

# Yongseok Kwon

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## EDUCATION

### University of Michigan

Aug. 2020 – Aug. 2022

*M.S.E. in Mechanical Engineering*

Ann Arbor, MI

- Focus: Robotics, Deep Learning, Motion Planning, Optimization
- GPA: 4.0/4.0

### Ulsan National Institute of Science and Technology (UNIST)

Mar. 2016 – Feb. 2020

*B.S. in Mechanical and Aerospace Engineering, Human Factors Engineering*

Ulsan, Republic of Korea

- Honors: *Summa Cum Laude*
- GPA: 3.94/4.3

## PRE-PRINTS

- [1] **Yongseok Kwon**, Jonathan Michaux, Seth Isaacson, Bohao Zhang, Matthew Ejakov, Katherine A. Skinner, Ram Vasudevan. "Conformalized Reachable Sets for Obstacle Avoidance With Spheres" In Submission, 2024. [[project page](#), [arXiv](#), [code](#)]

## PUBLICATIONS

- [1] Jonathan Michaux, Qingyi Chen, **Yongseok Kwon**, Ram Vasudevan. "Reachability-based Trajectory Design with Neural Implicit Safety Constraints." *Robotics: Science and Systems*, Daegu, Republic of Korea, 2023. [[project page](#), [arXiv](#), [code](#)]

## EXPERIENCE

### ROAHM Lab, University of Michigan

Jul. 2021 - Jan. 2023, Aug. 2024 - Present

*Researcher*

*Advisor: Prof. Ram Vasudevan*

- Developed a probabilistically safe trajectory planner with conformalized neural network-based reachable sets, ensuring collision-free motion in both simulation and hardware experiments with the Kinova Gen3 robot. 📄
- Developed a novel trajectory planner with neural implicit safety constraints, achieving a planning speed of 40 Hz for 7 DoF robot arms in simulation.
- Developed a Python library for handling various continuous sets (e.g., intervals, zonotopes, and polynomial zonotopes) to compute reachable sets in robotic arm kinematics and dynamics, with support for parallel computation, resulting in a 2,000-fold speed enhancement. [[zonopy](#), [zonopy-robots](#)]

### Institute of Innovation for Future Army (IIFA), Republic of Korea Army

Feb. 2023 - Aug. 2024

*Robotics Researcher (Mandatory Military Obligation)*

- Conducted fieldwork near the Korean Demilitarized Zone to identify technological needs for national defense.
- Managed national defense research initiatives with a specific focus on unmanned reconnaissance systems.

### Locomotor Control Systems (LOCO) Lab, University of Michigan

Jan. 2021 - May 2021

*Researcher Assistant*

*Advisor: Prof. Robert D. Gregg IV*

- Trained a neural network-based gait model on human walking datasets with positional encoding for gait phases.
- Developed a gait state estimator by integrating an Extended Kalman Filter (EKF) with the neural network-based gait model for real-time tracking of motion.
- Demonstrated real-time swing motion of an EKF-based controller using open-source robotic leg hardware. 📄

## COURSE PROJECTS

### Transformer for Reaching Tasks, University of Michigan

Fall 2021

*Course: Introduction to Robotic Manipulation*



- Generated expert dataset via trained agent for offline reinforcement learning.
- Applied the decision transformer for a 7 DoF robotic arm reaching task.

### Trajectory Planning for Autonomous Car, University of Michigan

Fall 2021

*Course: Self-Driving Car*



- Implemented a high-level planner to predict waypoints for lane-changing maneuvers in autonomous driving.
- Formulated convex collision avoidance constraints for trajectory planning in dynamic racing scenarios.

### UAV Navigation via Dubins Path Planning, UNIST

Fall 2021

*Course: UAV Flight Control and Simulation*



- Developed a simulation dynamics and a tracking controller for UAV navigation.
- Implemented a Dubins-curve-based RRT to generate paths under kinematic constraints for UAVs.

## SKILLS

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- **Programming:** Python, MATLAB
- **Software:** IPOPT, Gurobi, OSQP, MuJoCo
- **Frameworks and Others:** Pytorch, Weight & Biases, Stable-Baseline3, Linux, Conda, Git

## HONORS AND AWARDS

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**National Science and Engineering Scholarship**, Korea Student Aid Foundation (KOSAF) *2018 – 2019*  
◦ Full-tuition scholarship for the last two years of undergraduate studies.

**Academic Performance Scholarship**, UNIST *2016 – 2017*  
◦ Full-tuition scholarship for the first two years of undergraduate studies.