Hao-Fang Cheng

Personal Website • howard.top@gmail.com • +(886)910030070 • LinkedIn •

EDUCATION

Master in Electrical Engineering Aug 2021 – Aug 2023

National Taiwan University, Taipei, Taiwan

Graduate Research Exchange, Polytechnique Montréal, Montreal, Canada Feb 2023 – Aug 2023

Bachelor in Mechanical Engineering Sep 2017 – Jun 2021

National Taiwan University, Taipei, Taiwan

Relevant Courses: *Robotics, Machine Learning, Computer Vision, Control System, System Dynamics*

PUBLICATIONS

[1] **H.-F. Cheng**, Y.-C. Ho and C.-W. Chen, "Autonomous Dental Surgery for Root Canal Treatment: Compensating for Robot-Patient Misalignment and File Deflection," *IEEE Transactions on Automation Science and Engineering (T-ASE)*, 2025. doi: 10.1109/TASE.2025.3611997. [link] [video]

[2] **H.-F. Cheng**, Y.-C. Li, Y.-C. Ho and C.-W. Chen, "Force-Guided Alignment and File Feedrate Control for Robot-Assisted Endodontic Treatment," in *Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Kyoto, Japan, 2022, pp. 1841–1847. doi: 10.1109/IROS47612.2022.9981393. [link]

[3] C.-Y. Lin, H.-T. Chen, **H.-F. Cheng** and Y.-J. He, "Electrical Impedance Sensing System Design for Abnormal Object Detection," in *Proc. IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)*, Delft, Netherlands, 2021, pp. 1313–1318. doi: 10.1109/AIM46487.2021.9517604. (Finalist, Best Paper) [link]

[4] C.-W. Chen, Y.-C. Li, and **H.-F. Cheng**, "Endodontic robotic surgical system and endodontic robotic surgical assembly," U.S. Patent No. 12,029,509, 2024.

EXPERIENCE

Robotic Engineer for Fenceless Collaborative Manipulator Nov 2024 - Present

Control Group, Mantis Robotics, New-Taipei, Taiwan.

- Enhancing the perception of collaborative robots by proposing an online calibration algorithm.
- Co-developed a lightweight dual-arm robotic system for efficient manipulation.

***Research Assistant for Autonomous Surgical Tasks** Aug 2021 - Oct 2024

NASA Lab, National Taiwan University, Taiwan. Advisor: Prof. Cheng-Wei Chen

- Led the *DentiBot* project, building the first robot that can autonomously clean and shape root canals.
- Pioneered a 6-DoF string-based patient tracking module that, achieved submillimeter precision.
- Proposed a hybrid position/force control strategy for safe robot-patient alignment.
- Proposed a compensator for the dental file deformation based on the prior knowledge of a cantilever beam.

Research Intern for Human-Drone Interaction Feb 2023 - Aug 2023

MIST Lab, Polytechnique Montreal, Canada. Advisor: Prof. Giovanni Beltrame

- Co-developed an indoor drone show featuring resilient drones performing alongside dancers.
- Incorporated a decentralized controller to manage 6 drones simultaneously.
- Elevated stability of the ultra-wideband (UWB) localization system by enhancing the Extended Kalman Filter.

Research Assistant for Abnormal Tissue Detection Sep 2020 - Jun 2021

MIARL Lab, National Taiwan University, Taiwan. Advisor: Prof. Chun-Yeon Lin

- Invented an electrical impedance sensing system to accurately detect abnormal objects in biological phantoms.
- Applied a deep neural network (DNN) to predict the location and size of abnormal objects.
- Developed biological phantoms with resistivity properties to simulate human tissues and tumors.

Summer Intern for Autonomous Drone Development Jul 2020 - Aug 2020

Summer Intern, Fly-Control Group, Taiwan Space Agency, Taiwan. Advisor: Dr. Chen-Yu Chan

- Developed mode-switching capabilities for a drone, enabling smooth transitions between navigation and rolling.
- Optimized control parameters, empowering the drone to roll 360°.

HONORS & ACCOLADES

Second Place in 2020 TDK National Creative Design Competition (Flying Group) Oct 2019

Led a team to fabricate an autonomous drone within three months.

- Designed a drone that expertly followed ground trajectories, navigated obstacles, and delivered payloads.
- Represented university, led team and secured resources in the competition as the university's pioneer, to construct a fully functional drone from the ground up.

Dean's List(Rank 5/143), National Taiwan University Aug 2020

TEACHING EXPERIENCE

Teaching Assistant *Electronic Circuits Lab (EE1005), NTU* Jan 2022 - Jan 2023

- Lectured undergraduate students and resolved technical issues related to electrical instruments.

Teaching Assistant *Programming for Business Computing (MGT1006), NTU* Sep 2020 - Jan 2021

- Guided new programmers in learning Python and assisted them with homework assignments.

Mentor *High School Students Robotic Projects, NTU and Taipei First Girl High School* Jun 2022 - Sep 2022

- Guided two high school students in developing a virtual environment for human-robot interaction.

SKILLS

- Programming: Python, C/C++, MATLAB
- Systems: ROS/ROS2, Linux (Ubuntu), Git, Docker
- CAD software: Fusion360, Inventor, AutoCAD