# Pengzhi Yang

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## ● EDUCATION AND TRAINING

09/2022 – CURRENT Delft, Netherlands
**MASTER OF SCIENCE - COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE TECHNOLOGY** Delft University of Technology (TUD)

**Address** Delft, Netherlands

09/2016 – 06/2020 Chengdu, China
**BACHELOR OF ENGINEERING - COMPUTER SCIENCE;** University of Electronic Science and Technology of China (UESTC)

*Yingcai Honors College (Elite School - Top 2% Student).* **GPA: 3.90/4.00, Ranking: 7.11%**

**Address** Chengdu, China

03/2019 – 06/2019 Santa Barbara, United States
**EXCHANGE PROGRAM - COMPUTER SCIENCE** University of California, Santa Barbara (UCSB)

**GPA: 4.00/4.00**

**Address** Santa Barbara, United States

## ● ADDITIONAL INFORMATION

### PUBLICATIONS

**Policy Learning for Active Target Tracking over Continuous SE(3) Trajectories**
**P. Yang**, S. Koga, A. Asgharivaskasi, N. Atanasov. *Learning for Dynamics and Control (L4DC)*. 2023. [pdf]

**Learning Continuous Control Policies for Information-Theoretic Active Perception**
**P. Yang**, Y. Liu, S. Koga, A. Asgharivaskasi, N. Atanasov, *IEEE International Conference on Robotics and Automation (ICRA)*, 2023. [pdf]

**Monocular Camera and Single-Beam SonarBased Underwater Collision-Free Navigation with Domain Randomization**
**P. Yang**\*, H. Liu\*, M. Roznere, A. Quattrini Li. *The International Symposium on Robotics Research (ISRR)*, 2022. [oral][pdf][video]

**Magnetic Field Energy of Two Parallel Current-carrying Straight Wires[J]**
**P. Yang**, J. Liu, H. Yang, S. Wu, B. Teng. *Physics Bulletin. 38(7): 9-13*, 2019. [pdf]

### RESEARCH INTERNSHIPS

02/2022 – CURRENT
**Learning-based Active Target Tracking**

**Existential Robotics Laboratory, University of California, San Diego (UCSD).** *Advisor: Prof. Nikolay Atanasov, Dr. Shumon Koga.*
1. Proposed a continuous control policy trained with PPO for active target tracking with an information-theoretic cost by employing a differentiable FoV.
2. 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.
3. 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.
4. Papers have been **accepted by ICRA 2023** and **L4DC 2023**, see Pub. 1, 2.

07/2019 – 02/2022
**Underwater Robot Obstacle Avoidance and Navigation**

**Dartmouth Reality and Robotics Lab, Dartmouth College.** *Advisor: Prof. Alberto Quattrini Li.*
1. 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.
2. 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.
3. 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.
4. 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.

11/2019 – 06/2020
**Robot Indoor Localization**

**Center for Robotics, UESTC.** *Advisor: Prof. Shuzhi Ge, Dr. Chen Wang.*
1. Modified ACS files to create VizDoom Mazes with required behaviors: discretized agent's actions and built APIs for interaction.
2. Reproduced Active Neural Localizer with A3C algorithm in the created mazes based on Bayesian Filter. Adjusted the Perception Model using distance information in the simulated 3D environments and facilitated the system's practical applications.

03/2018 – 01/2019
**Research on Energy of Magnetic Field of an Ideal Physical Model**

**School of Physics, UESTC.** *Advisor: Prof. Baohua Teng.*
1. Calculated the energy density distribution of magnetic field in two parallel long current-carrying straight wires based on the principle of vector synthesis of magnetic induction intensity.
2. Simulated the magnetic field distribution and total magnetic energy curves under different current directions and different wire distances, gave a reasonable and intuitive theoretical description of the problem.
3. Paper accepted by Physics Bulletin, see Pub. 4.

**INTERNSHIP**

12/2020 – 08/2021
**Quadruped Robot Locomotion with Deep Reinforcement Learning**

**Robotics X, Tencent** (Research Intern). *Advisor: Dr. Cheng Zhou.*
1. Trained policy network with PPO using reference motions for quadruped robot (Max) locomotion in Pybullet.
2. 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.
3. 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.

03/2022 – 07/2022
**Development of a 3D Simulator for Large-Scale Heterogeneous Swarm Robots**

**Stars Lab, Beihang University** (Software Developer). *Advisor: Prof. Liang Han.*
1. Developed highly efficient functions for swarm robots' in-pair interactions such as collision avoidance.
2. Improved the efficiency using Pytorch broadcasting technique for the 3D simulator packaged by PyTorch TorchScript and ran it on GPU. It was shown to perform much better than Octree tricks.

**SELECTED PROJECTS**

09/2022 – 11/2022
**Robot Dynamics & Control, TUD**

1. 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.
2. Course Project got **9.5/10**.

04/2019 – 06/2019
**Compiler for Simplified C++, UCSB**

1. 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.
2. 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**

1. Built a 32-bit CPU based on gate-level circuits; embedded a deep pipeline into its ALU module; ran FFT on this simulated processor.
2. Won **1st** place in the Efficiency Competition amongst all teams.

## HONOURS 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

## SKILLS SUMMARY

**Languages**

Python, C++, C, C#, Matlab, JavaScript, Verilog, Shell, XML, SQL, Latex.

**Frameworks**

Pytorch, 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.