

# Zewen (Anthony) Chen

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Research Interests in Robotics: Dexterous Manipulation, Multimodal Sensing, Robot Learning

## EDUCATION

### Columbia University

New York, NY

**M.S. in Mechanical Engineering, Concentration in Robotics and Control**, [4.165/4.00]

Expected May 2026

**Courses:** Applied Robotics, Robotics Studio, Robot Learning, Reinforcement Learning, Modern Control Theory, Model Predictive Control

### Zhejiang University

Hangzhou, CN

**M.S. in Design Science (finished with thesis)**, [Avg. 90.5/100]

Jun 2024

**Courses:** Affective Computing and Design, Innovation Design, Informatics for Design, Integrated Design

### Zhejiang University, Chu Kochen Honors Program

Hangzhou, CN

**B.E. in Automation (finished with thesis), Concentration in Robotics**, [3.95/4.00]

Jun 2021

First-class scholarship of Zhejiang University, ranking **6/152** in the program

**Courses:** Linear Algebra 1&2, Mathematical Analysis 1&2, Probability and Mathematical Statistics, Lectures on C Programming, Data Analysis and Algorithm Design, Data Structure, Principles of Automatic Control 1&2, Robotics, Design and Practice of Robot, Artificial Intelligence

## PUBLICATIONS

- S. Islam\*, **Z. Chen\***, Z. He\*, et al., "MiniBEE: A new form factor for compact bimanual dexterity," arXiv preprint arXiv:2510.01603, 2025, submitted to IEEE International Conference on Robotics and Automation (ICRA) 2026. [**\* joint first authorship**]
- B. Wang, K. Zhang, **Z. Chen**, et al., "An intelligent font generation system based on stroke inference, mitigating production labor and enhancing design experience," Expert Systems with Applications, vol. 263, p. 125657, 2025. [**second student author**]
- Y. Yin, **Z. Chen**, Y. Zhao, et al., "Automated Chinese seal carving art creation with AI assistance," in Proc. IEEE Conf. Multimedia Information Processing and Retrieval (MIPR), 2020, pp. 394–395.

## RESEARCH EXPERIENCE

### Robotic Manipulation and Mobility Lab (ROAM Lab), Columbia University (PI: Prof. Matei Ciocarlie)

New York, NY

#### MiniBEE: Miniature Bimanual End-Effector

Apr 2025 - Present

- Designed and refined a novel 8-DOF robotic arm with dual end-effectors, which is wearable for in-wild data collection, enabling dexterous bimanual manipulation and extending the workspace when mounted on a larger industrial robot. (**Project Website:** <https://roamlab.github.io/minibee/>)
- Implemented algorithms for individual joint position control, Cartesian velocity control, sample-based singularity avoidance, motor torque control, trigger-to-gripper mapping, and trajectory record & replay, all packaged in an interactive GUI for easy accessibility.
- Built a real-world data collection pipeline and trained diffusion policies able to successfully complete bimanual manipulation tasks such as object reorientation, glasses unfolding, and lid removal & pouring out pills for pill bottles.
- Delivered a poster presentation at **NEMS 2025 at MIT** and completed a manuscript submitted to **ICRA 2026 as co-first author**.

#### PopcornFT: Compact LED-Based F/T Sensing for Robot Fingers

Jan 2025 - Jun 2025

- Designed a Gaussian-based heuristic model for contact detection by monitoring each signal's deviation, showing detection when ~50% of signals (**24** in total) exceed ~10x their standard deviation. This model ensures dynamic and cross-prototype robustness and has been used for in-hand object rotation in a robotic hand using PopcornFT. (**Project Website:** <https://roamlab.github.io/PopcornFT/>)
- Trained a transformer-based model and tuned the hyperparameters for the force and torque regression.
- Performed the ablation studies for the model performance by using fewer LED signals for training, which showed that reducing the number of LEDs to **16** or **12** does not lead to a significant performance drop, indicating the feasibility of designing more compact and cost-effective sensors.
- Contributed to a poster presentation at **NEMS 2025 at MIT**.

### NEXT Lab, Zhejiang University (PI: Prof. Kejun Zhang)

Hangzhou, CN

#### Optimization of Process and Technology in Chinese Font Design

Sep 2022 - Jun 2024

- Developed a novel AI-assisted interactive paradigm for Chinese font design in collaboration with **Apple Inc.**
- Collected stroke annotations and constructed a labeled database using graphical and structural features.
- Developed algorithms leveraging graphical features to extract and match strokes from Diffusion model-generated character images, enabling reconstruction of vectorized Chinese characters.
- Conducted user studies demonstrating that the proposed paradigm increases design speed by **30%** while preserving the quality.
- Completed a manuscript published in **ESWA as the third author (second student author)**
- Extended previous work by eliminating manual stroke annotations through automatic stroke intersection detection and segmentation using ControlNet, followed by rule-based character reconstruction for my **master's thesis**.

#### Transformer-Based Chinese Characters Image Generation

Sep 2021 - Aug 2022

- Led the design and implementation of spatial and channel attention modules to capture long-range pixel interactions between style and content features, serving as a content-style mixer for one-shot font generation.
- Performed extensive experiments and user studies, demonstrating performance in one-shot font generation.

## AI Chinese Seal

Oct 2019 - Aug 2020

- Collected and restored raw data from ancient documents, formalizing them using a **polynomial-parameterized** font model.
- Trained a generative adversarial network (GAN) to generate styled Chinese character images.
- Completed a **short IEEE manuscript as the second author** and collaborated on a seal carving system to produce **commemorative seals for Zhejiang University graduates in 2020**.

## Zhejiang University (PI: Prof. Shibo He & Kejun Zhang)

Hangzhou, CN

### Chinese Character Generation Using Structural Semantics and Deep Learning (Undergraduate Thesis)

Nov 2020 - May 2021

- Proposed a “character-creation” method for automatic generation of Chinese characters using the ideographic description sequences (IDS, a semantic sequence that can describe the structure and components of Chinese characters).
- Developed a component-level combination method for character image generation and a subsequent deep learning-based image optimization network, where the latter achieved 24–48% improvements in NRMSE and PSNR over the baseline combination method.
- Demonstrated ability to generate **rare and artistic “novel characters”**, expanding potential applications in AI art.

## Zhejiang University (PI: Prof. Yiping Feng)

Hangzhou, CN

### Computer Vision-Based Non-Destructive Fruit-Sorting Robot (Undergraduate Group Research)

Sep 2020 - Jan 2021

- Revitalized software and hardware architecture for a robotic arm and realized it using Raspberry Pi, Arduino, camera, customized gripper, and pressure sensors, allowing it to **detect different types of small fruits, grasp them without damage, and sort**.
- Organized weekly discussions with team members and wrote progress reports to ensure project scheduling as the team leader.

## TEACHING EXPERIENCE

### Columbia University

New York, NY

#### Teaching Assistant for Course: Modeling & Identification of Dynamic Systems

Sep 2025 – Dec 2025

- Assisted with preparing the standard answers for the homework, grading the homework, and assisting students online and offline.

## PROJECTS EXPERIENCE

### Columbia University

New York, NY

#### Balancing a Unicycle Robot on the Slope (Modern Control Theory Course Project)

Mar 2025 - May 2025

- Modeled and linearized the nonlinear dynamics of an on-slope unicycle robot using the Euler-Lagrange method.
- Built simulations in MATLAB/Simulink to analyze the linearized and nonlinear system stability under slope conditions.
- Designed advanced controllers (Lyapunov-based,  $H_2$  optimal,  $H_\infty$  optimal) for stabilizing both linearized and nonlinear models, enabling the unicycle to rapidly balance within **10 seconds** on slopes with a gradient variation of  **$\pm 9.5$  degrees**.

#### Refined Disturbance Rejection MPC (Model Predictive Control Course Project)

Mar 2025 - May 2025

- Reproduced the benchmark “Disturbance Rejection MPC” controller for the mobile robot and extended it to continuous-time and asynchronous simulations in Simulink.
- Reduced average MPC prediction time **from 0.34 s to 0.0043 s** while maintaining comparable control performance by developing shortened-horizon control, improving the real-time applicability of MPC in practice.

#### Bipedal Robot Design (Robotics Studio Course Project)

Sep 2024 - Dec 2024

- Devised and built a bipedal robot capable of stable walking with a custom mechanical structure (CAD modeling and 3D printing).
- Programmed integrated control system enabling smooth walking (cubic polynomial trajectories), posture adjustment, self-checking, and wireless voice interaction with emotional feedback on the screen face.
- Simulated and optimized gaits in a physics engine, validating stable walking performance with a top speed of **14.3cm/s**.

## Zhejiang University

Hangzhou, CN

### Algorithm Design for Mobile Robot and Articulated Robot (Design and Practice of Robot Course Project)

Mar 2020 - Jul 2020

- Implemented path planning, localization, tracking, and map reconstruction for a mobile robot in ROS using Python/C++ (**A\*, DWA, ICP, EKF, Particle Filter, and Hybrid Bayesian Network-based laser mapping**), enabling real-time navigation in Gazebo simulation.
- Programmed a 6-DOF robotic arm with forward and inverse kinematics, achieving precise trajectory control and successfully completing a bell-tolling task **43 times within 100 s** on a **real robot**, demonstrating reliable planning-control integration.

## AWARDS

- SUPCON Scholarship of Zhejiang University (**10** recipients in the College of Control Science and Engineering annually) Dec 2019
- First-class scholarship of Zhejiang University (**Top 5%** in the undergraduate program) Jan 2020
- Award of Honor for a Graduate of Zhejiang University (Scholarship for M.S.) Dec 2022
- Outstanding Graduates of Zhejiang University (Honor for outstanding undergraduate graduation) Jun 2021
- Excellent Postgraduate Students' Award of Zhejiang University (Honor for outstanding M.S. graduation) Jun 2024

## LEADERSHIP EXPERIENCE

### Student Traditional Handicraft Club, Zhejiang University

Hangzhou, CN

#### Head of Handicraft Technology Department

Sep 2018 - Jul 2019

- Organized weekly meetings and campus handicraft courses, **winning first prize for teaching twice**.
- Responsible for coordinating large-scale activities such as "Traditional Handicraft on Campus" and "Club Culture Festival".

## SKILLS

- C, C++, Python, MATLAB, PyTorch, ROS, SOLIDWORKS, PyBullet, 3D-Printing