

Pengzhi Yang

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EDUCATION

- **Delft University of Technology (TUD)** Delft, Netherlands
Master of Science - Computer Science, Artificial Intelligence Technology September 2022 - Present
- **Eidgenössische Technische Hochschule (ETH) Zurich** Zurich, Switzerland
ETH Robotics Student Fellowship Program; Acceptance Rate: 8.9% July - August 2023
- **University of Electronic Science and Technology of China (UESTC)** Chengdu, China
Bachelor of Engineering - Computer Science; GPA: 3.90/4.00, Ranking: 7.11% September 2016 - June 2020
Honors Diploma - Yingcai Honors College
- **University of California, Santa Barbara (UCSB)** Santa Barbara, United States
Exchange Program - Computer Science; GPA: 4.00/4.00 March 2019 - June 2019

TOEFL: Reading 29/ Listening 26/ Speaking 25/ Writing 25/ Total 105, **GRE:** Verbal 156/ Quantity 170/ AW 4.0

RESEARCH INTERESTS

I am avidly invested in exploring the potential of deep reinforcement learning (DRL) methods to enhance the decision-making proficiency of robots through the integration of robust perceptual capabilities.

PUBLICATIONS

1. **P. Yang**, S. Koga, A. Asgharivaskasi, N. Atanasov, Policy Learning for Active Target Tracking over Continuous SE(3) Trajectories, *Learning for Dynamics and Control (L4DC)*, 2023. **Oral presentation (top 10%)**. [\[pdf\]](#)
2. **P. Yang**, Y. Liu, S. Koga, A. Asgharivaskasi, N. Atanasov, Learning Continuous Control Policies for Information-Theoretic Active Perception, *IEEE International Conference on Robotics and Automation (ICRA)*, 2023. [\[pdf\]](#)
3. **P. Yang***, H. Liu*, M. Roznere, A. Quattrini Li, Monocular Camera and Single-Beam SonarBased Underwater Collision-Free Navigation with Domain Randomization, *International Symposium on Robotics Research (ISRR)*, 2022. [\[oral\]](#) [\[pdf\]](#) [\[doi\]](#) [\[video\]](#)
4. **P. Yang**, J. Liu, H. Yang, S. Wu, B. Teng, Magnetic Field Energy of Two Parallel Current-carrying Straight Wires[J], *Physics Bulletin*. 38(7): 9-13, 2019. [\[pdf\]](#)
5. J. Li, L. Han, H. Yu, Z. Wang, **P. Yang**, Z. Ren, Potato: A Data-Oriented Programming 3D Simulator for Large-Scale Heterogeneous Swarm Robotics, *ICRA Workshop on The Role of Robotics Simulators for Unmanned Aerial Vehicles*, 2023. [\[pdf\]](#)
6. Y. Zhou, M. M. Gillavry, **P. Yang**, Z. Xu, B. Zhang, R. Bidarra, Astral Body: a virtual reality game for body ownership investigation, *Submitted to Games and Learning Alliance Conference (GALA)*, 2023.

RESEARCH EXPERIENCE

- **Prof. Emilio Frazzoli's group, ETH Zurich** Zurich, Switzerland
Research Assistant, Daily Supervisor: Dr. Dejan Milojevic, Dr. Gioele Zardini June 2023 - Present
Sensor Benchmarking of Object Detection Models for Autonomous Vehicle Co-design
 - Leveraged the MMDetection3D platform to generate detection metrics (True Positives, False Negatives, and False Positives) across various object detection models, utilizing both Camera and Lidar sensors.
 - Enhanced the GUI for more intuitive datapoint visualization.
 - Implemented both Exact and Variational Gaussian Process models to predict and analyze different models' performance with different input features, informing subsequent autonomous vehicle co-design tasks.
- **Existential Robotics Laboratory, University of California, San Diego (UCSD)** Remote
Research Assistant, Advisor: Dr. Shumon Koga, Prof. Nikolay Atanasov February 2022 - June 2023
Learning-based Active Target Tracking
 - Proposed a continuous control policy trained with PPO for active target tracking with an information-theoretic cost by employing a differentiable FoV.
 - Applied attention-based model architecture for permutation-invariant property dealing with an arbitrary number of moving targets. Leveraged Kalman Filter to maintain the mean and covariance for the targets and utilize both as the observation to formulate the task into an MDP problem.
 - Achieved prioritized landmark localization and joint exploration-landmark localization. Also applied the model in a Unity simulated environment – updating the landmarks' position estimations using a pinhole camera model with the simulated semantic segmentation and depth cameras.
 - Papers have been **accepted by ICRA 2023** and **L4DC 2023**, see Pub. [1](#), [2](#).

- Dartmouth Reality and Robotics Lab, Dartmouth College** Hanover, US and Remote
Research Assistant, Advisor: Prof. Alberto Quattrini Li July 2019 - February 2022
Underwater Robot Obstacle Avoidance and Navigation
 - Monocular camera and single-beam sonar for low-cost perception platform. Tested existing depth estimation methods and adopted Depth Prediction Transformers (DPT) as the backbone network for feature extraction.
 - Proposed a novel DRL-based (Proximal Policy Optimization, PPO) collision-free navigation system: integrating predicted depth maps, single-beam sonar readings, and relative goal positions for an Autonomous Underwater Vehicle to navigate to the goals while avoiding nearby obstacles with continuous actions.
 - Employed Unity Simulation for realistic underwater scenes to train the policy network. Combined Domain Randomization to improve the model's robustness and mitigate the problem from *sim-2-real gap*.
 - Extensive ablation studies, comparisons, and field experiments demonstrated the proposed system's high efficiency, safeness, and transferability. Paper **accepted by ISRR 2022**, see Pub. [3](#).
- Center for Robotics, UESTC** Chengdu, China
Undergraduate Research Assistant, Advisor: Dr. Chen Wang, Prof. Shuzhi Ge November 2019 - June 2020
Robot Indoor Localization
 - Modified ACS files to create VizDoom Mazes with required behaviors for environmental interactions.
 - Reproduced Active Neural Localizer with A3C in the created mazes based on Bayesian Filter. Adjusted the Perception Model employing distance information in the simulated 3D environments.

INTERNSHIP

- Robotics X, Tencent** Shenzhen, China
Research Intern, Advisor: Dr. Cheng Zhou December 2020 - August 2021
Quadruped Robot Locomotion with Deep Reinforcement Learning
 - Trained policy network with PPO using reference motions for quadruped robot (Max) locomotion in Pybullet.
 - Introduced domain adaptation: predicting randomized dynamic parameters using sequences of Robot state and executed action data in Pybullet. Fed the predicted parameters for the policy network and computed better adaptable control policies for Max's locomotion. Obtained a 5.09% higher average reward in various dynamics environments in Gazebo compared with Robust DRL controller.
 - Deployed the project in Tencent TLeague Framework (a high-performance distributed RL framework) with Kubernetes, and almost five times accelerated the training speed. During testing, realized a faster real-time control with C++ implementations (Eigen). The system adapted to the real robot was also achieved.

SELECTED PROJECTS

- Seminar Formal Methods for Learned Systems, TUD** September - November 2022
 - Acquired foundational knowledge in Modelling, Specification, and Verification for Machine Learning. Conducted Reachability Analysis for Neural Network Control Systems using Julia programming language.
 - Investigated the efficacy and robustness of Shielding Techniques in RL-based systems. See final report [\[here\]](#).
- Robot Dynamics & Control, TUD** September - November 2022
 - Applied a PD controller to control a quadrotor to follow different paths. Implemented torque and position-controlled robot and achieved singularity-robust control and task-priority control with a robot arm. Controlled vehicle lateral displacement motion using PID controller. Final project got **9.5/10**.
- Compiler for Simplified C++, UCSB** April - June 2019
 - Course project of Translation of Programming Languages (CS160). Implemented a simplified compiler using C++, including Scanner, Parser, Abstract Syntax Tree, Type Checking, and Code Generation.
 - Passed all tests successfully with zero errors and generated valid X86 assembly codes. Received an **A+**.
- Development of an Eight-Stage Pipelined MIPS Processor, UESTC** April - June 2018
 - Built a 32-bit CPU based on gate-level circuits; embedded a deep pipeline into its ALU module; ran FFT on it.
 - Won **1st** place in the Efficiency Competition amongst all teams.

SKILLS SUMMARY

- Languages:** Python, C++, C, C#, Matlab, JavaScript, Julia, Verilog, Shell, XML, SQL, Latex
- Frameworks:** Pytorch, GPytorch, Tensorflow, OpenCV, Keras, Eigen, D3, Scikit, Pandas
- Tools:** ROS, Unity, Kubernetes, Docker, GIT, Gazebo, Pybullet, UWSim, QGroundControl, VizDoom, Jupyter Notebook, SolidWorks, MathCad, Vivado, Wireshark, Multisim
- Interests:** Travelling, [Photography](#), Swimming, Biking, Scuba Diving (Open Water Certificate), Manual Work

HONORS AND AWARDS

- Shiqiang Enterprise Scholarship (top 1%) October 2018
- Excellent Student Scholarship in UESTC (top 5%) September 2017/2018/2019
- Excellence (top 10%) in College Students Innovation and Entrepreneurship Competition (2018) of UESTC January 2019
- Second prize in the English Speech Contest in UESTC June 2018
- Outstanding Volunteer as the team leader of a voluntary teaching organization in China rural counties October 2017
- Excellence Award for Business Competition at Manulife short-term program February 2018