

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 - Present

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

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.

IN-PROGRESS FIRST AUTHOR PROJECTS

- Motion planning for robotic knot tying via simulation generated inverse unraveling (*co-first*)
- DisMech: an efficient and physically accurate simulator for controlling soft robots comprised of elastic rods (*first*)
- Active learning for efficient 3D reconstruction via NERF models (*co-first*)

SUBMITTED & IN-PROGRESS PUBLICATIONS

- T-ASE 2023 [A. Choi*](#), D. Tong*, D. Terzopoulos, J. Joo, and M. K. Jawed. “Deep Learning of Force Manifolds from the Simulated Physics of Robotic Paper Folding”, *IEEE Transactions on Automation Science and Engineering*, 2023 (*submitted and on arXiv*)
- IJRR 2023 D. Tong, [A. Choi](#), W. Huang, L. Qin, J. Joo, and M. K. Jawed. “Sim2Real Physically Informed Neural Controllers for Robotic Deployment of Deformable Linear Objects”, *International Journal of Robotics Research*, 2023 (*in revision and on arXiv*)

PUBLICATIONS

- 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 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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| APS 2023 | D. Tong, A. Choi , J. Joo, and M. K. Jawed. "An Implicit Simulation Framework to Handle Frictional Contact in Elastic Rods", <i>Bulletin of the American Physical Society</i> , 2023 |
| USNCCM17 | G. Wang, D. Tong, A. Choi , and M. K. Jawed. "Computer Graphics Inspired Fast Simulation of Knots and Tangles", <i>17th U.S. National Congress on Computational Mechanics (USNCCM17)</i> , 2023 |

ACADEMIC EXPERIENCES

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|---|---|
| Graduate Student Researcher UCLA, Structures-Computer Interaction Lab Advisors: Mohammad Khalid Jawed & Jungseock Joo & Demetri Terzopoulos, UCLA | Los Angeles, California Jan. 2020 - Present |
| <ul style="list-style-type: none"> 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. 2022 - March 2022 |
| <ul style="list-style-type: none"> 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 |
| <ul style="list-style-type: none"> 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 |
| <ul style="list-style-type: none"> 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 |
| <ul style="list-style-type: none"> 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. | |

INDUSTRY EXPERIENCES

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| Graduate Robotic Software Intern Vecna Robotics, Research & Advanced Development Division Advisors: Siddharth Chhaptar & Magnus Snorrason | Waltham, Massachusetts Summer of 2021 |
| <ul style="list-style-type: none"> 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.

HONORS & ACHIEVEMENTS

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

SKILLS

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| Programming Languages | C/C++, Python, Java, MATLAB |
| Software Tools and Environments | ROS, Linux, Bash, Git/Github, L ^A T _E X, Unity |
| Libraries | NumPy, OpenCV, MoveIt, SciPy, SymPy, PyTorch, TF2/Keras |
| Prototyping | Arduino, Beaglebone, Raspberry Pi, 3D Printing, SOLIDWORKS |
| Spoken Languages | Bilingual English & Korean, 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