

EDUCATION

Massachusetts Institute of Technology

Cambridge, Massachusetts

M.Eng. Electrical Engineering and Computer Science, GPA: 5.0/5.0

2020–2021

Relevant coursework: Visual Navigation for Autonomous Vehicles, Embodied Intelligence, Machine Learning, Computer Vision, Probabilistic Programming and Artificial Intelligence, Feedback System Design

Massachusetts Institute of Technology

Cambridge, Massachusetts

B.S. Electrical Engineering and Computer Science, Mathematical Economics, GPA: 5.0/5.0

2016–2020

Relevant coursework: Robotics: Science and Systems, Signals, Systems, & Inference, Electromagnetics, Introduction to Algorithms, Economics Research, Econometrics, Real Analysis, Computational Science and Engineering, Project Engineering, Engineering Leadership, SuperUROP

EXPERIENCE

MIT Distributed Robotics Laboratory

Cambridge, Massachusetts

Research Assistant

August 2019 - present

- Investigating improvements in sample efficiency of model-free reinforcement learning agents with the use of interpolated experience replay.
- Running ablation studies with RLlib, PyTorch, and OpenAI Gym via a MapReduce HPC framework.
- Leveraged OpenAI Gym and TensorFlow-Agents to develop a multi-agent training and evaluation environment for pixel-based Multi-Agent Reinforcement Learning.
- Wrote baseline Multi-Agent Proximal Policy Optimization algorithms using TensorFlow-Agents.

Nasdaq

Boston, Massachusetts

Data Science and Machine Learning Intern

June - August 2020

- Implemented, trained, and tested deep reinforcement learning (DQN) agents for use in our financial time-series decision-making platform using TensorFlow, NumPy, and Pandas.
- Implemented synthetic data generation using a Monte Carlo K-Nearest Neighbors Interpolation algorithm.
- Developed and tested unsupervised clustering approaches for financial time series portfolio optimization using Scikit-Learn.
- Integrated cluster embeddings into our Temporal Convolution Neural Network time series predictive framework.
- Collaboratively developed error analysis and metrics modules using multiple regression, statistical hypothesis testing, and statistical clustering metrics.
- Co-authored a white paper on our findings, implementation, and AI platform.

National Geospatial-Intelligence Agency

Springfield, Virginia

Lidar Imagery Scientist

June - August 2019

- Developed a neural network-based image and digital surface model building footprint extraction framework using data fusion, PyTorch, and AWS.
- Co-authoring paper with PSU ARL discussing the importance of including geometric information in automated geospatial analysis tasks.
- Advised for other machine learning projects within my office, and organized a machine learning seminar for my career service.

- Presented my findings to NGA Director Vice Admiral Robert Sharpe and Deputy Director Dr. Stacey Dixon.

Spacemaker AI

Data Science Intern

Cambridge, Massachusetts

December 2018 - May 2019

- Utilized AWS, Python, and Docker to create, preprocess, and analyze data for predictive energy efficiency modeling.
- Used Deep Convolutional Generative Adversarial Neural Network topologies written in Keras for intelligent architectural site proposal generation.

National Geospatial-Intelligence Agency

Lidar Imagery Scientist

Springfield, Virginia

June - August 2018

- Used Python, NumPy, and Scikit-Learn to implement computer vision algorithms for intelligence applications.
- Led a team of interns through NGA's Innovation Experience program; this entailed developing and briefing a proposal to NGA leadership.
- Presented my findings at the 2018 Lidar Community of Practice (LCoP) Conference and to NGA Director Robert Cardillo.

MIT Photovoltaics Laboratory

Undergraduate Research Assistant

Cambridge, Massachusetts

September 2017 - May 2018

- Utilized MATLAB to write semiconductor physics model scripts to iteratively solve for minority excess carrier density for long-timescale degradation measurements.
- Utilized a Python-based GUI to match sample lifetime curves at different temperatures and injection levels, and to scan for and detect low-injection hysteresis in order to characterize sample defects.
- Investigated the effects of Depletion-Region Modulation (DRM), Shockley-Read-Hall (SRH) recombination, trapping artifacts, and Inversion Layer effects in lifetime characterization and defect analysis.

Raytheon Technologies

Electrical Engineering Intern

Sterling, Virginia

May 2017 - August 2017

- Developed analog and basic digital electronic circuits for use in our transmitting and receiving antenna tuner boxes.
- Used a network analyzer to properly match transmission line/antenna load impedances using Smith Charts and Bode Plots.
- Configured a LAN/IP network with streaming media for developing optimal and safe experiment viewing.

MIT Hatton Center for Carbon Capture

Undergraduate Research Assistant

Cambridge, Massachusetts

September 2016 - December 2016

- Conducted Potentiostatic Intermittent and Galvanostatic Intermittent Titration tests on organic Carbon-based electrodes.
- Assembled electrode bases for organic-polymer drop-casting.
- Prepared carbon sequestration system's organic polymers through organic synthesis.

PUBLICATIONS

1. W. Schwarting, T. Seyde, I. Gilitschenski, L. Liebenwein, **R. Sander**, S. Karaman, D. Rus, "Deep Latent Competition: Learning to Race Using Visual Control Policies in Latent Space", *Conference on Robot Learning*, November 2020.

POSTER PRESENTATIONS

1. **R. Sander**, E. Bradley, J. Petrich, A. Dawood, S. Hough, "Deep Learning and Sensor Fusion for Building Footprint Extraction", *MIT Undergraduate Research Technology Conference*, October 2019.
2. **R. Sander**, M. Jensen, Y. Zhu, Z. Hameiri, T. Buonassisi, "Investigating LeTID and PERC Solar Cells Through Occupation Probability Modeling", *MIT Energy Initiative Annual Research Conference*, October 2018.

CONFERENCE SPEAKING OPPORTUNITIES

1. Classified Briefing, *Lidar Community of Practice Conference, August 2018.*
2. Classified Briefing, *Intelligence Community Intern Showcase, July 2018.*

JOURNAL REVIEW

1. Reviewer, *Intelligence-Based Medicine (El Sevier).*

TEACHING

- **Teaching Assistant** at Massachusetts Institute of Technology Fall 2020
Machine Vision (6.801/6.866)
- **(Incoming) Teaching Assistant** at Massachusetts Institute of Technology January 2021
Introduction to Deep Learning (6.s191)
- **Laboratory Assistant** at Massachusetts Institute of Technology Fall 2018
Introduction to Machine Learning (6.036)
- **Laboratory Assistant** at Massachusetts Institute of Technology Spring 2018
Computation Structures (6.004)
- **Technical Instructor** at MIT Global Startup Labs January 2020
Programa en Data Science (Montevideo, Uruguay)
- **Python Instructor** at MIT Global Teaching Labs January 2019
Injaz (Amman, Jordan)
- **Machine Learning Tutor** at Wyzant March 2020-present
250 hours of online tutoring experience
- **Mathematics Educator** at Numerade April 2020-present
25 explanatory videos developed

SKILLS

- **Programming:** Python, PyTorch, TensorFlow, Rllib, C++, ROS, Bash, AWS, Anaconda, Gen, Docker, MATLAB, Stata
- **Computer Science:** Computer Vision, Reinforcement Learning, Neural Networks, Robotics, Graphical Models, Algorithms and Data Structures, Object-Oriented Programming, Variational Methods
- **Electrical Engineering:** Signal Processing, State Space Control, Estimation, Electromagnetics, Arduino, Circuits
- **Economics:** Econometrics, Statistics, Intermediate Microeconomics, Introductory Macroeconomics, Energy Economics
- **Mathematics:** Optimization, Real Analysis, Fourier Methods, Finite Element Analysis, Linear Algebra, Matrix Calculus, Probabilistic Inference
- **Government:** Active TS/SCI Security Clearance, QTModer, Technical Briefings
- **Other:** LaTeX, Google Suite, Microsoft Office, GitHub

LANGUAGES

- **English** Native Speaker
- **Spanish** Introductory Proficiency

PROJECTS

For a full list of projects, you can find them at rmsander.github.io.

- **Lidar-Lidar Calibration for Darpa SubT Challenge** November - December 2020
Implemented Lidar-Lidar calibration estimation and evaluation framework using manifold optimization in Python (pymanopt), OctoMap, ROS, and Matlab. (Link)
- **Autonomous Autocurricula Learning** February - May 2020
Implemented Multi-Agent Proximal Policy Optimization using TensorFlow-Agents for use in an OpenAI Gym environment. (Link)
- **Descriptor-Based LDA for Unsupervised Image Annotation** October - December 2019
Implemented unsupervised image annotation in Python using Scale-Invariant Feature Transforms (SIFT), pre-trained Convolutional Neural Networks (CNNs), and Latent Dirichlet Allocation (LDA). (Link)
- **Sparse Data Fusion for Semantic Segmentation in Point Clouds** November - December 2019
Implemented data fusion and customized PointNet++ training algorithms using PyTorch, NumPy, and the A2D2 dataset. Achieved 90% unbalanced accuracy in road segmentation. (Link)
- **Unsupervised Point Cloud Detection Using Generative Models and Gen** May 2020
Implemented object bounding box estimators using generative models and proposal distributions using Gen, a probabilistic programming language built on top of Julia. (Link)
- **Deep Learning for Autonomous Navigation** April - May 2019
Developed training algorithms for YOLOv3-based object detection for use in an autonomous navigation ROS package. (Link)
- **Estimating Causal Effects of Ride-hailing** October - December 2019
Performed econometric analysis using fixed effects with instrumental variables regression. We found a negative, statistically-significant coefficient of ride-hailing on congestion costs per capita. (Link)
- **AWS for Machine Learning** January - February 2020
Co-developed an AWS API for the MIT GSL-PRO data science and machine learning workshop during January 2020. For this, we wrote an API for scaled VM starting, stopping, backup, and environment activation processes for our students. (Link)
- **My CS/AI Guide** January 2020 - Present
Developing a guide with conceptual overviews, bug resolutions, and common problems I have encountered through my studies in artificial intelligence. Developing a complementary GitHub repository containing tutorials and applications to tie in with concepts covered. (Link)
- **WebMoira Management** April 2020 - Present
Developed Python and bash scripts for automating processes with managing emails using MIT's WebMoira system. (Link)

SCHOLARSHIPS AND AWARDS

- Phi Beta Kappa Honor Society 2020
- Tau Beta Pi Engineering Honor Society 2019
- IEEE Eta Kappa Nu Honor Society 2019

- Lincoln Laboratory Undergraduate Research and Innovation Scholar 2019-2020
- Science, Mathematics, and Research for Transformation Scholarship 2017-2020
- IEEE Power and Energy Society Scholarship 2018 -2020
- Society of American Military Engineers (SAME) Engineering and Construction Camp Scholarship 2016
- Society of American Military Engineers (SAME) Northern Virginia Post Scholarship 2016 -2020
- Aerojet Rocketdyne Scholarship 2016
- Team America Rocketry Competition Engineering Notebook Competition - Runner-Up 2016

EXTRACURRICULAR ACTIVITIES

- **MIT Energy Club** Undergraduate Energy Club Co-President, Webmaster 2017-Present
President of MIT Undergraduate Energy Club from 2018-2020. Webmaster for MIT Energy Club from 2017-2020. Industry Showcase Director for the 2019 MIT Energy Conference.
- **Tau Beta Pi** Chapter Community Service Chair, Secretary, and Webmaster 2019-Present
Organized and mentored community service events for the broader Boston and Massachusetts community. Updating, maintaining, and creating new web features on our Ubuntu-hosted website using SSI, HTML, NodeJS, and GitHub.
- **Eta Kappa Nu** Chapter Webmaster 2019-2020
Created a GitHub wiki for documenting features used within our website Docker containers. Additionally, led a collaborative effort to integrate a class recommendation web application into our suite of web application tools, and deployed our new tutoring site using Docker and Nginx.
- **Kappa Sigma** Chapter Philanthropy, Community Service, and Alumni Relations Chair 2018-2019
Partnered with the MIT Undergraduate Association Innovation committee to host a campus-wide T-shirt and clothing drive. Organized a fundraiser for service members and their families, as well as assisting with a pantry drive and dinner for the homeless.
- **MIT Wind Ensemble** Marketing Chair 2016-2018
Member of the MIT Wind Ensemble under Dr. Fred Harris.