Siddhant Gautam

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Research Interests

To solve challenging real-world problems in the area of medical imaging and signal processing
Research Interests: Computational Imaging, Signal Processing, Machine Learning

Education

- **Michigan State Universtiy** — East Lansing, Michigan
  Ph.D. in Computational Mathematics Science and Engineering — *Aug.'20 - Present*
  GPA: 3.78/4.00
  Advisor: Prof. 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: Prof. 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: Prof. 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: 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. 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.
2. **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.
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, 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.
2. **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**, 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: Prof. 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: Prof. 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: Prof. 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: Prof. 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: Prof. Devin Silvia *Jan.'22 - Apr.'22*
- **Engineering Electromagnetics** | Teaching Assistant
  Instructor: Prof. Uday K. Khankhoje *Jul.'19 - Nov.'19*
- **Computational Electromagnetics** | NPTEL Teaching Assistant
  Instructor: Prof. Uday K. Khankhoje *Jan.'19 - Apr.'19*
- **Electric Circuits and Networks** | Teaching Assistant
  Instructor: Prof. Debdutta Ray *Jul.'18 - Nov.'18*
- **Signals and Systems** | Teaching Assistant
  Instructor: Prof. 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*