Yi-Chen Ju

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Education

University of Oslo (UiO) Aug. 2024 – Jul. 2025
Master of Science (Visting Master Student), Scientific Computing and Modeling *Oslo, Norway*

National Tsing Hua University (NTHU) Sep. 2022 – Jul. 2024
Master of Science, Scientific Computing and Modeling; GPA: 3.76/4.3 *Hsinchu, Taiwan*

National Central University (NCU) Sep. 2018 – Jun. 2022
Bachelor of Science, Mathematics; GPA: 3.27/4.3 *Taoyuan, Taiwan*

Working Papers

RAG-Augmented Agent for Smoothed Particle Hydrodynamics in DualSPHysics *Sep. 2025 – Present*
In collaboration with the Ocean Engineering Laboratory, Zhejiang University (Ongoing) *Zhoushan, China*

- Designed an **End to End multi-agent** (Orchestrator/Retriever/Generator/Validator) converting user queries into scenario prompts and executable DualSPHysics XML.
- Delivered **generation→validation**: Generator compiles compliant XML from prompts+RAG; a rule-encoded **Normalizer** checks schema/units/ranges and auto-fixes gaps to **run-ready**.
- Built the **RAG knowledge base**, authored system prompts & guardrails, and **designed and operated the Prompt-to-XML pipeline** from data to deployment.

Assessing Scale Effects in Solitary Wave-Induced Boulder Transport via High-Fidelity SPH Simulations *Aug. 2024 – Jul. 2025*
Visiting Research Paper in University of Oslo (Unsubmitted) *Oslo, Norway*

- Built a DualSPHysics SPH model for solitary-wave boulder transport; reproduced flume results and validated free surface, run-up, and boulder motion.
- Scaled simulations to study **scale effects**; used dimensionless analyses (Fr/Bo) and sweeps to locate small-scale breakdowns.
- Reduced non-physical **dissipation** via a heuristic (viscosity/time-step/boundary tuning), restoring target wave height/energy and stable transport.

Optimized ICP Algorithm for Point Cloud Registration with Overlapping Region Pruning *Sep. 2022 – Jul. 2024*
Master Research Thesis in National Tsing Hua University *Hsinchu, Taiwan*

- Reviewed PCR variants, DPCR methods, and Point Transformer–based models for feature extraction, correspondence, and geometric optimization (rigid & non-rigid).
- Improved ICP by detecting and excluding **overlapping-but-incorrect** regions, boosting efficiency and accelerating convergence.
- Proposed overlap-aware sampling that downweights overlapping points, reducing zero-rotation/translation bias while balancing speed and accuracy.

Other Professional Research Experience

Machine Learning for Galaxy Classification in Dark Matter Research *Jul. 2021 – Oct. 2021*
Summer Research Internship in National Central University Astronomy Institute *Taoyuan, Taiwan*

- Analyzed velocity dispersion profiles of brightest cluster galaxies (BCGs) and ordinary elliptical galaxies using open datasets from MaNGA and ATLAS, identifying distinct profile characteristics between the two galaxy types.
- Designed and implemented machine learning Random Forest and Multi-Layer Perceptron classification algorithms for BCG identification to analyze velocity dispersion profiles using features such as standard deviation, average, maximum, and minimum.
- Validated the classification model using labeled training and testing datasets, with subsequent application to the MaNGA 1270 database for automated BCG identification.

In-Depth Study and Presentation of Quantum Circuit Optimization *Nov. 2020 – Nov. 2021*
Intern *Taoyuan, Taiwan*

- Conducted research on optimizing quantum circuits to improve the implementation of practical quantum gates and enhance computational efficiency.
- Actively participated in seminars and discussions on advanced quantum computing topics, delivering presentations to communicate research findings effectively.

ML-Based Navigation and Obstacle Avoidance for LiDAR Robots *Jun. 2019 – Sep. 2020*
Undergraduate Researcher in National Central University Robotics Lab *Taoyuan, Taiwan*

- Developed a Q-learning algorithm with linear function approximation to enable a LiDAR-equipped robot to navigate and avoid obstacles autonomously.
- Applied machine learning principles to process real-world LiDAR sensor data, integrating angle and distance measurements into the robot's decision-making framework.
- Trained and tested the robot in a real-world environment, utilizing a custom reward function to optimize goal-reaching efficiency and collision avoidance.

Internship Experience

Technology R&D Department of Jin Shin Engineering Consultants Co., Ltd. *Jul. 2024 – Present*
Research Intern, Point Cloud Research and Development *Hsinchu, Taiwan*

- Developed algorithms for point cloud compression and feature extraction, leveraging K-Nearest Neighborhood Search and curvature analysis to detect sharp edges and downsample planar areas while preserving key geometric features.
- Proposed a machine learning-based segmentation framework using Point Transformer, enabling automated differentiation of architectural components for Building Information Modeling (BIM).
- Implemented GPU-accelerated processing with Open3D and synthesized research findings into actionable strategies, driving innovation in point cloud applications within the company.

Logitech International S.A. *Jul. 2023 – Sep. 2023*
NPI Operation Intern *Hshinchu, Taiwan*

- Extracted and organized legacy database records, transitioning data into a centralized repository and creating a web-based interface to facilitate efficient access and retrieval for team members.
- Designed and implemented an automated tool to generate visual tree diagrams of complex folder structures, improving data navigation and enhancing workflow efficiency.

Extracurricular Experience

National Tsing Hua University Basketball Team *Sep. 2022 – Jul. 2024*
Team Player

- Tsing hua basketball team player, fostering teamwork, discipline, and collaboration.

National Central University Basketball Team *Sep. 2018 – Jul. 2020*
Team Captain

- Team captain, mentoring, strategizing, and fostering teamwork while building leadership.

Specialized Skills

Programming: Python, MATLAB, C++

Languages: English (Fluent)-IELTS overall:7.5, Mandarin (Native)