

ZACH (JAEHYEON) PARK

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Education

The Cooper Union for the Advancement of Science and Art

Bachelor of Engineering in Mechanical Engineering / Minor in Bioengineering

Aug. 2020 – May 2026

GPA: 3.86/4.00 (Summa Cum Laude)

Carnegie Mellon University

Master of Science in Mechanical Engineering - Research

Aug. 2026 – May 2028

- **Memberships:** Tau Beta Pi (Engineering Honor Society), ASME, and BMES
- **Related Coursework:** Bio-Inspired Robotics, Mechatronics, Feedback Control, Signal Processing, Design & Prototyping, Materials Science, Mechanics of Materials, Stress & Applied Elasticity, Mechanical Vibrations, Sports Medicine

Research & Technical Experiences

Mechanical Design Intern, HUROTICS Inc.

Seoul, South Korea | Jun. 2026 – Aug. 2026

- Designed and built dynamic mannequin test jig for end-of-line validation of cable-driven hip exosuit, owning CAD, motor sizing (right-angle planetary actuators, absolute encoders), and wiring
- Replicated human soft-tissue compliance with layered ballistic gel and silicone to capture skin-shear effects rigid dummies miss, programming repeatable gait trajectories to verify cable assistive force and IMU accuracy
- Explored reinforcement-learning exosuit control with open-source musculoskeletal frameworks (SCONE, DEP-RL), using test jig to investigate sim-to-real transfer for closing simulation-reality gap
- Investigated vision-augmented gait-phase and terrain detection, adding ToF sensor data and computer vision to existing IMU/load-cell sensing to improve locomotion intent estimation and adaptively modulate assistance

Tail for Quadruped Balance Recovery Project, Cooper Union

New York, NY | Jan. 2026 – May 2026

- Designed cable-driven modular tail (1/2/3-segment) for roll stabilization on Mini Pupper quadruped, deriving closed-form cable-coupling kinematics and inverse dynamics identifying the tail as an effective stiffness controller
- Quantified segmentation effect via 18 controlled impulse-disturbance trials across 9 conditions, showing active tail control increased damping ratio in every condition, with 3-segment yielding up to 1.66x improvement over 1-segment

Project Lead, Surgeon Ergonomic Assist

New York, NY | Aug. 2025 – May 2026

- Designed stool-mounted active armrest with NEMA 23 motor and self-locking lead screw for height adjustable forearm support; integrated Time of Flight (ToF) sensors and tactile interface for intuitive, hands-free vertical tracking
- Fabricated Aluminum 6061 prototypes, validating structural integrity via FEA (FoS > 2) under dynamic loads; engineered fail-safe control architecture with autocalibration and software limits to prevent actuator over-extension
- Quantified ergonomic efficacy via sEMG and computer vision analysis, validating 30% reduction in trapezius activation, 23% decrease in straight line drawing tremor, and 10% improved forward-head offset during surgical simulations

Mechanical Design Intern, Mount Sinai BioDesign

New York, NY | Aug. 2025 – May 2026

- Created modular Chronic Subdural Hematoma (CSDH) testbed with patient-specific cranial geometry (<1 mm deviation from CT), replaceable dura, and silicone brain for configurable hematoma and burr hole testing
- Refined multi-lumen cranial access port geometry across 4 design revisions, optimizing bend angle, lumen sizing, and endoscope viewing window to maximize subdural visualization through 14 mm burr hole (± 0.3 mm clearance)
- Developed reusable silicone brain phantom with embedded ICH cavity and pre-formed instrument channels via 3D-printed molds, reducing fabrication time by 90% and annual material cost by 70% over single-use gelatin models
- Authored FDA-aligned test protocols under QMS framework and execute 5+ neurosurgeon-led evacuation trials, documenting failure modes and root cause analysis; present validation data to Medtronic and Stryker R&D

Undergraduate Researcher, Cooper Union (Prof. Wootton)

New York, NY | Jan. 2025 – May 2026

- Engineered dual-axis piezoelectric sensor with custom differential amplifier for non-invasive arteriovenous fistula (AVF) vibration monitoring in hemodialysis patients, distinguishing waveform signatures between patent and stenotic flow
- Built closed-loop test rig with silicone vascular phantom, custom pulsator, and compliance chamber, replacing \$3,000+ commercial pulsatile pump at under \$200
- Miniaturized benchtop prototype into wireless wearable with silicone-encapsulated sensor pad, maintaining signal fidelity within 6% of bench reference while reducing form factor to under 4cm

Undergraduate Researcher, Wake Forest University (Prof. Weaver) *Winston-Salem, NC | May 2025 – Aug. 2025*

- Created 9 subject-specific lumbar spine FE models from astronaut CT/MRI data in LS-DYNA, simulating 36 loading scenarios; validated predictions against cadaveric benchmarks within 8% to assess injury risk under launch loads
- Automated vertebral segmentation and material property assignment pipeline in Python/MATLAB, reducing per-model preprocessing time by 40% across all datasets and 19 bilateral muscle groups

Volunteer, The Nicholas Institute of Sports Medicine and Athletic Trauma (NISMAT) *New York, NY | Aug. 2025*

- Processed 3D infrared marker-based motion capture and force plate data using Visual3D for kinematic & kinetic analysis
- Performed paired t-tests using MATLAB SPM1d to assess countermovement jump asymmetry post-ACL reconstruction

Product Design Lead, Ovelia Health *Baltimore, MD | Feb. 2025 – Dec. 2025*

- Led product design and development of digital health platform for Polycystic Ovary Syndrome (PCOS) screening and cycle tracking integrating Machine Learning based emotional support and symptom assessment
- Refined UI/UX through 50+ user/clinician interviews (NSF I-Corps) and worked with Johns Hopkins Bloomberg School of Public Health and Aspect Health to prepare IRB-approved clinical validation of screening algorithm
- Secured \$23k in funding through accelerator programs and won 2nd place at 2025 TEDCO Expo Pitch Competition

Undergraduate Researcher, Technische Universität Dresden *Dresden, Germany | May 2024 – Aug. 2024*

- Inspected electromagnetic-formed parts on Fraunhofer production floor, identifying springback defects across 5 process parameters via full-factorial DOE; correlated measurements with LS-DYNA predictions to reduce forming error by 18%
- Applied Machine Learning model (Monte Carlo Dropout, 200+ runs) to replace physical trial-and-error with data-driven process selection, reducing tooling iteration cycles and informing fixture geometry for production-ready parts

Undergraduate Researcher, Seoul National University (Prof. Lee) *Seoul, South Korea | Jun. 2021 – Aug. 2021*

- Participated in developing modular AGV with ROS-based multi-point coupling architecture enabling swarm collaboration
- Created Blender animations visualizing collaborative AGV motion and optimized docking/connection sequences

Poster Presentations

“Personalizing an Average Male Human Body Model with MRI-Derived Muscle Data from Long-Duration Astronauts”

- Biomedical Engineering Society (BMES) Annual Meeting (Oct. 8-12, 2025) / Full Travel Grant from Wake Forest University and Cooper Union
- Wake Forest University Summer Symposium (Jul. 31, 2025) / Awarded Undergraduate Research Presentation Certificate

“Optimizing Small Wind Turbine Efficiency through Attaching a Novel Structure”

- National Conference for Undergraduate Research (NCUR) (Apr. 7-9, 2025) / Full Travel Grant from Cooper Union

“Real-Time Multi-Drone Control through Hand Gesture Recognition with MediaPipe”

- Cooper Union Vertically Integrated Projects (VIP) Spring Showcase (Apr. 25, 2024)

Awards & Scholarship

Maroon & Gold Labs Full Grant Winner **Nov. 2025**

- Awarded \$5,000 Cooper Union incubator funding supporting Ovelia Health clinical study and validation

NIH NIBIB/VentureWell DEBUT Challenge 2nd Place Winner **Oct. 2025**

- Engineered wearable AVF monitoring device for early detection of fistula stenosis using piezoelectric sensors
- Awarded \$15,000 prize and invited to present at 2025 BMES Annual Meeting, selected from 123 teams nationwide

Pfizer Digital Hackathon 2nd Place Winner (Team Lead) **Sep. 2025**

- Prototyped HIPAA- and COPPA-compliant digital companion platform for pediatric cancer patients and caregivers
- Led team and presented our solution at Pfizer NY Headquarters to 50+ Pfizer Digital professionals

Pfizer Inaugural Digital Hackathon 2nd Place Winner **Sep. 2024**

- Built NLP-based virtual companion app promoting student mental health and resilience across NYC schools

Cooper Union President Half & Full Tuition Scholarship **Aug. 2020 – May 2026**

Skills

Programming Languages & Frameworks: Python, PyTorch, MATLAB, C++, ROS2, React Native, JavaScript

Software & Tools: Fusion 360, SolidWorks, Visual3D, JMP, NI LabVIEW, Mimics, LS-DYNA, Arduino, MS Office