

YIHAO (Charles) CAI

Email: ycai5@wpi.edu | LinkedIn: [linkedin.com/in/yihao-cai](https://www.linkedin.com/in/yihao-cai) | GitHub: github.com/CharlesCai123

Mobile: +1 7743123987 | Address: 199 Highland St, Worcester, MA 01609

EDUCATION

Worcester Polytechnic Institute

Sep. 2021 – May. 2023

Worcester, MA, USA

- Major: Robotics Engineering – Master of Science (GPA: 3.8/4.0)
- Relevant Course: Robot Dynamics/Control, Human Robot Interaction, Motion Planning, Operating System, Software Security

Nanjing University of Posts and Telecommunications

Sep. 2016 – Jun. 2020

Nanjing, Jiangsu, China

- Major: Telecommunications Engineering – Bachelor of Science (GPA: 3.43/4.0)
- Relevant Course: Digital Signal Processing, Signals & Systems, Automation Control Theory, Computer Networks, etc.

WORKING EXPERIENCE

ABB Inc. (USA)

Jan. 2023 – May. 2023

R&D Engineer, Department of Robotics & Discrete Automation / Internship

San Jose, CA, USA

- As an R&D engineer, I must find cutting-edge solutions in CV/ML to increase pick-and-place robot performance.
- Build a software framework on Nvidia AI SoC (Jetson AGX Orin) by setting up the GPU computing pipeline (with CUDA, PCL, OpenCV, TensorFlow) and model conversion (TF-TRT) for testing and optimizing inference result (5x faster)
- Research & explore the state-of-the-art Transformer-based DLNN model (Mask3D) in 3D semantic instance segmentation to provide alternatives for solving limitations of the current approach by establishing the high-performance training pipeline.
- Innovate a 2D-based approach for 3D point cloud data labeling and batch generation to train customized models.

Hillstone Networks Co., Ltd

May. 2021 – Aug. 2021

Software Development Engineer, Department of Cloud Security

Beijing, China

- Utilize Kubernetes to organize Docker container clusters and design a security scheme following CIS Benchmarks to protect against container threats; Implement RPC frameworks (HTTP, RESTful, gRPC) to build microservice modules using Golang.
- Exposed to Linux kernel and system modules, including SELinux, AppArmor, eBPF and IPC namespace; I create application-level policies for securing interactions among Docker modules (dockerd, containerd and runc, etc.), increasing overall container security performance in business product around 15%

Whale Cloud Technology Co., Ltd

Jul. 2020 – Mar. 2021

DevOps Engineer, Department of International & Operation Center

Nanjing, China

- Configure web environment by building an automation framework using Shell to deploy Java middleware (Nginx/Dubbo/Redis) on server and ensuring security by utilizing Iptables packet filter with other flow analysis tools (Tcpdump/Wireshark).
- Conduct an end-to-end product delivery by designing test cases (Functional Test) in agile software development, setting up CI/CD pipeline for blue-green deployment, and maintaining Oracle user databases by creating stored procedure statements.

PROJECT / RESEARCH EXPERIENCE

Using Reinforcement Learning to Provide More Robust Congestion Control

Sep. 2022 – Dec. 2022

- To improve congestion control (CC) robustness in TCP layer, I design and implement a distributed RL-based framework in a virtual network environment (Mininet) and extend its interfaces for customized network topology using synthetic data ([GitHub](#))
- Make a system analysis and test the final performance by comparing it with other traditional CC algorithms (TCP Cubic) in a three-by-three dumbbell network topology with different metrics (Bandwidth, Router Buffer Usage, etc.)

Photo App Development (Full-stack)

May. 2022 – Aug. 2022

- Design and create App UI layout using Flutter including interaction with SaaS platform Firebase, response/request by RESTful API, and widget status management through Riverpod; Also, I build an architecture for Flutter Automation Testing (Frontend)
- For backend side, I set up an environment for auto-configuring PostgreSQL database and also establish a benchmark test framework to estimate database RLS (Row-Level-Security) feature performance ([GitHub](#))

WPI HiRO (Human-Inspired Robotics Laboratory) Lab Researcher

Aug. 2021 – Sept. 2022

- I create an IBVS (Image-based Visual Servoing) scheme with two 6-Dof Kinova arms model by combination of Unity3D and ROS for shared autonomous teleoperation which uses Oculus VR headset for remote scenario telepresence ([GitHub](#))
- Development of physical wearable system with RealSense Cameras (sensing), HTC VIVE Trackers (body data) and VR Headset (gaze data + presence) in Unity3D using C#. Design user study and analyze data for research on active telepresence ([GitHub](#))

National University Sci & Tech Innovation Program – SLR (Sign Language Recognition)

Sept. 2018 – Jan. 2020

- Data Extraction of sign language features from a batch of video frames captured by KinectV2 (using C++) plus image-processing algorithms from OpenCV (Edge Detection, Threshold Segmentation, Image Filtering) for performance optimization.
- Implementation of Neural Networks (C3D, LSTM, R(2+1)D, etc.) to train model and model parameters tuning on server

An Intelligent Housekeeper System Design Based on Physical Raspberry Pi using C++

Dec. 2018 – May. 2019

- Build a master controlling system from scratch by deploying wires on bread board with GPIO pins Including single module implementation (Laser and Temp sensor, MQ-5 Gas Sensor, ADC etc.) and module communication (using SPI, I2C, UART)
- Program analog sensors using C++ and design a user-friendly GUI with Qt Creator in Raspberry Pi (Broadcom BCM2835)

Summer Mathematical Modelling Competition Activity

Jun. 2018 – Sept. 2018

- Master common mathematical models and algorithms like regression model, correlation analysis and grey prediction, etc.
- Responsible for creating mathematical models applied to daily life and improve the parameters (MATLAB)

University Automation Science Laboratory Robotics Research Project

Jan. 2017 – Dec. 2018

- Design robot URDF model (using Solidworks) for simulation and integrate tools/algorithms into the physical robotic platforms (TurtleBot, DOBOT Arm, etc.) to perform some basic tasks (Navigation, Locomotion, Grasping, etc.)
- Build a framework for robot hand-eye coordination system using Halcon and MATLAB, plus implementation of it for object detection and grasping without collision using motion planning algorithms from MoveIt library.

EXTRA-CURRICULAR ACTIVITIES

- Member of Cyber Security and Rho Beta Epsilon Club in WPI 2021 - Present
- Founder Member of University Piobot Robotics Club in NJUPT 2017 - 2019
Team Leader of Robotics Arm Team, organizing instruction lessons and participating in national robotics competitions and projects

HONORS / AWARDS

- Candidate of Tau Beta Pi Honor Society (WPI Massachusetts Alpha Chapter) 2022
- ML Paper published on IWPR 2020 (DOI: <http://dx.doi.org/10.1117/12.2574424>) 2020
- First Prize in 2018 National Artificial Intelligence Internet Innovation Competition 2018
- Third Prize in National University Mathematics Modelling Competition 2018
- Third Prize in 2018 China National Service Robot Competition 2018
- First Prize in Provincial University Advanced Mathematics Contest 2017
- Faculty Honors: Faculty Academic Excellence Scholarship, Civilian Award 2016 – 2017

SKILLS

- **Programming Languages:**
 - C/C++, Python, MATLAB, C#, Shell/Tcl, Golang, Dart, Assembly, HTML5/CSS, JavaScript, PL/SQL, VHDL/Verilog
- **AI & Robotics Framework:**
 - ROS, Gazebo/RViz, SLAM, OpenCV/Open3D, Point Cloud Library, MoveIt, scikit-learn, TensorFlow/PyTorch/RLlib, Keras/Caffe, CUDA/cuDNN/TensorRT, OpenGL
- **Tools/Platforms:**
 - **Software:** MS Office, OmniGraffle, Unity3D, Blender, Wireshark, Mininet, SolidWorks, AutoCAD, IDA Pro
 - **IDE:** Vim/Emacs, RoboWare Studio, Android Studio, VSCode, Eclipse, CLion, PyCharm, Qt Creator, MASM
 - **DevOps/Web:** CMake, Docker, Kubernetes, Oracle Database, Flutter, .Net Framework, Git and SVN