SEAN M. FARRELL

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RESEARCH INTERESTS

My research interests lie in the intersection of **computational imaging, machine learning, wireless communication, and radar imaging**. My current research focuses on designing new systems and algorithms for solving imaging inverse problems at sub-optical wavelengths (millimeter wave, terahertz, and mid-wave infrared). Broadly, my research leverages inverse rendering, compressed sensing, machine learning, and end-to-end design to achieve unprecedented imaging speed, field-of-view, and resolution.

EDUCATION

Rice University, Houston, TX Expected Spring 2026
Ph.D., M.S. in Electrical and Computer Engineering (GPA: 3.95)
Research Advisor: Prof. Ashok Veeraraghavan

Trinity University, San Antonio, TX 2015 - 2019
B.S. in Engineering Sciences, Minor in Mathematics, magna cum laude (GPA: 3.74)
Research Advisors: Prof. Peter Kelly-Zion, Prof. Dennis Ugolini

RESEARCH EXPERIENCE

Rice University, Houston, TX 2019 - Present
Graduate Research Assistant, Electrical and Computer Engineering

- Lead research and development of a novel video-rate terahertz (THz) interferometric imager using a continuous wave super-heterodyne receiver, physics of diffraction, and machine learning
- Designed sub-THz extremely wideband (150 GHz) synthetic aperture radar and 3D reconstruction algorithm to extract an object's shape from radar measurements
- Proposed a novel radar signal processing technique that incorporates a generative neural network to achieve high-accuracy sparse-aperture millimeter wave radar imaging
- Created a differentiable renderer with end-to-end optimization to achieve asymmetric optical visibility at MWIR as part of the Coded Visibility DARPA project
- Collaborated with Prof. Ashok Veeraraghavan and Dr. Henry Everitt to build Rice's RF-Imaging lab with imaging devices operating between 70-3000 GHz

Trinity University, San Antonio, TX 2016 - 2018
Undergraduate Research Assistant, Electrical Engineering and Fluid Dynamics

- Designed stochastic filtering signal processing methods to reduce experimental noise in computed tomography for sessile drop evaporation studies
- Measured vapor cloud concentrations of hydrocarbon mixtures using infrared spectroscopy and computed tomography techniques

Undergraduate Research Assistant, Physics

- Engineered a LIGO-based interferometer experiment for undergraduate physics labs
- Operated an atomic force microscope to measure charge distribution on LIGO optics
- Automated an optical charging vacuum chamber using LabVIEW

TECHNICAL SKILLS

Programming: Python, Pytorch, MATLAB, Scala, C++, VHDL, BASIC, LabVIEW

Software & Tools: Optical alignment & instrumentation, Radar system design/testing, Autodesk Inventor CAD, Microsoft Office Suite, Wireless Insite, Mitsuba (physics-based renderer), Blender

PUBLICATIONS

Journal Papers

Yongyi Zhao*, **Sean M. Farrell***, Christian R. Jacobson, A.J. Yates, Andrew McClung, Urcan Guler, Naomi J. Halas, Peter Nordlander, Ashok Veeraraghavan, "SCREEN: SCatteRErr ENabled optical asymmetry," in *Optica*, 2025.

Sean M. Farrell, Vivek Boominathan, Nathaniel Raymondi, Ashutosh Sabharwal and Ashok Veeraraghavan, "CoIR: Compressive Implicit Radar," in *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2023.

Conference Papers

Sean M. Farrell, Kris Li, Edwin Vargas, Ariel Habshush, Li Zhang, Brian Woods, Henry O. Everitt, Ashutosh Sabharwal, Ashok Veeraraghavan, "RADISH: RADar Implicit SHapes via Extreme-wideband Sub-terahertz Synthetic Aperture Radar," in *IEEE Conference on Computational Imaging Using Synthetic Apertures (CISA)*, 2025.

Sean M. Farrell, Ashok Veeraraghavan, Ashutosh Sabharwal, César A. Uribe, "Distributed Generalized Wirtinger Flow for Interferometric Imaging on Networks," in *IFAC Conference on Networked Systems (NECSYS)*, 2022.

Patent

Sean M. Farrell, Vivek Boominathan, et al. "COMPRESSIVE IMPLICIT RADAR FOR HIGH-ACCURACY MILLIMETER WAVE IMAGING", United States Provisional Application No. 63/658,218 filed on June 10, 2024

PRESENTATIONS

RADISH: RADar Implicit SHapes via Extreme-wideband Sub-terahertz Synthetic Aperture Radar 2025
IEEE Conference on Computational Imaging Using Synthetic Apertures (CISA), College Park, MD

CoIR: Compressive Implicit Radar 2023
International Conference on Computational Photography (ICCP), Madison, WI

Distributed Generalized Wirtinger Flow for Interferometric Imaging on Networks 2022
9th IFAC Conference on Networked Systems (NECSYS), Zurich, Switzerland

Measuring Vapor Concentration and Diffusive Flux Distributions of an Evaporating Drop 2018
American Physical Society Division of Fluid Dynamics, Atlanta, GA

Signal Processing to Reduce Effects of Experimental Noise on Drop Evaporation Analysis 2018
Trinity University Research Symposium

Sessile Drop Evaporation Study: Measurement of Bi-component Vapor Cloud Concentration 2017
Trinity University Research Symposium

LIGO Interferometer for Undergraduate Physics Lab 2016
Gulf Coast Undergraduate Research Symposium, Houston, TX

TEACHING EXPERIENCE

3D CV: From Autonomous Cars to the Metaverse (ELEC 448/541) 2023 - 2024
Teaching Assistant, Rice University

Computational Photography (ELEC 549) 2023
Teaching Assistant, Rice University

Introduction to Random Signals (ELEC 303) 2020, 2022
Teaching Assistant, Rice University

LEADERSHIP AND INVOLVEMENT

Research Experience for Undergraduates (REU), *Mentor* 2020 – Present

Latinx Doctoral Diversity Group, *Member* 2019 – 2023

Rice Graduate Education for Minorities (RGEM), *Member* 2019 – 2023

IEEE Communications Society (ComSoc) Student Leadership Conference, *Member* 2022

HONORS AND AWARDS

Graduate Teaching Award for Course Support (*Nominated*) 2024

Junior Academic Achievement Award 2018

Best Investigation and Analysis Using Statistics (BIAS) Award 2018

Mathematical Contest in Modeling (MCM) 2018

Outstanding Sophomore Design Award 2018

Austin Marathon Finisher 2017

Eagle Scout Award 2012