

EDUCATION

National Yang Ming Chiao Tung University (NYCU)

B.S. in Biomedical Engineering

GPA: 3.73/4.3 | GPA (Last 60 Credits): 4.10/4.3

Courses: Linear Algebra, Numerical Method, Engineering Mathematics, Programming Language (C/C++), Data Structure, Operating System, Introduction to Machine Learning and Practice, Neuroengineering

Taipei, Taiwan

Sep 2021 – Jun 2025

RESEARCH EXPERIENCE

Neurotech Lab (NTK Lab), NYCU | Prof. You-Yin Chen

Undergraduate Researcher

Research Assistant

Taipei, Taiwan

Mar 2023 – Jun 2025

Jul 2025 – Present

RGB-Based Multi-View 3D Markerless Motion Capture System (co-advised by Prof. Hui-Ting Shih)

- Engineered a real-time pipeline integrating multi-camera capture, frame synchronization, pose estimation, 3D triangulation, filtering, and inverse kinematics; used CPU multiprocessing for parallel computation and GPU acceleration with CuPy for 3D reconstruction, achieving ~1-frame latency at 30 fps
- Designed an occlusion-robust triangulation algorithm using SVD residuals for camera set selection and validated it against the VICON system, reducing joint-angle error by 5% and improving correlation by 9%
- Developed a robust multi-person motion analysis algorithm that resolves occlusion and identity-switching under noisy visual conditions, enabling reliable 3D pose estimation for caregiver–patient interaction studies
- Established motion-analysis pipelines for clinical studies in stroke, knee and lower-back pain, and fall-risk assessment, extracting kinematic and biomechanical metrics for quantitative analysis of gait and balance
- Deployed the system across 6 clinical institutions and 2 daycare centers, collaborating with clinicians to collect patient gait data, evaluate usability, and integrate the system into existing rehabilitation workflows
- Created a GUI using PyQt6 tailored for clinical workflows, integrating patient data collection, motion analysis, and 3D result visualization into a unified interface
- Enhanced calibration accuracy by fine-tuning YOLOv8 on custom chessboard datasets, reducing error by 6% and improving robustness under low-quality imaging
- Integrated a Realtek AMB82-MINI embedded AI camera module with the system to provide wireless RGB video streaming on the local network

Neural Engineering Research

- Developed a brain-computer interface prototype with 8-channel EEG, implementing real-time filtering and feature extraction, and mapping oscillatory patterns of motor imagery and attention onto discrete device-control commands
- Performed correlation analysis between 32-channel EEG and bilateral lower-limb EMG from four muscles on each leg to quantify corticomuscular coupling during locomotion
- Conducted a lower-limb EMG study comparing knee-exoskeleton-assisted and unassisted gait to evaluate rehabilitation progress and fatigue-related changes

WORKING PAPERS

- M.-H. Wang, **B.-H. Chen**, L.-W. Huang, Y.-Y. Chen, and H.-T. Shih, “Validation of NTKCAP markerless motion capture system for gait kinematics” (manuscript in preparation)

CONFERENCES

- **B.-H. Chen**, C.-H. Tsai, L.-W. Huang, M.-H. Wang, C.-S. Hsu, and Y.-Y. Chen, “Robust Self-Occlusion Mitigation for Enhanced Accuracy in 3D Markerless Motion Capture Systems,” *International Conference on Movement Science and Technology*, November 2024
- M.-H. Wang, K.-T. Tsai, **B.-H. Chen**, L.-W. Huang, C.-H. Tsai, C.-S. Hsu, and Y.-Y. Chen, “Markerless Gait Analysis for Lower Back Pain: A Cost-Effective Solution to Assess Pelvis-Trunk Coordination,” *Symposium on Engineering, Medicine, and Biology Applications*, January 2025
- L.-W. Huang, M.-H. Wang, **B.-H. Chen**, K.-H. Su, C.-H. Tsai, Y.-Y. Chen, and H.-T. Shih, “A Real-Time Algorithm for Detecting Gait Events in Lower-Limb Prosthesis Users Using a Markerless Motion Capture System,” *American Society of Biomechanics Annual Meeting*, August 2025
- A.-Y. Huang, M.-H. Wang, L.-W. Huang, **B.-H. Chen**, H.-H. Wang, C.-H. Kuo, S.-W. Lu, Y.-C. Lo, Y.-Y. Chen, and H.-T. Shih, “Spatiotemporal Cortical-Synergy Connectivity in the Gait Cycle,” *Symposium on Engineering, Medicine, and Biology Applications*, January 2025

PROJECTS

Bidirectional Teleoperation System for Robotic Arms and Exoskeletons Aug 2025 – Dec 2025

- Developed a MuJoCo dynamics simulation of a multi-joint robotic arm for a ball-catching teleoperation task and modeled rigid-body dynamics, joint limits, and contacts for controller prototyping
- Implemented a torque-sensing and data-acquisition pipeline, including A/D conversion to obtain synchronized joint-torque and position measurements for closed-loop control experiments

Trigger-based Security Event Monitoring System, NTK Lab, NYCU Jan 2024 – Apr 2024

- Designed a multimodal surveillance pipeline using 4K cameras on NVIDIA Jetson Nano to run pose estimation (RTMDet + RTMPose) and an LSTM classifier at 15 fps, analyzing 26 skeletal keypoints per person to detect fights and abnormal crowd gatherings
- Implemented a Flask-based web interface for live keypoint-overlay streaming, browser monitoring, and automatic saving of 10-second incident clips

10-Band Graphic Equalizer, Electric Circuits Lab, NYCU Feb 2023 – Jun 2023

- Designed and implemented a 10-band graphic equalizer with op-amp band-pass filters covering 100 Hz–10 kHz for real-time audio adjustment
- Validated frequency response via oscilloscope measurements, confirming stable ± 12 dB gain control and reliable continuous operation

ACHIEVEMENTS & COLLABORATIONS

International Pitch Presentations at Mount Sinai Hospital New York, USA | May 2025

- Presented our RGB-Based Multi-View 3D Markerless Motion Capture System technology to healthcare investors and incubators and delivered a presentation on clinical applications in gait and rehabilitation

Exhibited at Taiwan Healthcare+ Expo Nangang, Taiwan | Dec 2024

- Demonstrated the system to clinicians, experts, and the public through live gait-assessment sessions

MOUs & Institutional Partnerships

- Signed Memoranda of Understanding with Taipei Veterans General Hospital, Taipei City Hospital, and the Institute for Information Industry to establish long-term clinical and research collaborations

Media Coverage and Recognition

- Featured by multiple media outlets as an AI-based breakthrough motion-capture application for rehabilitation and healthcare

TEACHING EXPERIENCE

Teaching Assistant, Electric Circuits Lab, NYCU Taipei, Taiwan | Feb 2024 – Jun 2024

- Guided 30 students in applying circuit theory to laboratory experiments while providing technical support and evaluating reports with constructive feedback

AWARD

Most Popular Poster Award, MATLAB & Simulink Creative Poster Competition Taipei, Taiwan | Nov 2023

- Optimizing Elderly Muscle Strength Training through Real-Time Adjustment of Knee Exoskeleton Based on Electromyographic Signals for Muscle Fatigue Assessment

LEADERSHIP EXPERIENCE & EXTRACURRICULAR ACTIVITIES

Vice General Coordinator, 6th NYCU Biomedical Engineering Camp Jan 2023 – Jul 2023

- Led a team of 30+ undergraduate organizers to design and execute lectures and hands-on activities introducing biomedical engineering to 45+ high school students as part of a one-week outreach camp

Chief Director, Artistic Design Department, Piano Club, NYCU (Yang Ming Campus) Jul 2022 – Jun 2023

- Created the visual identity, promotional campaigns, and event materials for annual concerts and campus performances, enhancing audience engagement and club visibility

Member, Student Association, NYCU Jul 2021 – Jan 2022

- Assisted in coordinating student activities and administrative tasks, contributing to community engagement

SKILLS

Programming & Tools: Python (PyTorch, TensorFlow, OpenCV, CuPy, scikit-learn, PyQt6, Pandas), C/C++, MATLAB/Simulink, EEGLAB, MuJoCo, OpenSim, Unreal Engine, Linux, Git

Algorithms: Multi-view geometry, pose estimation (YOLOv8, RTMPose), 3D triangulation (weighted DLT), inverse kinematics and musculoskeletal modeling (OpenSim)

Signal Processing & Biomechanics: EEG/EMG signal processing and time–frequency analysis, feature extraction, gait analysis, human motion biomechanics, quantitative rehabilitation assessment