

JAKE GONZALES

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RESEARCH INTERESTS

My research interests are broadly at the intersection of control theory, machine learning and AI, optimization, and game theory. Specifically, I am interested in developing safe and scalable decision-making algorithms for learning-enabled multi-agent systems operating in uncertain, real-world environments.

EDUCATION

University of Washington

Ph.D., Electrical Engineering

Advisors: Prof. Behçet Açıkmeşe 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

HONORS AND AWARDS

Amazon Elevate Fellowship Funds (\$10,000 award)

Dec. 2024

Amazon Ph.D. Fellowship, UW Amazon Science Hub [[announcement](#)]

2024 - 2025

GEM Ph.D. Fellowship

2023

Department of Defense (DoD) Secret Security Clearance

2023

Four Nominations for Employee Recognition Awards 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

PUBLICATIONS

1. **Jake Gonzales**, Kazuki Mizuta, Karen Leung, Lillian Ratliff. “Safe Probabilistic Planning for Human-Robot Interaction using Conformal Risk Control,” *IROS*, 2025, (submitted).
2. **Jake Gonzales**, Joey Sullivan, Samuel Burden, Lillian Ratliff, Daniel Calderone. “Hierarchical Decision Framework for Multi-Agent Path Finding,” (In Preparation for CDC), 2025.
3. 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](#)]
4. Adam J. Thorpe, **Jake A. Gonzales**, Meeko MK Oishi. “Data-Driven Stochastic Optimal Control Using Kernel Gradients,” *American Control Conference (ACC)*, 2023, [[Paper Link](#)]
5. 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, Proceedings of the 41st IMAC*, 2023, [[Paper Link](#)]
6. Kelsey Wilson, Ruby Ta, **Jake Gonzales**, Seethamble 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

Sept. 2023 – Present

University of Washington

Seattle, WA

- Working with Prof. Lillian Ratliff and Prof. Sam Burden on developing a hierarchical decision-making framework for large-scale autonomous mobility, using learned congestion models and nonatomic routing game theory to guide low-level search algorithms for efficient multi-agent path planning.
- Working with Prof. Lillian Ratliff and Prof. Karen Leung on developing a novel framework that combines control-theoretic safety constraints with conformal risk control for safe probabilistic planning without making distributional assumptions on human behavior.
- Awarded Amazon PhD Fellowship to investigate 1) using foundation models to improve scalability and generalization in multi-agent RL, 2) fine-tuning foundation models through interactions in Stackelberg games, and 3) using vision foundation models for congestion prediction in realistic warehouse settings in NVIDIA Isaac Sim.

Undergraduate Researcher

Aug. 2021 – May 2023

University of New Mexico

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 for uncertain, nonlinear systems.
- Developed kernel gradient-based optimization algorithms for solving data-driven stochastic optimal control problems.

Undergraduate Researcher

Aug. 2022

Stanford University

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

- Collaborated with MIT-LL technical staff, graduate students from REALM, and Prof. Chuchu Fan working on neural control barrier functions.
- Developed algorithms for safe multi-agent control of nonlinear, high-dimensional systems with input constraints using neural control barrier functions.

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 Link](#)]

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.

TEACHING EXPERIENCE

Teaching Engineering

Spring 2024

Teaching Assistant, EE 406

University of Washington

Computer Logic Design

Spring, Fall 2022

Teaching Assistant, ECE 238

University of New Mexico

Introduction to Electrical Engineering

Spring, Fall 2021

Teaching Assistant, ECE 101

University of New Mexico

PROFESSIONAL SERVICE

- Delegate Reviewer for Prof. Karen Leung, ICRA, 2025

RELEVANT COURSEWORK

* indicates graduate courses

Control Theory: classical control theory, design of feedback control systems, linear systems theory*, linear multivariable control*, nonlinear control systems*

Mathematics: probability theory, advanced calculus*, convex optimization*, mathematical foundations of systems theory*, fundamental concepts in analysis*

Learning and Robotics: machine learning*, deep learning*, reinforcement learning*, autonomous mobile robots*, decision-making and control for safe interactive autonomy*

LEADERSHIP & MENTORING

PhD Student Member, University of Washington Fall 2024 - Present

- Serving on the UW ECE DEI advisory committee to provide input on faculty/staff searches and advocate for initiatives promoting department inclusion.

Math Mentor, Prison Mathematics Project 2023 - 2025

- Mentoring an inmate rehabilitating himself through mathematics.

Graduate Student Volunteer, University of Washington Fall 2023, 2024

- Provided feedback to underrepresented prospective PhD students applying to UW ECE through GASP.

Research Mentor, Tesla High School Sept. 2023 - April 2024

- Mentored HS students using ML to model mercury pollution in aquatic ecosystems.

Peer Mentor, UNM Student Success Center Aug. 2022 - May 2023

- Mentored five new undergrad engineering students from traditionally underrepresented groups to provide help and guidance with challenges of being an engineering student.

Chess Coach, Learners Chess Academy 2021-2023

- Taught chess at local K-8 schools in Albuquerque, NM to 100+ students.

TECHNICAL SKILLS

Programming: Python, C++, C

Scientific Computing: CVXPY, JAX, NetworkX

ML Frameworks/Libraries: PyTorch, TensorFlow, scikit-learn

Software & Tools: MATLAB/Simulink, ROS, Unity, Gazebo, Arduino