

Davis Catherman

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EDUCATION

Worcester Polytechnic Institute (WPI)	Worcester, MA
Ph.D. in Robotics Engineering (Software) - GPA: 4.00/4.00	Jan. 2020 – Dec. 2024
M.S. in Robotics Engineering (Software) - GPA: 3.88/4.00	Aug. 2018 – Dec. 2019
Christopher Newport University (CNU)	Newport News, VA
B.S. in Computer Engineering & minor in Leadership Studies - GPA: 3.53/4.00	Aug. 2014 – May 2018

RELATED WORK EXPERIENCE

Robotist / SWE, Waymo	<i>Multiple Locations</i>
<i>Intern - Behavior Planner, Prediction, & Router</i>	May 2022 – Aug. 2022
<ul style="list-style-type: none">Created proposal for implementation of new features to optimize trajectory generation in tricky scenariosRecognized by full time employees for leadership and guidance provided to interns resulting in efficient on-boarding	
<i>Intern - Behavior Planner, Prediction, & Controls</i>	May 2021 – Aug. 2021
<ul style="list-style-type: none">Developed an online framework for graph sampling and path planning enabling a non-uniform graph structureProduced comparable results to existing motion planning algorithm while adding necessary functionalityEvaluated findings and developed plots with the Dremel SQL engine and presented results to the search team	
Software Developer, Kuva Systems	<i>Cambridge, MA</i>
<i>Engineering Intern Rotation Program</i>	Aug. 2019 – May 2021
<ul style="list-style-type: none">Developed supervised machine learning model detecting methane at a 5% greater accuracy than statistical methodsCreated production ready systems with Yocto board support package resulting in a 300% deployment speedupIncreased efficiency by designing software systems with UML then deployed across the company & internationally	
Robotist / SWE, Canon Inc.	<i>Newport News, VA</i>
<i>Advanced Manufacturing Technology Intern</i>	Jan. 2018 – Dec. 2018
<ul style="list-style-type: none">Predicted manufacturing defects using Python and Tensorflow reducing wasted time and materialProposed solutions to prevent millions in government fines by analyzing the problem and potential technologies	
Software Engineer, NASA	<i>Hampton, VA</i>
<i>Safety Critical Avionic Systems Intern</i>	Aug. 2016 – Dec. 2017
<ul style="list-style-type: none">Enabled simulation testing by modifying the software sim environment, saving thousands of dollars in hardwareAugmented safety critical testing with bash scripts and Bamboo unit tests producing strong code verification	

RELATED PROJECTS

NASA Phase II: Lunar Swarm Data Structure <i>Buzz, Python, ARGoS3</i>	Aug. 2022 – Present
<ul style="list-style-type: none">Successfully renewed research for Phase II project from the success and initial results of the Phase ICurrently preparing publication related to the novelty of the data structure with over 2500 experiment trials	
NASA Phase I: Lunar Swarm Data Structure <i>Buzz, Python, ARGoS3</i>	Aug. 2021 – Aug. 2022
<ul style="list-style-type: none">Designed a swarm oriented distributed data structure to leverage historical information stored in CRDTsUsed the existing information in the data structure for novel purposes such as creating an estimation functionPresented work to team of NASA employees to review and consider for a Phase II grant to productionize the work	
Capstone: RoboTender <i>Python, C++, ROS, MoveIt!, Kinova, Angular, Controls, Git</i>	Aug. 2017 – Apr. 2018
<ul style="list-style-type: none">Poured beverages without foam tested by completing 20 orders accomplished by implementing trajectory planningProduced repeatable serving with a python server queuing system completing 15 consecutive autonomous servings	

TECHNICAL SKILLS

Languages: Python, C/C++, Java, Bash, Buzz, MATLAB, JavaScript, Verilog HDL
Tools: ROS (Robot Operating System), Make, Git, Docker, Singularity, Slurm, Continuous Integration (CI)
Simulation & CAD: Gazebo, MoveIt!, ModelSim, Multisim, Logisim, JSBSim, CAD
Libraries: TensorFlow (1.x & 2.x), PyTorch, Pandas, NumPy, Matplotlib, Requests, PyQt5, OpenCV, Keras, Theano
Other: AWS, UML, Agile, HPC, REST, Atlas humanoids, Kinova Robot Arm, AI, UAVs, 3D Printers, Microcontrollers

PUBLICATIONS

Catherman, Neville, Bloom, & White, "Reinforcement Learning Adversarial Swarm Dynamics," *Proceedings of IEEE SoutheastCon*, March, 2020, Raleigh, NC, USA.

Catherman, Kaminski, & Jagetia, "Atlas Humanoid Robot control with Flexible Finite State Machines for Playing Soccer," *Proceedings of IEEE SoutheastCon*, March, 2020, Raleigh, NC, USA.

White & Catherman, "Mobile Robot Controller Performance over Unexpected Terrain Disturbances," *Proceedings of IEEE SoutheastCon*, April, 2019, Huntsville, AL, USA.

Conner, Catherman, Enders, Gates, & Gu, "Flexible Manipulation: Finite State Machine-based Collaborative Manipulation," *Proceedings of IEEE SoutheastCon*, April, 2018, St. Petersburg, FL, USA.

ADDITIONAL PROJECTS

Behavior Planner | *Python, TensorFlow, Reinforcement Learning, ROS, Gazebo, MoveIt!* Sep. 2020 – May 2021

- Created model to select the optimum action sequence in a game environment resulting in 10% higher scores
- Implemented the system using ROS and Gazebo with hierarchical state machines producing verifiable results

Multi-agent Learning | *Python, DDQN, Reinforcement Learning, TensorFlow, Git* Aug. 2019 – Dec. 2019

- Developed system for multiple agents to make in through a maze without collision, achieving 95% optimality
- Used a POMDP process in a grid-world to limit agent knowledge, instead using intelligent reward shaping

Adversarial Swarm Games | *Python, Reinforcement Learning, TensorFlow, ARGoS, C++* Jan. 2019 – Apr. 2019

- Created a swarm game with agents using reinforcement learning to perform task allocation
- Provided analytics of results and explanation for emergent behaviors resulting in a conference publication

Swarm Information Propagation Decision Making | *ARGoS, Buzz, C++, Git* Jan. 2019 – Apr. 2019

- Researched the effects of information propagation on collective swarm decision making
- Analyzed the use of decaying resource qualities as the quantifiable metric to activate a decision

Humanoid Playing Soccer | *Python, C++, ROS, Gazebo, MoveIt!, Atlas, Docker, Lidar* Jan. 2019 – Apr. 2019

- Developed vision, walking, and control components necessary for a humanoid atlas to compete in a game of soccer

TurtleBot Trajectory Controllers | *Python, ROS, Controls, Gazebo, Git* Aug. 2018 – Dec. 2018

- Implemented multiple trajectory controllers on a Turtlebot with a VICON system and in simulation using Gazebo
- Provided analytics of results and explanation for emergent behaviors resulting in a conference publication

ADDITIONAL WORK EXPERIENCE

Team Lead Software Developer, SICdrone

Jan. 2019 – Jul. 2019

Engineering Intern Program

Cambridge, MA

- Developed UAV control algorithm to adjust thrust proportions per rotor based on tilt angle of extra rotors
- Optimized team efficiency through formalization of agile development workflow saving 10 hours each week
- Introduced dynamic modeling of drone saving thousands of dollars of hardware by simulating the control systems

Engineering Tutor, Center for Academic Success, CNU

Aug. 2016 – Dec. 2016

Student Worker, Information Technology Services, CNU

Apr. 2015 – May 2016

Employee (Seasonal), Information Technology, Trinity Episcopal School

Jun. 2012 – Aug. 2017

RESEARCH & LEADERSHIP EXPERIENCE

Vice President, Graduate Student Government, WPI

June 2021 – Present

Student Representative, Rho Beta Epsilon (Honors Society), WPI

Mar. 2021 – Present

Ph.D. Researcher, NEST Lab (Robotics Lab), WPI

Jan. 2021 – Present

Research Student, CHRISLab (Robotics Lab), CNU

Aug. 2016 – Jul. 2018

Team Mission Commander (Leader), Unmanned Aerial Systems, CNU

Aug. 2015 – Jul. 2018

Mentor, FIRST Robotics Team 539, Trinity Episcopal School

Aug. 2014 – Jul. 2018

CERTIFICATES, HONORS, & AWARDS

Amateur Radio Operator – General Class, FCC HAM Radio License

Exp. July 2030

FAA Part 107 Certificate Holder, FAA Commercial UAS Pilot

Exp. Aug. 2023

Forbes 30 Under 30 Scholar, Forbes in Boston, MA

Oct. 2018

Collegiate Cyber Defense Competition (CCDC), CNU

Mar. 2018

PCSE Community Scholarship, Department of Engineering, CNU

Apr. 2017

1st Place, Ethical Hacking Competition, CNU

Feb. 2016