

# EMILY SHEETZ

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## EDUCATION

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### University of Michigan

*August 2018 - Present (Anticipated December 2024)*

PhD, Computer Science and Engineering

GPA: **3.940** / 4.0

Artificial Intelligence

Robotics

Member of Ensemble of Computer Science and Engineering Ladies+ (ECSEL+)

Member of Graduate Society of Women Engineers (GradSWE)

### University of Michigan

*August 2018 - June 2021*

MS, Computer Science and Engineering

GPS: **3.940** / 4.0

### Monmouth College

*August 2014 - May 2018*

BA, Mathematics and Computer Science

GPA: **3.975** / 4.0

Spanish Minor

Honors Program

*Summa Cum Laude*

Member of Blue Key Honors Society

Member of Sigma Delta Pi, Spanish Honors Society

Member of Alpha Lambda Delta

## RESEARCH

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### Affordance Representation and Execution

January 2019 - Present

*University of Michigan*

*Ann Arbor, MI*

- Explore use of object affordances to achieve complex robot manipulation tasks
- Extend representation of object affordances to include controllers to improve manipulation abilities
- Lead project conception and implementation and work collaboratively with students

### Natural Language Processing

August 2017 - May 2018

*Monmouth College*

*Monmouth, IL*

- Trained a Generative Adversarial Network (GAN) to generate sentences of text on the character level
- Explored how probabilistic language models could be quantitatively evaluated using perplexity
- Defined the problem, investigated methods, and planned the execution of the research plan
- Presented results of mathematics and computer science senior research projects to faculty and students

### Analog and Digital Sound Synthesis

August 2017

*Monmouth College*

*Monmouth, IL*

- Introduced to software for high quality sound recording and visualizing sound waves
- Explored FM synthesis with non-sinusoidal carrier waves using the LittleBits Synth Kit
- Presented research to faculty and students

### Optimized Snapshot-Based Visual Homing for UAVs

May 2017 - July 2017

*Auburn University*

*Auburn, AL*

- Researched visual homing on unmanned aerial vehicles (UAVs)
- Introduced to Python, OpenCV, and machine learning implementations

- Implemented simulation framework for testing techniques in MATLAB
- Worked independently to research, design simulation framework, and find solutions

### **Design of a Mathematical Model for an Autonomous Vehicle**

June 2016 - August 2016

*University of Arizona*

*Tucson, AZ*

- Used system identification to develop a mathematical model for internal vehicle dynamics
- Introduced to autonomous systems, control theory, and model predictive control
- Worked independently to research, analyze data, troubleshoot, and solve problems
- Operated the Cognitive Autonomous Test (CAT) Vehicle for project testing

### **Analysis of Chaotic Walks on a Plinko Board**

August 2015

*Monmouth College*

*Monmouth, IL*

- Conducted experiments for introduction into the mathematics of chaos theory
- Supervised students during Summer Opportunity for Intellectual Activity projects
- Presented research to faculty, students, and community members

### **Particle Image Velocimetry for Flow Around an Airfoil**

August 2014 - May 2015

*Monmouth College*

*Monmouth, IL*

- Investigated water flow around airfoils at angles of attack using particle image velocimetry
- Operated lab equipment including lasers, flow cell, and Phantom v9.1 high speed camera
- Created poster presentation and presented research to students and faculty members

### **High Speed Imagery and Mathematical Modeling**

August 2014

*Monmouth College*

*Monmouth, IL*

- Focused on experiment design, data analysis, and introduction to mathematical modeling
- Collaborated with mathematics majors to conduct experiments
- Gained experience designing experiments and using Mathematica and MATLAB

## **WORK EXPERIENCE**

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### **NASA Johnson Space Center Pathways Intern**

May 2023 - August 2023

*NASA Johnson Space Center, ER4*

*Houston, TX*

- Lead development of tool manipulation pipeline for Valkyrie to use a tool mounted to her body
- Develop general manipulation tools, such as sequencing action primitives and locally searching the robot's workspace for states that satisfy goal constraints
- Ensure straightforward operator interaction with general and tool-specific manipulation tools through RQT and RViz panel plugins
- Lead robot ops sessions to test key functionality and coordinating with several team members to ensure proper support of ops sessions
- Work on tasks closely related to projects by teammates and act on feedback from multiple teammates
- Regularly test features and document progress through written documentation and teams updates
- Perform robot operations to test use of new VR features for driver-assist teleoperation of robots
- Present work to team and upper branch management

### **NASA Johnson Space Center Pathways Intern**

January 2022 - May 2022

*NASA Johnson Space Center, ER4*

*Houston, TX*

- Incorporate human-in-the-loop object registration and stance generation to the Valkyrie virtual reality (VR) project
- Integrate multiple pieces of existing software and implement communication between separate parts

- Work on tasks closely related to projects by teammates and act on feedback from multiple teammates
- Regularly test features and document progress through written documentation and video demos
- Perform robot operations to test use of new VR features for driver-assist teleoperation of robots
- Present work to team and upper branch management

### **Research Mentor**

June 2021 - Present

*Lumiere Education*

*Virtual*

- Mentor high-school students on research projects related to computer science and robotics
- Explain reading and writing academic research papers during one-on-one weekly meetings
- Advise on research question, project design, code implementation, and research paper deliverables
- Lead small group lessons on applying artificial intelligence and machine learning concepts in Python

### **Research Intern**

August 2020 - Present

*NASA Johnson Space Center*

*Houston, TX*

- NASA Space Technology Graduate Research Opportunities (NSTGRO) application and acceptance based on project proposal
- Collaborate with employees at JSC to incorporate my work into their existing projects with Valkyrie
- Present research findings at regular meetings
- Prepare quarterly progress reports and annual research plans

### **Engineering Teaching Consultant**

August 2020 - Present

*University of Michigan*

*Ann Arbor, MI*

- Consult with teaching assistants to address teaching challenges
- Review teaching philosophy statements
- Learn about best teaching practices and pedagogy research to share during consultations

### **Academic Success Program Tutor**

January 2019 - Present

*University of Michigan*

*Ann Arbor, MI*

- Tutor undergraduate level mathematics and computer science courses
- Explain concepts and work through examples with student athletes one-on-one
- Practice helpful studying, reading, and note-taking habits

### **Graduate Student Instructor**

August 2019 - May 2020

*University of Michigan*

*Ann Arbor, MI*

- Prepare for and lead weekly discussion sections to review course material and clarify homework concepts
- Work with students one-on-one during office hours to address questions and concerns with the course
- Collaborate with staff members to write and grade exams, handle exam management, write assignments

### **Research Intern**

June 2019 - August 2019

*TRAC Labs*

*Webster, TX*

- Developed a hierarchy of single- and multi-objective potential field controllers
- Explored practical use of controllers through experiments on the TRACArm robot
- Worked with the Robotics Lab to discuss ideas and implementation details within existing software

### **Computer Science Tutor**

August 2017 - May 2018

*Monmouth College*

*Monmouth, IL*

- Utilized knowledge of programming practices and languages C++, Java, and Python
- Lead group discussions of material and explain concepts one-on-one
- Encouraged students to think about problems and solutions from new perspectives

**Computer Science Lab Assistant***Monmouth College*

August 2016 - May 2017

*Monmouth, IL*

- Assist in Introduction to Computer Science and Introduction to Programming labs
- Lead group discussions of material and explain concepts one-on-one
- Encourage students to think about problems and solutions from new perspectives

**Math Tutor***Monmouth College*

August 2016 - May 2017

*Monmouth, IL*

- Tutor high school student in algebra in one-on-one sessions
- Explain concepts and problem-solving strategies
- Talk student through homework problems to practice discussed strategies

**Writing Tutor***Monmouth College*

May 2016 - May 2018

*Monmouth, IL*

- Provide direction to students at any point in the writing process
- Utilize nondirective tutoring methods to help students to improve their writing process
- Develop relationships with students through encouragement and validation of their efforts

**Speech Assistant***Monmouth College*

August 2015 - May 2018

*Monmouth, IL*

- Assist students at any point in the process of drafting or delivering a speech
- Observe speeches, evaluate speakers needs, and provide feedback on speeches
- Develop relationships with students by encouraging them and supporting their efforts

**Research Assistant***Auburn University*

May 2017 - July 2017

*Auburn, AL*

- Worked under the supervision of Dr. Saad Biaz and Dr. Richard Chapman
- Collaborated with peers to research, develop approach to problem, and write code
- Wrote academic paper, created poster, and presented research

**Research Assistant***University of Arizona*

June 2016 - August 2016

*Tucson, AZ*

- Worked under the supervision of Dr. Jonathan Sprinkle and doctoral students
- Collaborated with peers to research, write MATLAB scripts, and design experiments
- Experienced writing academic papers and presenting research

**Fulton Hall Resident Assistant***Monmouth College*

August 2015 - May 2017

*Monmouth, IL*

- Plan social programs and assist with organizing collaborative educational programs
- Provide emotional and academic support for residents and residence hall staff
- Create a community on the floor and in the residence hall with open-door policy

**TECHNICAL STRENGTHS**

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C++

Python

ROS

C#

Java

Qt  
MATLAB  
Mathematica  
JavaScript  
HTML

## PUBLICATIONS

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**Emily Sheetz**, Xiaotong Chen, Zhen Zeng, Kaizhi Zheng, Qiuyu Shi, and Odest Chadwicke Jenkins. Composable Causality in Semantic Robot Programming. IEEE International Conference on Robotics and Automation (ICRA), 2022.

Semir Tatlidil, Yanqi Liu, **Emily Sheetz**, R. Iris Bahar, and Steven Sloman. Using Human-Guided Causal Knowledge for More Generalized Robot Task Planning. Association for the Advancement of Artificial Intelligence (AAAI) Fall Symposium on Human-Robot Interaction (HRI). *arXiv preprint arXiv:2110.04664*, 2021.

## PRESENTATIONS

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**RSS Workshop on Declarative Representations in Robot Control** July 2021  
Composable Causality in Semantic Robot Programming  
Lightning Talk and Poster Presentation

**RSS Workshop on Artificial Intelligence and Manipulation for Robotics** July 2021  
Composable Causality in Semantic Robot Programming  
Poster Presentation

**Tri-Section Meeting of the Mathematical Association of America (MAA)** March 2018  
Optimized Snapshot-Based Visual Homing for UAVs  
Oral Presentation  
*Recipient of Outstanding Undergraduate Research (OUR) Award from the Illinois Section (ISMAA)*

**Scholar's Day Presentation on Mathematics Capstone Project** April 2018  
Evaluating Horror Text Generated by Probabilistic Language Models  
Poster Presentation

**Scholar's Day Presentation on Computer Science Capstone Project** April 2018  
Writing Horror Text Using Generative Adversarial Networks with Memory  
Poster Presentation

**Presenter at First Science Symposium** April 2018  
Probabilistic and Machine Learning Approaches to Text Generation  
Oral Presentation

**Scholar's Day Presentation on Honors Capstone Project** April 2017  
Mathematics and the Philosophy of Chaos  
Oral Presentation

**Scholar's Day Presentation on Historical Documents Research** April 2016  
Balancing Equality and Freedom: An Examination of Declarations of Independence  
Poster Presentation

**Scholar's Day Presentation on Mathematics Research** April 2015  
Particle Image Velocimetry Experiments for Flow Around an Airfoil  
Poster Presentation

**Scholar's Day Presentation on Gender Disparity in Education** April 2015  
Oral Presentation

## FUNDING APPLICATIONS

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<b>NASA Space Technology Graduate Research Opportunities (NSTGRO)</b>	November 2019
Accepted for funding and collaboration August 2020 to Present	
National Science Foundation Graduate Research Fellowship Program	October 2019
National Science Foundation National Robotics Initiative 2.0 Grant Proposal	February 2019
NASA Space Technology Research Fellowship (NSTRF)	November 2018
National Science Foundation Graduate Research Fellowship Program	October 2017

## ACADEMIC ACHIEVEMENTS

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<b>NASA Johnson Space Center ER Division Team Excellence Award</b>	August 2022
<b>NASA Johnson Space Center ER Division Individual Excellence Award</b>	May 2022
Advancement to PhD Candidacy	September 2021
Pass PhD Preliminary Examination	June 2021
Monmouth College Dean's List	August 2014 - May 2018
Paul Cramer Prize for Outstanding Work in Upper-Level Mathematics	April 2018
Computer Science Award for Senior Project	April 2018
Outstanding Undergraduate Research (OUR) Award at MAA Conference	March 2018
Robert Minter Prize for Student Working to Maximum Potential	April 2017
Paul Cramer Prize for Outstanding Work in Upper-Level Mathematics	April 2017
Computer Science Award for Introductory Sequence	April 2017
Ray A. Schwind Scholarship for Sciences	April 2016
Ray A. Schwind Scholarship for Sciences	April 2015
Hugh R. Beveridge Prize for Outstanding Work in Intermediate Mathematics	April 2015
Speaker Showcase Participant and Winner	December 2014
Illinois Seal of Biliteracy for English and Spanish	May 2014

## LEADERSHIP AND VOLUNTEERING EXPERIENCES

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Monmouth College Class Reunion Committee Member	May 2023 - October 2023
CSE Department Faculty Candidate Grad Student Host	March 2021
Computer Science and Robotics Visit Day Volunteer	March 2019 - April 2019
CSE Department Take Your Child To Work Day Volunteer	April 2019
Wind Ensemble Flute Section Leader	August 2016 - May 2018
Wind Ensemble President	August 2017 - May 2018
Wind Ensemble Secretary	August 2016 - May 2016
Marching Band Flute Section Leader	August 2015 - May 2018
Marching Band Woodwind Captain	August 2016 - May 2018

Blue Key Honor Society Secretary	March 2017 - March 2018
Monmouth College Admissions Events Volunteer	August 2015 - May 2018
Jamieson Center and Strom Center Thrift Shop Volunteer	August 2015 - May 2016
SO <i>f</i> IA Activities Coordinator	August 2015
Monmouth College Bands Dodgeball Tourmanment Supervisor	February 2014