

# ANDREW SANG-JIN CHOI

Email [asjchoi@cs.ucla.edu](mailto: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

- IJRR 2024 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*, 2024
- 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
- 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

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**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.

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**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**

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

**SKILLS**

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

**COURSEWORK**

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**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