Emily Zhixuan Zeng

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Education

PhD **University of Waterloo**, Vision and Image Processing Lab, supervised by Dr. Alexander Wong — 2023 - 2027

MASc **University of Waterloo**, Vision and Image Processing Lab, supervised by Dr. Alexander Wong — 2021 - 2023

BASc **University of Waterloo**, Mechatronics Engineering — 2016 - 2021

Experience

NVIDIA, Computer Vision Intern — May 2021 - Aug 2021
Incorporated synthetic data for training lane detection models.

- Developed data pipeline and experimented with synthetic data incorporation.
- Resolved critical failure scenarios blocking PathNetV4 release.
- Developed tools to better visualize and identify challenging scenarios.

NVIDIA, Computer Vision Intern — May 2020 - Aug 2020
Time series light signal detection for autonomous vehicles.

- Detection of blinking light signals.
- Defined labelling guidelines and potential model architectures.
- Trained proof of concept classification network using public data.

Miovision, Computer Vision Intern — Sep 2019 - Dec 2019
Traffic data analysis with computer vision.

- Led project to introduce active learning techniques to data ingest pipeline.
- Optimized selection of images for labeling from large unlabelled pool.
- 42% improvement in mean average precision between models.

Synapse Technology, Computer Vision Intern — Jan 2019 - Apr 2019
Developed and analyzed CNN models for detecting threats in security x-ray scans.

- Developed fine grain rotational data augmentation method.
- Significantly improved model performance in underrepresented classes.

Praemo, Data Scientist — May 2018 - Aug 2018
Used LSTM to detect anomalies in time series vibration data and predict machine failure in industrial robots.

ESI, Robotics Software Developer — Sep 2017 - Dec 2017
Robotic navigation using reinforcement learning and IR sensors.

- 95% success rate in simulation and 85% success rate on physical robot.

Projects

Explaining Diffusion — current

- Exploring biases and concept relationships of the natural language prompts given to latent diffusion models through semantic directions. Publication in progress

AutoRead — Apr 2021

- Text to speech model for fiction novels trained using automatically labeled audiobook dataset

Publications

Decoding Diffusion: A Scalable Framework for Unsupervised Analysis of Latent Space Biases and Representations Using Natural Language Prompts Dec 2024

E Zhixuan Zeng, Yuhao Chen, Alexander Wong

10.48550/arXiv.2410.21314 (Neurips Safe Generative AI Workshop 2024)

Understanding the Limitations of Diffusion Concept Algebra Through Food Jun 2024

E Zhixuan Zeng, Yuhao Chen, Alexander Wong

10.48550/arXiv.2406.03582 (MetaFood workshop, CVPR 2023)

Beyond the Scoreboard: Advancing Fairness in Athlete Selection with Simulation-Based Tournament Strategies Apr 2024

E Zhixuan Zeng, Yuhong Zeng

10.15353/jcvis.v9i1.10015 (Journal of Computational Vision and Imaging Systems 9.1, pp. 58–61.)

COVID-Net L2C-ULTRA: An Explainable Linear-Convex Ultrasound Augmentation Learning Framework to Improve COVID-19 Assessment and Monitoring Jan 2024

E Zhixuan Zeng, Ashkan Ebadi, Adrian Florea, Alexander Wong

10.3390/s24051664 (Sensors 24.5, p. 1664.)

Explaining Explainability: Towards Deeper Actionable Insights into Deep Learning through Second-order Explainability Jun 2023

E Zhixuan Zeng*, Hayden Gunraj*, Sheldon Fernandez, Alexander Wong

10.48550/arXiv.2306.08780 (XAI4CV workshop, CVPR 2023)

MMRNet: Improving Reliability for Multimodal Object Detection and Segmentation for Bin Picking via Multimodal Redundancy May 2023

Yuhao Chen, Hayden Gunraj, ***E Zhixuan Zeng***, Robbie Meyer, Maximilian Gilles, Alexander Wong

10.1109/CVPRW59228.2023.00012 (Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition 68–77)

ShapeShift: Superquadric-based Object Pose Estimation for Robotic Grasping Apr 2023

E Zhixuan Zeng, Yuhao Chen, Alexander Wong

10.48550/arXiv.2304.04861 (WICV workshop, CVPR 2023)

Investigating Use of Keypoints for Object Pose Recognition Dec 2022

E Zhixuan Zeng, Yuhao Chen, Alexander Wong

10.15353/jcvis.v8i1.5382 (Journal of Computational Vision and Imaging Systems)

MetaGraspNet: A Large-Scale Benchmark Dataset for Vision-driven Robotic Grasping via Physics-based Metaverse Synthesis Aug 2022

Yuhao Chen, Maximilian Gilles, ***E Zhixuan Zeng***, Alexander Wong

10.1109/CASE49997.2022.9926427 (2022 IEEE CASE)

Awards

2022 IEEE International Conference on Automation Science and Engineering: Finalist

Skills

Computer Vision: Object Detection, Image Segmentation, Pose Estimation, Image Generation

Machine Learning: Explainable AI, Reinforcement Learning, Text to speech, General Machine Learning

Technologies: Python, Pytorch, Tensorflow, OpenCV, Docker, C++