

ANDREW SANG-JIN CHOI

Email asjchoi@cs.ucla.edu

Website <https://quantumope.github.io>

Code <https://github.com/QuantuMope>

Google Scholar <https://tinyurl.com/quantumope>

EDUCATION

Research Interests: [robotics](#), [sim2real](#), [physical simulation](#), [robot learning](#) & [vision](#)

Doctor of Philosophy, Computer Science

Sept. 2021 – Dec. 2023

Major: Graphics & Vision | Minors: Robotics & Artificial Intelligence

GPA: 4.0/4.0

University of California, Los Angeles

Advisors: M. Khalid Jawed, Jungseock Joo, and Demetri Terzopoulos

Ph.D. Thesis: *Simulation of Deformable Objects for Sim2Real Applications in Robotics*

Master of Science, Computer Science

Sept. 2019 – June 2021

University of California, Los Angeles

GPA: 4.0/4.0

M.S. Thesis: *An Implicit Contact Method for Tying Discrete Elastic Knots*

Bachelor of Science, Mechanical Engineering

Sept. 2014 – June 2018

University of California, Davis

GPA: 3.8/4.0

Senior Design: *Underactuated Shoe Tying Manipulator*

Top 6% in College of Eng.

PUBLICATIONS

- T-ASE 2024 [A. Choi*](#), D. Tong*, D. Terzopoulos, J. Joo, and M. K. Jawed. “Learning Neural Force Manifolds for Sim2Real Robotic Symmetrical Paper Folding”, *IEEE Transactions on Automation Science and Engineering*, 2024
- RA-L 2024 [A. Choi](#), R. Jing, A. Sabelhaus, and M. K. Jawed. “DisMech: A Discrete Differential Geometry-based Physical Simulator for Soft Robots and Structures”, *IEEE Robotics and Automation Letters*, 2024
- IJRR 2023 D. Tong, [A. Choi](#), W. Huang, L. Qin, J. Joo, and M. K. Jawed. “Sim2Real Neural Controllers for Physics-Based Robotic Deployment of Deformable Linear Objects”, *The International Journal of Robotics Research*, 2023
- RA-L 2023 [A. Choi](#), D. Tong, B. Park, D. Terzopoulos, J. Joo, and M. K. Jawed. “mBEST: Realtime Deformable Linear Object Detection Through Minimal Bending Energy Skeleton Pixel Traversals”, *IEEE Robotics and Automation Letters*, 2023
- EML 2023 D. Tong*, [A. Choi*](#), J. Joo, and M. K. Jawed. “A Fully Implicit Method for Robust Frictional Contact Handling in Elastic Rods”, *Extreme Mechanics Letters*, 2023
- JAM 2023 D. Tong, [A. Choi](#), J. Joo, A. Borum, and M. K. Jawed. “Snap Buckling in Overhand Knots”, *Journal of Applied Mechanics*, 2022
- ICRA 2022 [A. Choi](#), M. K. Jawed, and J. Joo. “Preemptive Motion Planning for Human-to-Robot Indirect Placement Handovers”, *IEEE International Conference on Robotics and Automation (ICRA)*, 2022
- WACV 2022 A. Vepa, [A. Choi](#), N. Nakhaei, W. Lee, et al. “Weakly-Supervised Convolutional Neural Networks for Vessel Segmentation in Cerebral Angiography”, *IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)*, 2022
- JAM 2021 [A. Choi](#), D. Tong, M. K. Jawed, and J. Joo. “Implicit Contact Model for Elastic Rods in Knot Tying”, *Journal of Applied Mechanics*, 2021

* Equal Contribution

PRESENTATIONS

- APS 2024 R. Lahoti, [A. Choi](#), and M. K. Jawed. “DiSMech: A Simulator for Soft Robots and Flexible Structures based on Discrete Differential Geometry”, *Bulletin of the American Physical Society*, 2024
- APS 2024 G. Wang, D. Tong, and [A. Choi](#). “Computer Graphics Inspired Fast Simulation of Knots and Tangles”, *Bulletin of the American Physical Society*, 2024
- APS 2023 [A. Choi](#), D. Tong, D. Terzopoulos, J. Joo, and M. K. Jawed. “Deep Learning Force Manifolds from the Physical Simulation of Robotic Paper Folding”, *Bulletin of the American Physical Society*, 2023

INDUSTRY EXPERIENCES

Research Scientist

Horizon Robotics, General AI Laboratory
Supervisor: Wei Xu

Cupertino, California
Feb. 2024 – Present

- Conduct research in developing generalizable training strategies for intelligent autonomous robots.
- Work on training control policies for both robotic quadrupeds and manipulators.

Graduate Robotic Software Intern

Vecna Robotics, Research & Advanced Development Division
Supervisors: Siddharth Chhaptar & Magnus Snorrason

Waltham, Massachusetts
Summer of 2021

- Created an end-to-end robotic solution for autonomous refueling of self-driving warehouse vehicles using a 4DOF serial robot manipulator. Achieved a 99.6% success rate for a client specification of 98%.
- Created hydrogen fuel cell nozzle pose estimation and plane segmentation module using Aruco and RANSAC.
- Carried out motion trajectories using velocity control and inverse Jacobian method for the inverse kinematics.
- Designed the control flow pipeline, control & recovery states, and algorithms for the refueling action.
- Created autonomous testing pipeline and GUI for the autonomous refueling framework with the robot arm and mobile vehicle communicating to each other through server connection.
- Researched and implemented an open-source eye-in-hand hand-eye calibration module using dual quaternions for 4DOF manipulators.
- Created URDF models through Xacro for omnidirectional mobile forklift.
- Derived omnidirectional kinematics and created ROS plugin for Gazebo simulations. Solved inverse kinematics using a constraint-based optimization approach.

Control Systems Engineer

Brock Solutions

Los Angeles, California
Nov. 2018 – July 2019

- Programmed and debugged the programmable logic controllers (PLCs) that control the various actuators and sensors of the automated LAX baggage handling systems.
- Maintained human machine interfaces that display live system status in a high-stakes real time environment.
- Interfaced with real-time database applications to manage critical production information for airline clients.

R&D Engineering Intern

World Surf League (Kelly Slater Wave Company)
Advisor: Adam Fincham, USC

Culver City, California
Summer of 2017

- Collected and stored data from test runs that led to the world’s first artificial 6-foot barreling surf wave.
- Installed, programmed, and maintained pressure sensors, strain sensors, cameras, drones, and velocimeters.
- Performed force calculations for safety structures and managed the ordering of necessary materials/tools.

ACADEMIC & TEACHING EXPERIENCES

Graduate Student Researcher

UCLA, Structures-Computer Interaction Lab
Advisors: Mohammad Khalid Jawed & Jungseock Joo & Demetri Terzopoulos, UCLA

Los Angeles, California
Jan. 2020 – Dec. 2023

- Perform research in the general intersection of robotics, simulations, and learning with a focus on sim2real problems.
- Key research areas include #1) developing physically accurate simulations for deformable materials / soft robots, #2) developing sim2real solutions for robotic manipulation of deformable materials, and #3) developing automated robotic solutions for 3D reconstruction of objects / scenes.

Teaching Assistant for CS32: Introduction to Computer Science II (In-Person)

UCLA, Computer Science Department
Instructor: David Smallberg, UCLA

Los Angeles, California
Jan. 2023 – March 2023

- Taught students how to employ object-oriented programming to build large programs as well as a variety of fundamental data structures and algorithms in C++.
- Held office hours and led discussion sessions consisting of 43 students.
- Received a TA evaluation score of 8.0/9.0 with 19/43 (44.2%) survey participation.

Teaching Assistant for CS31: Introduction to Computer Science I (Online)

UCLA, Computer Science Department

Instructor: Howard Stahl, UCLA

Los Angeles, California

Summer of 2022

- Taught students fundamental concepts and principles of CS as well as general programming principles in C++.
- Held office hours and led discussion sessions consisting of 85 students.
- Received a TA evaluation score of 8.6/9.0 with 9/85 (10.6%) survey participation.

Robotics Senior Design Presentation

Meijo University, Robotics Department

Advisor: Jason K. Moore, UC Davis (now at TU Delft)

Nagoya, Japan

Summer of 2018

- Fully funded trip to present the design theory and findings of underactuated shot tying robot manipulator to robotics students and professors of Meijo University.
- Acted as a mentor to students completing their own robotics senior design projects. Provided technical guidance and feedback and partook in culture exchange programs.

Undergraduate Researcher

UC Davis, Green Technology Lab

Advisor: Masoud Rahman, UC Davis

Davis, California

April 2017 – June 2018

- Performed economic analysis on different energy management techniques for various battery systems.
- Modeled the energy parameters of residential and commercial communities using behavioral survey data, load data, PV generation data, etc. to calculate optimal battery sizing.

HONORS & ACHIEVEMENTS

1. **Senior Design Robotics Television Broadcast** CBS/NBC, 2018
2. **Meijo University Travel Grant** UC Davis, 2018
3. **Magna Cum Laude** *Top 8% in College of Eng.* UC Davis, 2018
4. **UC Davis / Meijo University Annual Robotics Competition Winner** UC Davis, 2018
5. **Engineering Dean's List** *Top 16% in College of Eng. 10 out of 12 quarters* UC Davis, 2014 - 2018
6. **H. and G. Smith Undergraduate Scholarship** *Based on scholastic potential* UC Davis, 2015

SKILLS

Programming Languages C/C++, Python, Java, MATLAB
Software Tools and Environments ROS, Linux, Bash, Git/Github, L^AT_EX, Unity
Libraries NumPy, OpenCV, MoveIt, SciPy, SymPy, PyTorch, TF2/Keras
Prototyping Arduino, Beaglebone, Raspberry Pi, 3D Printing, SOLIDWORKS
Spoken Languages English (Native), Korean (Heritage), Spanish (Limited Working Proficiency)

COURSEWORK

Math & Probability: Linear Algebra, Differential Equations, Probabilistic Systems Analysis

Robotics & Engineering: Electrical Circuits & Systems, Dynamics, Mechanical Design, Automatic Control of Engineering Systems, Simulation & Design of Mechatronic Systems, Measurement Systems, Vehicle Stability, Kinematics of Robotic Systems, Computational Robotics, Deformable Simulations for Soft Robotics

Computer Science & Machine Learning: Data Structures, Software Construction, Computer Organization, Operating Systems Principles, Programming Languages, Computer Network Fundamentals, Algorithms & Complexity, Machine Learning Algorithms, Machine Learning in Genetics, Pattern Recognition, Deformable Models in Computer Vision, Reinforcement Learning, Artificial Life in Computer Graphics & Vision, Human-centered AI