KYLE A WILLIAMS

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SUMMARY

Senior autonomy R&D engineer with 4.5 years of professional experience in artificial intelligence, robotics and mechatronics, on top of 1.5 years of thesis work and 5 years of graduate coursework. Starting Robot Learning PhD Fall 2024.

EXPERIENCE

Senior Member Technical Staff - Sandia National Labs - ABQ NM — Dec 2022 - Present
Member Technical Staff — Dec 2019 - Dec 2022
(1) Reinforcement Learning Principle Investigator - proposed and lead 2 year investigation into sim2real techniques for control of quadrotors. (2) Technical Lead of indoor autonomous systems lab - from construction to motion capture lab with autonomous quadrotors, planes, cars, and quadrupeds. (3) Robotics/Perception Engineer - algo/software dev for Spot from Boston Dynamics for autonomous industrial inspection. Trained and integrated yolov5 for object detection. Developing structure from motion pipeline for manipulation planning. (4) Numerous other projects in GNC, deep learning, deep RL, and mechatronics.

Graduate Research Assistant - GT Precision Machining Research Center - ATL GA — Aug 2018 - Dec 2019
Mechatronics and controls R&D for manufacturing. Rebuilt three axis mill with modern electrical, control, and communication systems. Electrical stack included power system, CAN bus, servos, sensors, and induction motors. Software stack included real time kernel, multithreading, socket comms, trajectory optimization, and an integrated digital twin.

Graduate Mechatronics R&D Internship - Agilent Technologies - WIL DE — Jan 2018 - Aug 2018
Mechatronics and controls R&D for automated liquid processing in Gas Chromatography. System modeling and identification, controller design, embedded software in C, data analysis in MATLAB, motor/sensor testing. 10x improvement in performance metric.

EDUCATION

MS Computer Science - Machine Learning concentration — Aug 2020 - May 2024
Georgia Institute of Technology - Online — 3.85 / 4.00 GPA

Relevant courses (10th of 10 in progress) - Intro Computer Vision, Autonomous Vehicles Lab, AI for Robotics, Reinforcement Learning, Deep Learning, Machine Learning for Finance, Optimization, Natural Language Processing, Algorithms, Dexterous Manipulation Lab

MS Mechanical Engineering - Automation, Robotics, and Control concentration — Aug 2018 - Dec 2019
Georgia Institute of Technology - ATL GA — 4.00 / 4.00 GPA

Thesis - Open Source CNC Control with CAM and Digital Twin Integration - http://hdl.handle.net/1853/62352
Relevant courses - Intro to Control, Mechatronics, Linear Control, Advanced Control Implementation, Robotics (kinematics), Finite Elements, Math

BS Mechanical Engineering - Automation and Robotics concentration — Jan 2015 - Dec 2017
Georgia Institute of Technology - ATL GA — 3.82 / 4.00 GPA

Minor - Embedded Computing

ACADEMIC RESEARCH PROJECTS

Learning for Dexterous Manipulation - STAR Lab — Jan 2024 - Present
Using reinforcement learning and domain randomization to improve dexterous manipulation of Mujoco hand.

Graduate Autonomous Driving VIP Team - Sandia National Labs — Jan 2019 - May 2019
Built autonomous GNC stack for a small car in ROS. Integrated SLAM, path planning, and trajectory planning. Used LIDARs, stereo cameras, IMUs and encoders.

Senior Design - Electric Vehicle Charging Robot - Ford — Aug 2017 - Dec 2017
Parallel arm robot for charging electric vehicles. Designed and manufactured robotic joints, links and motor couplers. Wrote inverse kinematics control code.

Undergrad Research - Smart Materials Advanced Research & Technology (SMART) Lab — May 2016 - Nov 2016
Studied dynamics of relaxor-ferroelectrics using strain decay data collected via piezo-response force scanning microscopy. Used unsupervised machine learning to identify independent physical mechanisms of decay in mesoscale crystal structure.

Robocup Mechanical Team - Robojackets Jan 2017 - May 2017
Mechanical design and manufacture of small wheeled soccer playing robots. Worked with fabrication tools like waterjet, mill, lathe, hand tools, etc.

TEACHING

Tutor – System Dynamics May 2017 - Dec 2017
Two weekly tutoring sessions helping students with homework or conceptual questions.

Grader – Thermodynamics Aug 2017 - Dec 2017
Responsible for grading homework and answering questions during weekly office hours.

AWARDS & HONORS

Sandia Spot Award (3x)	2020 - 2023
Leslie U and Ola Ryle Hammack Memorial Scholarship	June 2016
Zell Miller Scholarship	Aug 2014 - Dec 2017
Graduation with Highest Honors	Dec 2017
Faculty Honors (2x)	2017
Best Final Project – Mechatronics	Dec 2017

TECHNICAL SKILLS

Deep Learning - feed forward, recurrent, convolutional, attention, autoencoders, Neural ODEs, object detection, NLP
Deep Reinforcement Learning - Q learning, policy gradients, proximal policy optimization, multi agent
Localization/Navigation - Kalman filters, EKF, particle filters, pose graph optimization
Path Planning/Guidance – A*, RRT*, dynamic programming, optimization
Controls – PID, LQR, MRAC, sliding mode, nonlinear, adaptive, robust, digital; sysID, modeling, simulation
Programming – Python, Pytorch, MATLAB & Simulink, C/C++, Cuda, Java, embedded
Electronics – actuators, sensors, micro controllers/processors, comms, wireless, power
Mechanical – structural and mechanism design, solid mechanics and fea, prototyping

PUBLICATIONS

C. Llanes, Z. Kakish, **K. A. Williams**, S. Coogan, "CrazySim: A Software-in-the-Loop Simulator for Nano Quadcopter Fleets," 2024 ICRA (Submitted, not yet accepted).

N. Shoman, **K. A. Williams**, B. Balsara, A. Ramakrishnan, Z. Kakish, J. Coram, P. Hannold, T Rivas, H Smartt, "Machine Learning at the Edge to Improve In-field Safeguards Inspections," (Submitted, not yet accepted).

K. A. Williams, R. Schlossman, K. R. Williams,"Control with Adaptive Robust Reinforcement Learning," 2024 ACC (Submitted, not yet accepted).

C. T. Coletti, **K. A. Williams**,"Commercial-Off-The-Shelf (COTS) Hardware Implementation Method for Real-Time Control of Mobile Robotics and UAVs," 2024 AIAA SciTech (Accepted, not yet published).

Z. Kakish, **K. A. Williams**, S. Elliot, S. Cox, H. Smartt,"Inspecta 1.0: Incorporating Spot Robotic Support," 2023 INMM/ESARDA Joint Annual Meeting, Vienna, Austria.

C. T. Coletti, **K. A. Williams**, H. C. Lehman, Z. M. Kakish, D. Whitten, J. J. Parish,"Effectiveness of Warm-Start PPO for Guidance with Highly Constrained Nonlinear Fixed-Wing Dynamics," 2023 American Control Conference (ACC), San Diego, CA.

M. Gandhi, R. Schlossman, **K. A. Williams**, R. Melzer and J. Parish, "CUDA for Rapid Controller Robustness Evaluation: A Tutorial," 2021 60th IEEE Conference on Decision and Control (CDC), Austin, TX, USA, 2021, pp. 4861-4867, doi: 10.1109/CDC45484.2021.9683638.

K. R. Williams, R. Schlossman, D. Whitten, J. Ingram, S. Musuvathy, A. Patel, J. Pagan, **K. A. Williams**, S. Green, A. Mazumdar, J. Parish, "Trajectory Planning With Deep Reinforcement Learning in High-Level Action Spaces," in IEEE Transactions on Aerospace and Electronic Systems, vol. 59, no. 3, pp. 2513-2529, June 2023, doi: 10.1109/TAES.2022.3218496.

HOBBIES

Crossfit, basketball, guitar, literature