral mesh and expressed the electric field in terms of three-dimensional vector basis functions.
- Solved the vector Helmholtz equation in 3D using the Finite Element Method (FEM) to calculate the scattered electric field.
- To be used as a forward model in the rough surface scattering problem for finding ice in the Lunar craters.
- Project funded by Indian Space Research Organisation (ISRO) for its Chandrayaan-2 mission

- **Soil Moisture Retrieval Using Sliced Regression Inversion Technique** | Master's Thesis
Advisor: Dr. Uday K. Khankhoje *Jan.'18 - Jun.'20*
 - Developed a novel soil moisture retrieval algorithm called the Sliced Regression Inversion algorithm based on an electromagnetic scattering model.
 - Built a physics-based forward model to find the radar backscatter from vegetated lands
 - Estimated soil moisture by solving the least-squares equation after obtaining a linear relationship between the input and output parameters
 - Presented this work at the Progress In Electromagnetics Research Symposium (PIERS) in Rome, Italy held on 17-20 June 2019.
 - Project funded by the Indian Space Research Organisation (ISRO) for its upcoming NASA-ISRO Synthetic Aperture Radar (NISAR) mission.

Teaching Assistant

- **Data Visualization Principles and Techniques** | Teaching Assistant
Instructor: Dr. Devin Silvia *Jan.'22 - Apr.'22*
- **Engineering Electromagnetics** | Teaching Assistant
Instructor: Dr. Uday K. Khankhoje *Jul.'19 - Nov.'19*
- **Computational Electromagnetics** | NPTEL Teaching Assistant
Instructor: Dr. Uday K. Khankhoje *Jan.'19 - Apr.'19*
- **Electric Circuits and Networks** | Teaching Assistant
Instructor: Dr. Debdutta Ray *Jul.'18 - Nov.'18*
- **Signals and Systems** | Teaching Assistant
Instructor: Dr. Krishna Jagannathan *Jan.'18 - Apr.'18*

Seminars/Workshops Attended

- **Radiographic Imaging and Tomography (RadIT 2023)**
Boston Park Plaza, Boston, MA *August 14-17, '23*
- **Midwest Machine Learning Symposium (MMLS) 2023**
held at University of Illinois, Chicago *May 15-16, '23*
- **2019 Progress in Electromagnetics Research Symposium (PIERS-Rome)**
La Sapienza University of Rome, Rome, Italy *Jun. 16-20, '19*
- **Soil Moisture and Agricultural Monitoring using Microwave Remote Sensing**
Space Application Centre, ISRO, Ahmedabad, India *Feb. 07-08, '18*
- **National Finite Element Developers Meet**
ISRO Headquarters, Bangalore, India *Dec. 15, '17*
- **TI Internship Programme on Microcontroller-based Embedded System Design**
Netaji Subhas University Of Technology, New Delhi, India *Dec.'15 - Jan.'16*
- **Summer Training Programme on Verilog HDL and PLC-SCADA**
CETPA Infotech Private Limited, New Delhi, India *May.'15 - Jun.'15*