

Zhongming Huang

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Education

School of Electronics and Information Engineering, Tiangong University

Tianjin, China

Undergraduate of Telecommunication Engineering, Class of 2023

Sep. 2019 — Present

- GPA: 3.80/4.0 | Rank: 3/120
- Specialized Courses: Machine Learning and Bigdata Processing (90) / Digital Signal Processing (89) / Computer Networks (95) / Mathematical Modeling / Signals and Systems / Microcontroller / EDA Theory & VHDL Programming (96) / Communication Theory / High-Frequency Electronics / Electromagnetics / A&D Electronics (91) / C Programming (92) / Linear Algebra (90), etc.

Technical Skills

- Language:** TOEFL 105, GRE 330 (AW 4)
- Programming:** *Language* C, Python, VHDL and Markdown; *IDE* Visual Studio, MATLAB, Anaconda, Quartus, Keil; *OS* Ubuntu, Windows, Ubuntu (JetPack); *Framework* Tensorflow and Keras.
- Other Computer Skills:** Skilled in building neural networks using Tensorflow and Keras, using MATLAB to calculate or draw diagrams, using Markdown to edit documents or generate diagrams, drawing illustrations using Visio, and editing TEX scripts using Overleaf.

Publications and Patents

- Zhongming Huang**, YOLOv5-PolarMask: A One-stage Detector Unleashed for Instance Segmentation (Preparing)
- Zhongming Huang**, Semantic Road Segmentation Based on Adapted Poly-YOLO, In *Proc. The 3rd International Conference on Signal Processing and Machine Learning (SPML 2022)* (Accepted)
- Zhongming Huang**, Shangyun Yang, 6-DoF Occluded Object Semantic Grasp Planning with De-occlusion Instance Segmentation, Paper presented at the *5th International Conference on Intelligent Autonomous Systems (ICoIAS' 2022)* (In Press, **Best Presentation Award**)
- Zhongming Huang**¹, Yuxiang Wang¹, High Precision Small Hepatocellular Carcinoma Detection Using Improved EfficientNet with Self-Attention, Paper presented at *22nd IEEE/ACIS International Conference on Computer and Information Science (ICIS 2022)* (EI Indexing)
- Zhongming Huang**¹, Yuxiang Wang¹, Haolan Hu, Xun Liu, Tongzhen Liu and Zhanxu Zhang, Dynamic Feature Extraction Using I-Vector for Video Fire Detection, Paper presented at *2022 3rd IEEE International Conference on Pattern Recognition and Machine Learning (PRML 2022)* (EI Indexing, **Best Presentation Award**)
- Yukuan Sun, **Zhongming Huang**, Yuxiang Wang, Xun Liu, Zhanxu Zhang, Tongzhen Liu, Haolan Hu, A Multi-dimensional Sensing Quadrotor UAV Fire Inspection System (P.R.C. Patent for Utility Models, Application Number: CN202221074321.2)
- Zhongming Huang**, Yuxiang Wang, Xun Liu, Zhanxu Zhang, Tongzhen Liu, Haolan Hu, Fire Detection System Based on Deep Learning Quadrotor UAV (P.R.C. Software Copyright No.2022SR0916949)
- Zhongming Huang**, Yuxiang Wang, Haolan Hu, A Video Fire Detection Method Based on Features of Time Sequences (P.R.C. Patent for Invention, Application Number: CN202211245746.X)

1: the authors contributed equally in the paper work.

Active Researches

Title: YOLOv5-PolarMask: A One-stage Detector Unleashed for Instance Segmentation

Sep.2021 — Present

Research Intern | Supervisor: Ian Deng, PhD, University of California, San Diego

CA, United States (Remote)

- The previous work *PolarMask* (E. Xie et al., *CVPR2020*) aims to generate polygon localizations which wraps the instances as accurate as pixel-wise segmentations. The early collaboration of PolarMask with YOLO, one of the fastest one-stage detectors, was named Poly-YOLO. But the YOLOv3 backbone of Poly-YOLO brings limitations for segmenting objects of more kinds and sizes.
- Designed to use YOLOv5 as the backbone network and integrate PolarMask modules into its feature maps and losses, and other tricks will be tested to achieve decent segmentation speed and accuracy on more complex instances. This work is being organized into a paper.

Title: Semantic Road Segmentation Based on Adapted Poly-YOLO

Jun. 2022 — Present

Research Intern | Supervisor: Mark Vogelsberger, Professor, Massachusetts Institute of Technology

MA, United States (Remote)

- Aimed at the semantic road segmentation using object detection based methods, and make improvements upon the *Poly-YOLO* (P. Hurtik et al., *arXiv 2020*) baseline since it is not tuned for certain specific scenarios: 1) the anchors are not tuned for detecting large road targets; 2) the preprocessing mechanism for datasets to transform the masks into vertices is not accurate; 3) the pre-training dataset is limited.
- Improved the baseline model by allocating the anchors after splitting objects into three categories by the size, and also by training on larger datasets. The mAP at 0.5~0.95 IoU rised from 0.4 to over 0.8, the performance on detecting and segmenting small size objects is also enhanced, making the adapted model more reliable in real world road segmentation scenarios. This work is presented in a paper.

Research and Competition Experiences

5th International Conference on Intelligent Autonomous Systems (ICoIAS' 2022, Date: Sep. 23-25, 2022)

Dalian, China

Title: 6-DoF Occluded Object Semantic Grasp Planning with De-occlusion Instance Segmentation

Jan. 2022 — Jun. 2022

First Author, Oral Presenter | Collaborator: Shangyun Yang, School of Electronic and Information Engineering, Tiangong University

- Aimed to design an algorithm to pick a partially covered object in a cluttered scene, where the algorithm should calculate the best-next-grasp.
- Designed a set of scoring algorithms for optimal grasping for a partially covered object using a single fixed camera based on the layout of scene, this scoring algorithm weights factors including the occlusion area and grasp pose confidence in a non-linear approach and decides the best object to grasp next. The paper was presented at the 5th International Conference of Intelligent Autonomous Systems (ICoIAS' 2022) and was honored the Best Presentation Award.

22nd IEEE/ACIS International Conference on Computer and Information Science (ICIS 2022, Date: Jun. 26-28, 2022) Zhuhai, China

Title: High Precision Small Hepatocellular Carcinoma Detection Using Improved EfficientNet with Self-Attention Mar. 2022 — Jun. 2022

Co-researcher, Oral Presenter | Collaborator: Yuxiang Wang, School of Electronic and Information Engineering, Tiangong University

- Developed a model that can better autonomically detect subtle small liver cancer (*small hepatocellular carcinoma*) characteristics in CT scans and has the reliable accuracy for diagnosis, which applied to the detection of early liver cancer that is difficult to be distinguished by naked eyes.
- Combined the self-attention mechanism, often used in the field of natural language processing, with the convolutional neural network Efficient-net to improve the self-learning ability of the model, endowing the front end of the whole detection algorithm with an extraordinary ability to compare features between healthy livers and those with small liver cancer in CT scan images. Achieved a test detection accuracy of > 97% after training on the LiTS dataset; contributed as the co-first author.

Tianjin Provincial Project of The College Student Innovation and Entrepreneurship Plan

Tianjin, China

Project Number: 202110058107 | Certificate Number: 20210537

Title: Fire Detection System Based on Deep Learning Quadrotor UAV

Mar. 2021 — May 2022

Team Leader | Supervisor: Yukuan Sun, School of Computer Science and Software Engineering, Tiangong University

- Targeted at researching novel visual detection algorithms and relative deployment on mobile processing platforms. Trained and tested different traditional fire-detection CNN models and deployed them on a Jetson Nano Developer Kit, constructed an experimental quadrotor UAV prototype.
- Since traditional CNN detection models require massive dataset and huge computational capacity, a novel and efficient algorithm based on adapted I-Vector was proposed, which focuses on dynamic features of fire combustion instead of any static shape of fire. Achieved 91% detection accuracy after training on a dataset of only 1296 sequences (< 9 MB).
- Gave an oral presentation on the 2022 3rd International Conference on Pattern Recognition and Machine Learning (PRML 2022) held on July 22, 2022 with the Best Presentation Award.

The 16th “Challenge Cup” Contest (Held by the Ministry of Education of China)

Tianjin, China

Title: Automatic Inspection Robot for Underwater Pipelines

Team Leader | Supervisor: Di Zhao, Director of the Robot Lab of Tiangong University

Mar. 2021 — May 2021

- Committed to realizing the unmanned detection and maintenance the surface of underwater sewage or optical communication pipelines.
- Designed an underwater robot that can automatically follow the pipelines and gives feedback when the machine vision module (OpenMV) detects defects.

The 7th National College Students' Engineering Training Comprehensive Ability Competition

Tianjin, China

Title: Smart Logistic Quadrotor UAV

Team Member | Supervisor: Di Zhao, Director of the Robot Lab of Tiangong University

Dec. 2020 — Apr. 2021

- Aimed to program a quadrotor UAV to fly indoors and automatically move a geometrically shaped object from one point to another based on ground marks. The whole work involves automatic flight control, path planning, grasp control and automatic obstacle avoidance, the UAV was able to achieve full procedure after one-click take-off.

Honors and Prizes

- **Best Presentation Award** (Oral Presenter) Jul. 2022 & Sep. 2022
IEEE Int. Conf. Pattern Recognition and Machine Learning & Int. Conf. Intelligent Autonomous Systems
- **President First-class Scholarship** | First-class Scholarship of Tiangong University (Top 3%) Sep. 2020 & Sep. 2021
- **Provincial Second Prize** (Team Leader) Jun. 2021
The 16th “Challenge Cup” National College Student’s Extracurricular Academic Science and Technology Contest
- **Provincial Second Prize** May 2021
The 7th National College Students Engineering Training Comprehensive Ability Competition
- **Honorable Mention** (Team Leader) | U.S. College Student’s Interdisciplinary Contest in Modeling (ICM 2021) Mar. 2021
- **National Grand Prize** | National English Competition for College Students (NECCS 2020) Dec. 2020
- **National Third Prize** | 12nd National Mathematics Competition for College Students (NMCCS 2020) Dec. 2020