

JAKE GONZALES

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RESEARCH INTERESTS

My research interests are broadly at the intersection of control theory, machine learning, optimization, and game theory. Specifically, developing safe and scalable decision-making algorithms for large-scale multi-agent systems.

EDUCATION

University of Washington

Ph.D., Electrical Engineering

Advisors: Prof. Behçet Açikemse and Prof. Lillian Ratliff

Sept. 2023 – Present

Seattle, WA

University of New Mexico

Bachelor of Science in Electrical Engineering

Advisor: Prof. Meeko Oishi

Aug. 2019 – May 2023

Albuquerque, NM

PUBLICATIONS

- **Jake Gonzales**, Joey Sullivan, Samuel Burden, Lillian Ratliff, Daniel Calderone. “Decomposition and Learning Congestion for Multi-Agent Path Finding and Task Assignment,” (In Preparation), *ACC*, 2024.
- Oswin So, Zachary Serlin, Makai Mann, **Jake Gonzales**, Kwesi Rutledge, Nicholas Roy, Chuchu Fan. “How to Train Your Neural Control Barrier Function: Learning Safety Filters for Complex Input-Constrained Systems,” *IEEE International Conference on Robotics and Automation (ICRA)*, 2024, [Paper Link](#)
- Adam J. Thorpe, **Jake A. Gonzales**, Meeko MK Oishi. “Data-Driven Stochastic Optimal Control Using Kernel Gradients,” *American Control Conference (ACC)*, 2023, [Paper Link](#)
- Sofie W. Schunk, Shane McMurray, **Jake A. Gonzales**. “Advancing Model Credibility for Linked Multi-Physics Surrogate Models within a Coupled Digital Engineering Workflow of Nuclear Deterrence Systems,” *Model Validation and Uncertainty Quantification, Volume 3, Proceedings of the 41st IMAC*, 2023, [Paper Link](#)
- Kelsey Wilson, Ruby Ta, **Jake Gonzales**, Seethamle S. Mani, Casey Noll, Wesley Krueger, William Gruner, Timothy Wisley. “Visualization of MBSE Datasets in an Interactive 3D Game Engine,” *Western States Regional Conference INCOSE*, Sept. 2022.

RESEARCH EXPERIENCE

Graduate Researcher

University of Washington, *Advisors: Profs Lillian Ratliff and Behcet Acikmese*

Sept. 2023 – Present

Seattle, WA

- Working with Prof. Lillian Ratliff and Prof. Sam Burden on a project funded by the UW + Amazon Science Hub.
- Research in developing hierarchical decision-making framework for large-scale autonomous mobility.
- Combining congestion-aware routing game models with low-level search algorithms for efficient path planning and task assignment in large-scale multi-agent planning problems.

Undergraduate Researcher

University of New Mexico, *Advisor: Prof. Meeko Oishi*

Aug. 2021 – May 2023

Albuquerque, NM

- Research in non-parametric methods for approximating solutions to stochastic optimal control problems using the theory of kernel embeddings of distributions resulting in efficient controller synthesis.
- Developed gradient-based optimization algorithms for solving data-driven stochastic optimal control problems.

Undergraduate Researcher

Stanford University, REU

Aug. 2022

Palo Alto, CA

- Summer research program working with the Autonomous Systems Lab under Dr. Marco Pavone.
- Developed deep learning models for perception-based autonomous navigation through a hand-made driving course.

WORK EXPERIENCE

MIT Lincoln Laboratories

July 2023 – Sept. 2023

Research Intern

Boston, MA

- Developed algorithms for safe multi-agent control of nonlinear, high-dimensional quadrotor systems using neural control barrier functions.
- Deployed the algorithms into a simulated hardware experiment for a two-quadrotor system with a dynamic obstacle.

Sandia National Laboratories

March 2021 – July 2023

Undergrad Year-Round Intern

Albuquerque, NM

- Worked on challenging problems related to the advancement of digital engineering for nuclear deterrence applications.
- Developed reduced-order multi-physics models of subcomponents of nuclear deterrence systems.
- Performed Sobol' sensitivity analysis on complex, nonlinear physical systems for uncertainty quantification.
- Built interactive VR environments that integrated varying datasets for decision-makers to become experts on ND models.

TECHNICAL PRESENTATIONS

- Presented: “Hierarchical Framework for Scalable Multi-Agent Autonomous Mobility,”
Lightning Talk at ECE Research Showcase, University of Washington, March 2024. [Poster](#)
- Co-Presented: “Systems Engineering Leveraging a Commercial Gaming Platform,”
Western States Regional Conference INCOSE, Denver, CO, Sept. 2022.
- Co-Presented: “Fusing of Model-Based Systems Engineering and Virtual Reality,”
Sandia National Labs' 4th Annual XR Conference, virtual, July 2022.

HONORS AND AWARDS

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| GEM Fellowship | 2023 |
| Department of Defense (DoD) Secret Security Clearance | 2023 |
| Four Nominations for Employee Recognition Award at Sandia National Labs | 2022 |
| Department of Energy (DOE) Top Secret (Q) Security Clearance | 2021 |
| Hispanic Scholarship Fund (HSF) Scholar | 2021, 2022 |
| UNM Dean's List | 2021, 2023 |

TEACHING EXPERIENCE

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| EE 406 Teaching Engineering , <i>Teaching Assistant</i> , University of Washington | Spring 2024 |
| ECE 238 Computer Logic Design , <i>Teaching Assistant</i> , University of New Mexico | Spring, Fall 2022 |
| ECE 101 Intro to Electrical Engineering , <i>Teaching Assistant</i> , University of New Mexico | Spring, Fall 2021 |

SERVICE & MENTORING

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| Research Mentor , Tesla High School | 2023 - Present |
| • Mentoring HS students using ML to model mercury pollution in aquatic ecosystems. | |
| Math Mentor , Prison Mathematics Project | 2023 - Present |
| • Mentoring an inmate rehabilitating himself through mathematics. | |
| Graduate Student Volunteer , University of Washington | Fall 2023 |
| • Provided feedback to underrepresented prospective PhD students applying to UW ECE. | |
| Chess Coach , Learners Chess Academy | 2021-2023 |
| • Taught chess at local K-8 schools in Albuquerque, NM to 100+ students. | |

TECHNICAL SKILLS

Languages: Python(NumPy, pandas, Matplotlib), C++, C
ML Frameworks: PyTorch, Tensorflow, scikit-learn
Software: MATLAB/Simulink, ROS, Unity, Arduino