Po-Jui 'Ray' Huang

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EDUCATION

National Yang Ming Chiao Tung University — Hsinchu, Taiwan
M.S. in Electrical and Control Engineering — February 2021~ March 2023(expected)
GPA: 4.01/4.3

National Chiao Tung University — Hsinchu, Taiwan
B.S. in Electrical and Computer Engineering — September 2017~ January 2021
GPA: 3.61/4.3; Last 60 credits GPA: 3.74/4.3

SKILLS

- **Programming:** Python, C/C++, Matlab
- **Middleware and Libraries:** ROS, Gazebo, Docker, OpenCV, PCL
- **Deep Learning Framework:** PyTorch, TensorFlow
- **Embedded Board:** Nvidia Jeston (Xavier, TX2, Nano), Raspberry PI(3B, 3B+), PXA270
- **Hardware:** SolidWorks, 3D Printing

RESEARCH EXPERIENCE

Maritime RobotX Challenge — Sydney, Australia
NYCU Team Leader — March 2022 - Present
- Won 3rd place out of 20 teams in the competition
- Developed deep reinforcement learning autonomy system using **TensorFlow** with **Gazebo** simulator; achieved sim-to-real results for goal navigation and collision avoidance
- Integrated autonomy system with perception module and used behavior tree to handle the state of WAM-V with **Python, C++ and ROS**
- In charge of WAM-V-related missions; responsible for perception and autonomy as well as cooperating with UAV
- Head of fifteen-member team conducting research as well as responsible for communicating with competition organizer

Curriculum Reinforcement Learning for Navigation — May 2021 - July 2022
- Implemented distributed distributional deterministic policy gradient for navigation among movable obstacles using **TensorFlow**
- Applied curriculum learning to stimulate deep reinforcement learning agent and achieve high reward space; dealt with complex tasks including passing narrow gates and interacting with doors

DARPA Subterranean Challenge: Urban Circuit — Elma, Washington, USA
NCTU Team Member
Topic: Millimeter wave radar navigation in adverse environmental conditions — July 2020 - April 2021
- Built and calibrated sensor system to collect synchronized data for millimeter wave radar navigation

Topic: Integration of Multi Pan-Tilt Cameras on Unmanned Ground Vehicle Husky — January - June 2020
- Built emergency stop system to adhere to competition safety criteria; designed sensor brackets for unmanned ground vehicles using **SolidWorks**
- Designed a pan-tilt system with correct coordinate transformation using dynamixel motors to enhance D435 camera field of view

Topic: Tamasuke: Unmanned Fireproof Spherical Robot Platform — September 2019 - February 2020
- Built movable spherical nodes including mesh WiFi and Xbee using **Python** and **ROS** for communication systems
- Executed fireproof experiment using spherical robot; robot still functioned after being on fire for thirty seconds

PUBLICATIONS

- **P.-J. Huang***, C.-I. Huang*, S. K. Lim, P.-J. Huang, M.-F. Hsieh, L. S. Yim, Y.-T. Ko, H.-Y. Hung, Y. Chen, J.-X. Liu, L.-W. Liou, S.-F. Chou, Y.-C. Teng, K.-J. Weng, W.-C. Lu, H.-C. Wang, "A Learning-based Modular Heterogeneous USV and UAV Team in the Maritime RobotX 2022 Competition," Maritime RobotX 2022 Competition Technical Design Paper (*Equal Contribution)
- H.-C. Wang, S.-C. Huang, **P.-J. Huang**, K.-L. Wang, Y.-C. Teng, Y.-T. Ko, D. Jeon, I.-C. Wu, "Curriculum Reinforcement Learning from Avoiding Collisions to Navigating among Movable Obstacles in Diverse Environments," submitted to IEEE Robotics and Automation Letters 2022 (Under Review)
- J.-T. Huang, C.-L. Lu, P.-K. Chang, C.-I Huang, C.-C. Hsu, Z. L. Ewe, **P.-J. Huang**, and H.-C. Wang, "Cross-Modal Contrastive Learning of Representations for Navigation using Lightweight, Low-Cost Millimeter Wave Radar for Adverse Environmental Conditions," IEEE Robotics and Automation Letters 2021, (RA-L). 6(2), 3333-3340
- C.-L Lu*, J.-T. Huang*, C.-I Huang, Z.-Y. Liu, C.-C. Hsu, Y.-Y. Huang, S.-C. Huang, P.-K. Chang, Z. L. Ewe, **P.-J. Huang**, P.-L. Li, B.-H. Wang, L.-S. Yim, S.-W. Huang, M.-S Bai, H.-C. Wang, "A Heterogeneous Unmanned Ground Vehicle and Blimp Robot Team for Search and Rescue using Data-driven Autonomy and Communication-aware Navigation," Field Robotics - Special Issue: Advancements and lessons learned during Phase I & II of the DARPA Subterranean Challenge. 2022

PROJECT EXPERIENCE

Cloud Computing and Big Data Analytics   March 2022 - June 2022
- Extracted music data features and trained a Convolutional Neural Network with **PyTorch** for sound memorability prediction; came in top five percentile in class and shared findings with classmates
- Trained an Autoencoder model using **PyTorch** to detect anomaly time-series data

Embedded Operating Systems   March 2022 - June 2022
- Designed card matching game with PXA270 by socket, semaphore, multi-thread and timer using **C++**

Self-Driving Cars   September 2021 - January 2022
- Used Iterative closest point algorithm to estimate self-driving car positions with a given point cloud map using **C++** and **PCL**
- Participated in Argoverse 3D Tracking Competition detecting and giving location for every object in the scene using **C++** and **PCL**

Robotics   September 2020 - January 2021
- Implemented forward and inverse kinematics for a simulated robot arm using **Matlab**
- Implemented joint and Cartesian movement to plan path for a robot manipulator using **Matlab**

Human Centric Computer Lab   March 2020 - June 2020
- Implemented a teleoperated robot (Locobot) system with mission to detect and localize specific objects in an environment where a map is given via Apriltags
- Modules: Learning-based Object Detection (YOLO v4), Localization(Apriltags and wheel odometry)
- First place in Mini-Subterranean competition

TEACHING ASSISTANT

NYCU: Robotic Vision: Professor Hsueh-Cheng Wang   Spring 2022
- Responsible for applying deep reinforcement learning on robot navigation in lab courses

NCTU: Introduction to Artificial Intelligence: Professor Hsueh-Cheng Wang   Fall 2020
- Responsible for instructing AIMA Search and examiner for final coding interview test in lab

NCTU: AI Robot Development Workshop: Professor Hsueh-Cheng Wang   Summer 2020