DO-GON KIM

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EDUCATION

Columbia University Sep 2023 – May 2025
Master of Science, Mechanical Engineering, **GPA: 4.065**
Relevant Coursework: Intro to Robotics (A+), Computational Aspects of Robotics (A), Robot Learning (A), Intro to Control Theory (A+), Digital Manufacturing (A+), Mechatronics and Embedded Systems (A), Civil Eng Research (A+)

New York University Sep 2020 – Jan 2023
Bachelor of Science, Mechanical Engineering, **GPA: 3.823**
Relevant Coursework: Robotic Manipulation and Locomotion, Robotic Vision
Honors & Awards: Tau Beta Pi, UGSRP, Founder's Day Award, Dr. Morris Young Outstanding Project Design Award

SKILLS

Programming Language: Python, MATLAB, C++
Software/OS: ANSYS Workbench, SOLIDWORKS, Onshape, Gazebo Simulator, Pybullet, ROS 2, Linux, Rviz, Simulink
Machining/Tools: 3D printing, Laser cutting, Soldering, Baileigh WBS-22 Bandsaw, Jet JSG-96 Benchtop Sander

RESEARCH EXPERIENCE

Graduate Researcher, *Columbia University ROAM Lab*, New York, NY May 2024 – Sep 2025
- *SpikeATac: A Multimodal Tactile Finger for Manipulation*
  - Developed a ROS 2 data pipeline integrating PVDF, capacitive, and accelerometer sensors with a linear probe for finger-poking experiments to collect synchronized multimodal data and characterize sensor sensitivity
  - Developed two real-time gripper stopping algorithms based on multimodal tactile sensing: a difference-based method using a 16-channel PVDF array, and a mean-difference threshold method using 7 capacitive sensors
  - Demonstrated stable grasping with a parallel gripper on deformable and fragile objects (egg, nori, raspberry, blueberry, strawberry, flower, origami cube), showcasing SpikeATac's capability for delicate manipulation
- *VibeCheck: Active Acoustic Sensing for Manipulation*
  - Designed and developed fingers to enable active acoustic sensing for manipulation, enabling material, internal structure, and object state classification, grasp point, and contact type estimation
  - Developed and optimized tactile sensing systems using piezoelectric sensors and signal processing techniques, including FFT analysis for feature extraction, laying the groundwork for object classification using MLP
  - Demonstrated a peg-in-hole insertion task using active acoustic sensing, achieving 90% success rates for in-distribution starting states and 50% for out-of-distribution using only acoustic tactile feedback

Graduate Researcher, *Columbia University Nonlinear Control Group*, New York, NY May 2025 – Sep 2025
- Established a PD control framework in C++ within ROS2 for developing learning-apdaptive controller
- Built a control system to execute simultaneous commands across multiple joints with real-time responsiveness

Graduate Researcher, *Columbia University DitecT Lab*, New York, NY Jan 2024 – Sep 2024
- Spearheaded the development of a simulation framework using ROS2 and PyBullet in AWS DeepRacer, enabling ML model testing without physical hardware and fostering a dynamic environment for autonomous vehicle research
- Developed visualization tools for LIDAR to detect obstacles around the autonomous vehicle
- Developed a real-time ArUco marker detection system with OpenCV, allowing for accurate determination of position, orientation, and speed of markers, which were integrated into dynamic vision-based applications

Undergraduate Research Assistant, *NYU Control/Robotics Research Lab*, Brooklyn, NY Jun 2022 – Dec 2022
- Researched and utilized ROS with Gmapping and AMCL algorithms to build and localize maps using sensors
- Enabled Turtlebot3 Burger to detect obstacles and navigate autonomously with LIDAR, encoder, and IMU
- Studied SLAM algorithms (RTAB-Map, ORB-SLAM) and analyzed mapping errors to minimize discrepancies

TEACHING EXPERIENCE

Graduate Teaching Assistant, *Columbia University*, New York, NY Jan 2025 – May 2025
MECE E4601 Digital Control Systems
- Assisted Professor Homayoon Beigi in lectures, homeworks, exams, projects, and weekly meetings

Graduate Teaching Assistant, *Columbia University*, New York, NY Sep 2024 – Dec 2024
MECE E4602 Introduction to Robotics
- Assisted Professor Sunil Agrawal in lectures, homeworks, exams, projects, and weekly meetings

Note Taker, *Columbia University*, New York, NY Sep 2023 – Dec 2023
EEME E6601 Intro to Control Theory
- Assisted Professor Nicolas Chbat by providing detailed lecture notes through Columbia Disability Services

PUBLICATIONS

Peer-Reviewed Publications

[U.1] E. T. Chang*, P. Ballentine*, Z. He*, **D. Kim**, K. Jiang, H. Liang, J. Palacios, W. Wang, P. Piacenza, I. Kymissis, M. Ciocarlie, "SpikeATac: A Multimodal Tactile Finger with Taxelized Dynamic Sensing for Dexterous Manipulation," *Under Review*

[C.1] K. Zhang*, **D. Kim***, E. T. Chang*, H. Liang, Z. He, K. Lampo, P. Wu, I. Kymissis, M. Ciocarlie, "VibeCheck: Using Active Acoustic Tactile Sensing for Contact-Rich Manipulation," *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2025*

Workshop Papers, Abstracts, and Posters

[P.1] E. T. Chang*, P. Ballentine*, Z. He*, **D. Kim**, K. Jiang, H. Liang, J. Palacios, W. Wang, P. Piacenza, I. Kymissis, M. Ciocarlie, "SpikeATac: A Multimodal Tactile Finger with Taxelized Dynamic Sensing for Dexterous Manipulation," *Northeast Robotics Colloquium (NERC) 2025, Cornell University*

OUTREACH

Outreach and Engagement with Student Groups

- Guest speaker for *Re'Generation Movement*, a non-profit organization empowering youth leadership. Introduced research projects and discussed the importance of being part of an encouraging community, July 2025
- Guest speaker for the *Jeju Special Self-Governing Province Office of Education's "2025 Global University Exploration for High School Students."* Presented *VibeCheck* and *Spike-A-Tac* and mentored selected high school students from Jeju, Korea on research and study abroad pathways, July 2025

PROJECTS

Introduction to Robotics Project – *Cable Driven Parallel Robot* Sep 2023 – Dec 2023

- Developed an adaptive velocity controller for a 4-cable-driven parallel robot, enabling dynamic speed adjustments based on the different objects, which enhances precision in handling diverse materials
- Validated performance through MATLAB 3D simulations, demonstrating successful integration of inverse kinematics and adaptive velocity control for smooth, responsive motion
- Optimized the cable-driven system design by reducing cables from 7 to 4, simplifying kinematic solutions and minimizing collision issues, demonstrating the system's applicability in industrial settings like distribution warehouses

Robotic Vision Project – *Sheet Music Sight-Reader* Feb 2022 – May 2022

- Created a Colab-based CV pipeline that takes in the image of a sheet of music and outputs a playable music file
- Trained a model to detect a position of each note in sheet music using the YOLO algorithm with 90% accuracy
- Utilized Canny Edge Detector to find five lines in sheet music and applied a vertical slice on across the five lines to calculate an accurate position of five lines