Zachary W. Zhao

Phone: +1 (206) 255 9564 | Email: wennie99@uw.edu | LinkedIn | Address: Seattle, WA, USA

SUMMARY

- Extensive Python Development Experience: Over 5 years of professional and research experience in developing and debugging Python code, with roles at Visionify.ai, the University of Washington, and the AARG at the UoE.
- Collaborative Research Experience: Significant experience working alongside researchers at the Information Processing Lab at UW and the Autonomous Agents Research Group at the University of Edinburgh. Involved in interdisciplinary projects, publications, and patents, including computer vision projects with NASA JPL and UW.
- Skilled in defining evaluation metrics, building evaluation systems, and scaling up pipelines and tooling. Proficient in using advanced computer vision toolboxes like OpenPCDet and Openmmlab in both professional and research projects. Developed the PreValidator4PPE pipeline at Visionify.ai and created a zero-shot data generation pipeline for NASA.
- Experience with Large-Scale Datasets and Distributed Systems: Managed large-scale datasets for autonomous driving research such as Kitti and Waymo, and utilized cloud computing platforms for distributed machine learning training. Analyzed and implemented advanced CV algorithms on over 3,000 workplace videos on customer datasets.
- **Certifications:** Machine Learning, Deep Learning Specialization, Self-Driving Cars Specialization, Reinforcement Learning Specialization, Data Structures & Algorithms

EDUCATION

University of Washington **Seattle, WA**

M.S. in Electrical and Computer Engineering (GPA: 3.84) *Sep 2022 – Aug 2024*

Research Domain: Computer Vision, Deep Learning, Autonomous Driving

SKILLS

Python | C/C++ | Java | MATLAB | PyTorch | TensorFlow | Azure | CUDA | CV | ML | DL | LabVIEW | Linux | ROS | Rviz | Keil | Catia | AutoCAD | Arduino | STM32 | RPi | Git | PCB | 3D Print | HTML5 | CSS | React | D3.js | Node.js

PUBLICATION & PATENTS

- Zhao, W., et al. Interval Short-Term Traffic Flow Prediction Method Based on CEEMDAN-SE Noise Reduction and LSTM Optimized by GWO. Wireless Communications and Mobile Computing, 2022.
- A method for fruit recognition based on deep learning neural network. (CN 114677672A, Jun 2022)
- A Self-adapting Wind-driven Generator (CN 212106125U, Dec 2020)
- Multi-Parameter Measuring Device for Solid-Liquid Two-Phase Flow (CN208818259U, May 2019)

WORK EXPERIENCE

Computer Vision Engineer **Visionify.ai**

Enhanced workplace safety through DL computer vision techs *Seattle, WA / Mar 2024 - Present*

- Analyzed nearly over 3,000 client-specific workplace videos to identify the causes of false positives in PPE detection.
- Developed the PreValidator4PPE pipeline in python, a human body part visibility assessment tool based on the YOLOv8-pose model.
- Enhanced and achieved an average detection accuracy of 91.88% across five different input requirements of the PPE detection model.

Research Assistant, Machine Learning Engineer **Information Processing Lab UW**

Advance CV research in Autonomous Driving Domain *Seattle, WA / Jun 2023 – Mar 2024*

- Mitigated offset issues for provided dataset by designing and implementing advanced 3-D constrained multi-core image algorithms, contributed to the improvement of future driving datasets, focusing on detection accuracy in complex scenarios.
- Established a baseline for the CMKD on a custom dataset using OpenPCDet, setting the foundation for further model improvements and application-specific tuning.

Graduate Research Assistant **Autonomous Agents Research Group UOE**

Research in motion planning and prediction systems for autonomous vehicles *Edinburgh, UK / Apr 2023 – Aug 2023*

- Enhanced the system by incorporating 7 scenarios with on-ramps and off-ramps, using Python and the RoadRunner framework, to better simulate real-world traffic conditions and improve navigational capabilities in diverse driving environments.

RESEARCH EXPERIENCE

Machine Learning for Extreme Traverse Lunar Explorer **NASA JPL & UW ENGINE Capstone**

Jan 2023 – June 2023

- Developed and applied machine learning algorithms in Python and Linux to semantically segment real-world on-field datasets from JPL's EELS and IceNet, enabling hazard identification in harsh subterranean conditions on Earth and the Moon.
- Implemented non-supervised domain adaptation for robust semantic segmentation in unknown environments. Evaluated and compared unsupervised, semi-supervised, and non-deep learning methods to determine the most deployable approach for extraterrestrial missions.
- Pioneered a flexible zero-shot data generation pipeline, automating pixel-perfect semantic labeling without manual human annotations.

Machine Learning Cybersecurity, University of Washington *Apr. 2023 - June 2023*

- Utilized TensorFlow and Keras in python to adapt LeNet-5, VGG-16, and InceptionV1 (GoogLeNet) architectures for adversarial machine learning experiments.
- Implemented FGSM and DeepFool attacks on MNIST dataset, reducing test accuracy from 96.53% to 21.36%.
- Applied Distillation Defense and Randomized Smoothing techniques in python, achieving 98.69% accuracy under adversarial perturbations and identifying optimal sigma values for balancing robustness and performance.

Tuning-PlaySite, University of Washington *Apr. 2023 - June 2023*

- Developed and designed an interactive online tool for exploring and analyzing hyperparameter tuning in machine learning models, aiding users in selecting optimal settings for improved model performance.
- Created a user-friendly interface using Java and HTML5 that enables users to experiment with various hyperparameter configurations and visualize the results, facilitating informed decision-making in hyperparameter tuning for enhanced model accuracy.

TinyML-Weather-Wizard, University of Washington *Apr. 2023 - June 2023*

- Developed and optimized a sophisticated weather forecasting model using Python utilizing diverse datasets to accurately predict Seattle's weather conditions.
- Employed advanced model compression techniques and implemented periodic updates for efficient deployment on resource-constrained hardware in C++, specifically the Arduino Nano 33 device. This resulted in a compact and computationally efficient solution without compromising prediction accuracy.

Self-Driving Robot Path Planning project, University of Washington *Oct. 2022 - Dec. 2022*

- Led the development of an autonomous driving robot usingß Python in Linux system, leveraging the Robot Operating System (ROS) architecture in a dynamic open environment.
- Designed and implemented technologies for precise environmental mapping, adaptive path planning, real-time navigation, and intelligent decision-making, showcasing a grasp of mobility and automation concepts.

Vision Module Leader, China Agricultural Robot Competition *July 2021 - Oct. 2021*

- Implemented first and second-order derivative algorithms for image intensity analysis in LabVIEW, successfully isolating the maximal differential in image data. This approach effectively mitigated the effects of varying sunlight intensity and sampling frequency in open-space environments.
- Applied video image single frame sequential sequence extraction filter to suppress noise.
- Innovatively utilized continuous images to extract the target edge coordinates and averaged the gray values of several points in the maximum possible target neighborhood, made the accuracy of model recognition improved from 40% to 90%
- Won the **First Prize & Best Innovation Award**

Multi-Parameter Detection System for Acoustic Attenuation Data Inversion of Solid-Liquid Two-Phase Flow (National Entrepreneurship Training Project) *May 2020 - May 2021*

- Constructed inverse multi-parameter prediction models in Matlab by incorporating acoustic attenuation and acoustic propagation theories.
- Designed and created PCB circuit diagrams for the control system, and programmed electric control systems in C++.
- Developed a three-layer forward neural network based on the BP neural network for multiple return amplitudes and reflection coefficients to train samples with varying concentrations, resulting in an error deviation within 0.3%.
- Won the **Grand Prize (provincial)** and the **Third Prize (national)**

HONORS

- Provincial Outstanding Graduate (2021), Merit Student (2021), National Encouragement Scholarship (2020 & 2019), Postgraduate Academic Scholarship (2021), CUMCM Provincial First Prize (2019), Outstanding Class Leader (2019)