(410) 733-6905
Irvine, California
dghimire@uci.edu

# Donipolo Ghimire

PhD Candidate

GitHub: donipologhimire
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**PhD Candidate in Robotics**, (affiliated with Mechanical and Aerospace Engineering) , *University of California Irvine* 2020 - Present
**Master of Science in Mechanical and Aerospace Engineering**, *University of California Irvine* 2020 - 2022
**Bachelors of Science in Mechanical Engineering**, *Howard University* 2015 - 2019

## Skills

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|---|---|
| **Programming Language** | Python, C++,PyTorch, MATLAB, Node JS |
| **Robotic Tools** | Robots Operating System (ROS), Gazebo, Drake |
| **Research Interest** | Motion Planning, Mathematical Optimization, Machine Learning, Graph Theory |
| **Coursework** | Machine Learning, Graph Theory, Motion Planning, Optimal Control, Optimization, State Estimation and Filtering,Probabilistic Learning, Non Linear Controls, Linear Algebra, Dynamics |

## Technical Experience

**Graduate Student Researcher** **SEP 2020 — Present**
*University of California Irvine* *Irvine, CA*

- Engaging in advancing source-seeking algorithm using Behavioral Entropy and Gaussian Process-based exploration. We are proposing new state of the algorithm for source seeking by explicitly incorporating localization and mapping uncertainties to this framework. Currently, validating our method on Clearpath Warthog and Husky robots to demonstrate practical effectiveness in real-world deployments.
- Achieved milestones in multi-robot deployment strategies, leveraging exemplar-based clustering and variational inference techniques to optimize spatial coverage in complex and non-convex environments.

**Research Intern** **JUN 2024 — SEP 2024**
*US DEVCOM Army Research Lab* *Adelphi, MD*

- Collaborated with Research Scientists to develop and validate our proposed BEASST ( Behavioral Entropic Gradient-based Adaptive Source Seeking) framework, enabling mobile robots to dynamically balance between exploration and source-seeking behaviors.
- Rigorously tested this system in realistic simulation scenarios using ROS-Unity environments to mimic complex, unknown terrains, confirming its practical effectiveness in search and rescue mission. Authored a comprehensive journal paper documenting theoretical insights, extensive simulation validation and practical implications.

**Visiting Graduate Student Researcher** **JUL 2022 — NOV 2022**
*NASA Jet Propulsion Laboratory* *La Cañada Flintridge, California*

- Worked with a team to detect and localize the objects of interest like rocks, minerals, and geologic landforms using visual, thermal or wireless signals in perceptually degraded environments like planetary surfaces or caves of Mars and Moon under network and computation constraints.
- Deployed a pipeline for detection and relative object localization module that can be easily integrated into state-of-the-art robots like spot or husky robot which can be deployed for future planetary exploration of Martian or Lunar surfaces.

**Research Associate** **OCT 2019 — MAY 2020**
*Howard University* *Washington, DC*

- Made significant strides on the fabrication and characterization of Surface Relief Fiber Bragg Grating sensors. The purpose of the sensor is to detect a drug called, Fentanyl. Utilized optical fiber assisted UV lithography and polymer replication process for fabrication and presented work in the SPIE Defense + Commercial Sensing Conference.

**Undergraduate Researcher** **JUN 2018 — AUG 2018**
*University of California San Diego* *San Diego, CA*

- Designed, analyzed and developed motion planning strategies for Unmanned Aerial and Ground Vehicles. Achieved cooperative behavior among robots, by developing planning algorithms and estimating position using Kalman filter to perform heterogeneous interaction where human agent and UAVs interact and used ROS as the underlying software.

## Projects

**Visual SLAM** **MARCH 2025 — PRESENT**
*University of California Irvine* *Irvine, CA*

- Developing a visual SLAM pipeline in ROS that uses stereo Visual-Inertial Odometry(VIO) for fast and accurate state estimation combined with a robust pose graph optimizer for global trajectory estimation. We are integrating a stereo RGB-D camera for rich sensor information and are addressing real-time challenges in longer trajectories like computational complexity, drift accumulation, and missed loop closures to support applications like autonomous navigation in GPS-denied environments.

**Gen AI Meets Motion Planning: A Diffusion Approach** **OCT 2024 — DEC 2024**
*University of California Irvine* *Irvine, CA*

- Engineered a Denoising Diffusion Probabilistic Model (DDPM) to learn a prior distribution over smooth, collision-free trajectories based on expert demonstration. To train the model, we created a custom environment and generated a dataset of expert trajectories from A$^\star$ algorithm. We use a conditional UNet architecture that incorporates trajectory state, time embedding, and obstacles. Additionally, we employed Classifier-Free Guidance to improve the model's ability to generate trajectories that respect the provided obstacle map. `https://github.com/donipologhimire/diffusion_based_planning`

**Multi agent Planning with Dynamic Programming and a Fast Convolutional Greedy Algorithm** **JUN 2021 — SEP 2021**
*University of California Irvine* *Irvine, CA*

- Innovated a cutting-edge multi-agent persistent monitoring system, integrating horizon-based dynamic programming and a novel Convolution Greedy Algorithm. Optimized path planning for autonomous agents to maximize cumulative rewards in dynamic environments, significantly improving computational efficiency for real-time decision-making.

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**Deep Learning-based Hand Gesture Recognition for Robot Teleoperation** **MAY 2021 — JUN 2021**
*University of California Irvine* *Irvine, CA*

- Led a team to classify simple Hand Gesture (Left, Right, Forward) by using a Deep Neural Network, and K-nearest neighbor Algorithm and implemented the trained model to control a Turtle-bot robot using hand gestures. The hand-gesture data was collected using an Ultra-wideband Sensor to measure the relative distance measurement based on time-of-arrival Algorithms.
  https://donipologhimire.github.io/projects/

## Publications

1. **Ghimire, D.**, Suresh A. ,Nieto-Granda C. and Kia, S.S., 2025, February. BEASST: Behavioral Entropic Gradient-based Adaptive Source Seeking for Mobile Robots, *In Review.*
2. **Ghimire, D.**, Nieto-Granda C. and Kia, S.S., 2025, March. NavEX: A Multi-Agent Coverage in Non-Convex and Uneven Environments via Exemplar-Clustering, *In Review.* https://github.com/donipologhimire/NavEx
3. **Ghimire, D.** and Kia, S.S., 2024, December. Stein Coverage: a Variational Inference Approach to Distribution-matching Multisensor Deployment. 10.1109/LRA.2024.3390541 . Presented at ICRA Rotterdam, Netherlands
4. **Ghimire, D.** and Kia, S.S., 2023, June. Optimal Multi-Sensor Deployment via Sample-Based Quality-of-Service Distribution Matching. In 2023 European Control Conference (ECC) (pp. 1-6). IEEE. 10.23919/ECC57647.2023.10178375

## Oral and Poster Presentation

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| American Control Conference (Poster Presentation) | 2024,2025 |
| IEEE International Conference on Robotics and Automation (ICRA@40) | 2024 |
| SoCal Control Workshop, UC Los Angeles | 2024 |
| NSF-TIH Principal Investigators' Workshop | 2023 |
| The Southern California Robotics Symposium, UCI, UCLA | 2023,2022 |

## Scholarship and Fellowship

- UC- HBCU Fellowship 2020 - 2023
- Jet Propulsion Laboratory(JPL) Graduate Research Fellow 2022
- UCI Beall Applied Innovation's (BAI) Graduate Innovation Fellowship 2021
- Capstone Scholarship , Howard University 2015-2019

## Teaching Experiences

**Teaching Assistant** **JAN 2024 — Present**
*University of California Irvine* *Irvine, CA*

- Taught a class of two hundred students in Mechanical Systems, with a course objective of constructing a fully operational robot by the quarter's end. Offering mentorship and guidance to students in mastering C++ for programming micro-controllers, designing and analyzing feedback controllers, as well as acquiring software and hardware debugging skills.
- Led a Computer Aided Design course for hundred and fifty students, focusing on the design and construction of a functional walking robot. Offering mentorship in Engineering Design and Finite Element Analysis to enhance practical skills.

## Professional Activities

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| UCI Beall Applied Innovation: Graduate Entrepreneurial Program Organizer | 2021 — 2022 |
| MAE Graduate Student Association, UCI: Program Organizer | Winter 2022 |
| American Society of Mechanical Engineers, Howard University: Program Chair | Fall 2017 — Spring 2019 |

## Research Interests and Vision

My research focuses on enabling autonomous systems to perceive, reason, and act under uncertainty. Much of my work has centered on multi-robot exploration and deployment, active sensing, and source seeking where representations capture not only geometric data but also semantic information—such as traversability—and also rigorously quantify uncertainty that informs risk assessment and decision-making. Looking ahead, I am excited to explore the role of abstractions/representation in achieving efficient and robust autonomy in robotics. I believe that the "right" representations are paramount in enabling robots to understand complex environments and execute sophisticated tasks efficiently. I am particularly interested in two approaches. The first is a hierarchical architecture that involves a low-level control loop for basic movement execution (for example, moving from point A to B) and a higher-level system that operates at a slower duty cycle to break down missions into sub-goal. The second is an end-to-end learning architecture that directly maps sensor inputs to motor commands ("pixels to volts"). The hierarchical framework provides the benefit of interpretability and data efficiency, but the end-to-end framework provides more flexibility that learns complex mapping directly from data and leads to emergent behaviors that are difficult to engineer explicitly in a hierarchical system. Ultimately, I aim to develop a hybrid system that integrates structured reasoning with learned flexibility of end-to-end learning, bridging low-level perception and high-level task semantics for resilient and intelligent autonomy.