

SPENCER CARMICHAEL

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EDUCATION

University of Michigan

Ann Arbor, MI

PhD in Robotics (Advisor: Katherine A. Skinner)

May 2026

MS in Robotics (GPA: 4.00/4.00)

April 2022

BSE in Electrical Engineering, Minor in Physics (GPA: 3.91/4.00)

April 2017

SELECTED EXPERIENCE

University of Michigan

Ann Arbor, MI

Graduate Research Assistant

September 2020 – Present

- Developed a thermal inertial SLAM system robust to motion blur, rolling shutter distortions, and noise:
 - Designed thermal-aware rendering methods with Neural Radiance Fields (NeRFs) and 3D Gaussian Splatting (3DGS)
 - Wrote a package for sparse, on-manifold B-spline trajectory optimization with PyTorch
 - Integrated the above with an efficient rasterizer (gsplat) into an original SLAM pipeline with novel schemes for opacity resetting and relocalization
- Led the creation of an autonomous vehicle data collection platform:
 - Worked with stereo RGB, monochrome, event, and thermal cameras, lidar and RTK/PPK GNSS-IMU systems
 - Performed sensor selection, configuration, placement, multispectral calibration, and sub-ms time sync
 - Wrote custom ROS drivers (for time sync and metadata logging) and tools for data management and visualization
- Published well-documented, Dockerized Python/C++ implementations for all research projects (links below)

The MITRE Corporation

Bedford, MA

Senior Signal Processing Engineer

March 2019 – May 2020

Signal Processing Engineer

June 2017 – March 2019

- Designed, modeled, and simulated Position, Navigation and Timing (PNT) algorithms to assess and harden GPS and computer vision-based navigation systems:
 - Developed methods for improved GPS signal acquisition and modeled the conditions of signal capture in spoofing
 - Characterized optical countermeasures to visual SLAM and established a taxonomy of algorithmic vulnerabilities

FIRST-AUTHOR PUBLICATIONS

- *Leveraging 3D Geometry for Place Recognition and Image Restoration in Visual and Thermal SLAM* **Dissertation**
- *TRGS-SLAM: IMU-Aided Gaussian Splatting SLAM for Blurry, Rolling Shutter, and Noisy Thermal Images* **arXiv 2026**
 - Thermal inertial SLAM system achieving cm-level ATE and dense maps where existing methods fail [Website](#) | [Code](#)
- *TRNeRF: Restoring Blurry, Rolling Shutter, and Noisy Thermal Images with Neural Radiance Fields* **WACV 2025**
 - Thermal image restoration method and a dataset supporting novel quantitative restoration metrics [Website](#) | [Code](#)
- *Dataset and Benchmark: Novel Sensors for Autonomous Vehicle Perception* **IJRR 2025**
 - Multimodal dataset for SLAM and place recognition featuring stereo event and thermal cameras [Website](#) | [Code](#)
- *SPOT: Point Cloud Based Stereo Visual Place Recognition for Similar and Opposing Viewpoints* **ICRA 2024**
 - Place recognition method using VO-derived structure to overcome opposing viewpoints in driving [Website](#) | [Code](#)

TALK

- *Understanding the Effects of Relative Time Alignment on Satnav Spoofing* **JNC 2018**
 - Analyzed the spatial distribution of GPS signal capture based on time-alignment to determine receiver vulnerability, spoofer requirements, and anti-spoofing strategies

TECHNICAL SKILLS

- **Languages:** Python, C++, MATLAB
- **Frameworks & Tools:** PyTorch, ROS, OpenCV, Docker, Git, Anaconda, Linux, LaTeX

PATENT

- **US Patent 12475596:** *System For Operating A Movable Device* – Patent stemming from place recognition work