Keyu Wan

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Education

California Institute of Technology (Caltech) Pasadena, CA
BS., Major: Mechanical Engineering, Minor: Biology *Expected Graduation 6/2026*

- GPA: 4.1

Research and Work Experience

AMBER Lab, Research Intern 2/2024 – Present
California Institute of Technology, Pasadena, CA
Supervisor: Prof. Aaron D. Ames

- Develop lower-limb exoskeleton concepts for neurorehabilitation of patients with lower-body paralysis.
- Implement computational musculoskeletal and exoskeleton models to optimize muscle activation during rehabilitation.
- Build machine-learning algorithms for controller design and refined control policies to achieve targeted activation patterns.
- Senior thesis: design and manufacture of a user-centered leg prosthesis for improved mobility and comfort.

Daraio Lab, Research Intern 9/2023 – Present
California Institute of Technology, Pasadena, CA
Supervisor: Prof. Chiara Daraio

- Conceive reconfigurable chain-mail metamaterials for wearable structural support; 3D-printed portable device prototypes.
- Lead experiments and analysis of confinement-induced stiffness changes, load distribution, and anisotropy.
- Explore applications that combine structured fabrics and smart systems in material design for assistive devices.

Gharib Lab, GALCIT, Research Intern 2/2023 – 10/2024
California Institute of Technology, Pasadena, CA
Supervisor: Prof. Morteza Gharib

- Designed, modeled, manufactured and experimented a bio-inspired flexible flying robot; controlled and evaluated motion modes.
- Ran simulations/analyses to identify optimal shape trajectories and characterize relationships between deformation angles and thrust.

Clinical Research Associate 12/2023 – 9/2024
Cedars-Sinai Medical Center, Los Angeles, CA
Supervisor: Dr. Joseph H. Schwab, MD

- Designed and controlled an acoustic cuff and a reflex hammer device for quantitative leg neurological deep-tendon-reflex assessment.
- Analyzed and optimized synchronized acquisition to quantify reflex latency/amplitude as indicators of neural pathway function.

BIONICS Lab, Research Intern 6/2025 – 9/2025
Harvard University, Cambridge, MA
Supervisor: Prof. Shriya Srinivasan

- Designed and executed in vivo rat hindlimb FES studies with randomized stimulation paradigms and synchronized EMG/force/sonomicrometry.
- Built multimodal signal-processing pipelines and feature-informed deep-learning models for fatigue prediction and adaptive control.

LIGO, Engineering Intern 12/2023 – 6/2024
California Institute of Technology, Pasadena, CA
Laser Interferometer Gravitational-Wave Observatory (LIGO)

- Investigated factors affecting passive vibration damping in interferometer isolation systems.
- Helped ensure lasers and mirrors are isolated from environmental noise and vibration through configuration studies and testing.

Oka Lab, Research Intern 9/2024 – Present
California Institute of Technology, Pasadena, CA
Supervisor: Prof. Yuki Oka

- Analyze neural signals and brain samples across regions; perform chemical injections in mice and monitored behavioral/physiological changes.
- Develop deep-learning methods and image processing techniques to detect and quantify mouse behaviors in response to stimuli.

Independent Researcher, Housner Fund Fellowship 1/2024 – 6/2025
George W. Housner Student Discovery Fund, California Institute of Technology
Independent Research

- Identified patient-specific facial acupressure points through image processing and developed automated acupressure-relaxation cycles to aid facial-paralysis recovery.
- Designed and prototyped a personalized soft-robotic pressing device for non-invasive facial rehabilitation.

Selected Publications

Design and Analysis of Bio-inspired Soft Body Morphing Quadcopter
K Wan, M Gharib
IEEE 31st International Conference on Mechatronics and Machine Vision in Practice (M2VIP), pp.99-104, 2025. doi:10.1109/M2VIP67511.2025.11165708

A Virtual Human–Exoskeleton Framework for Personalized Gait Coordination
K Wan, K Li, A D Ames
In Submission, Manuscript Available upon Request.

Polycatenated Architected Materials for Adaptive and Autonomous Robotic Systems
S Nadarajah, W Zhou, T Nkala, **K Wan**, C Daraio
Materials Research Society (MRS), 2025.

Quantitative Reflex Tests Using A Novel Acoustic-Based Sensing System
A Yazdkhasti, R Berkun, R Reyes, **K Wan**, H Ghaednia, J H Schwab
Orthopaedic Research Society (ORS), 2025.

Personalized Acupoint Massage Method for Rehabilitation in Patients with Facial Paralysis
Oral Presentation
Society for Neuroscience (SfN), 2024.

Honors and Awards

- **M2VIP John Billingsley Best Paper in Mechatronics Award** (2025)
- **AAAS Student E-poster, 1st Place**, (2025)
- **Gee Family Poster, 1st Place**, (2024)
- **Housner Student Discovery Fund Fellow**, (2024–25)
- **Caltech SURF: Larson Scholar**, (2023); **Darin Butz**, (2024, 2025)
- **Caltech FCC Appreciation Award**, (2024)

Teaching Experience

Teaching Assistant 9/2024 – Present
California Institute of Technology, Pasadena, CA

- Responsible for leading recitations, holding weekly office hours, and writing up and grading problem sets.
- TA Classes: ME/CS/EE 133 Robotics; ME 12 Mechanics; ACM 95/100 Methods of Applied Mathematics for the Physical Sciences

Technical Skills

Programming: Python; C++; C; MATLAB; Java

Robotics and Simulation: ROS; MuJoCo; Solidworks; Ansys; TDT

Fabrication: 3D printing, laser cutting, CNC machining, soldering/microsoldering, PCB prototyping

Wet Lab: rodent perfusion, immunohistochemistry, confocal microscopy

Volunteering and Certificates

Equity and Title IX Advocate 6/2024 – 6/2025
California Institute of Technology, Pasadena, CA

Community Tutor 4/2024 – 9/2024
Caltech Y RISE Program, Pasadena, CA

Summer Student Ambassador 6/2024 – 9/2024
California Institute of Technology, Pasadena, CA

Hospital Volunteer 4/2024 – 9/2024
Huntington Hospital, Pasadena, CA

Mental Health First Aid USA 3/2024
National Council for Community Behavioral Healthcare, Los Angeles, CA

Basic Life Support Provider 3/2024
American Heart Association, Los Angeles, CA