Zhongming Huang

Email: reavenhuang@gmail.com | Personal Webpage: reavenh.github.io | TEL: (86) 18073697626 / (86) 18229629398

Address: No.399 Binshui West Road, Tiangong University, Tianjin 300387, China

Education

School of Electronics and Information Engineering, Tiangong University **Tianjin, China**

Bachelor of Engineering in Telecommunication Engineering (Expected in July 2023) Sep. 2019 — Present

- GPA: 3.80/4.0 | Rank: 3/120 | Major GPA: 3.82/4.0
- 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 & Editing:** *Language* C, Python, VHDL and Markdown; *IDE* Visual Studio, MATLAB, Anaconda, Quartus, Keil; *OS* Ubuntu, Windows, Ubuntu (JetPack); *Framework* Tensorflow and Keras; *Editing* Overleaf, Visio.

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)* (**EI Compendex** Accession No. 20224813165040, **Best Presentation Award**)
- **Zhongming Huang[1],** Yuxiang Wang[1], 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 Compendex** Accession No. 20224012844753)
- **Zhongming Huang[1]**, Yuxiang Wang[1], 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 Compendex** Accession No. 20224012844697, **Best Presentation Award**)
- **Zhongming Huang**, Yuxiang Wang, Xun Liu, Zhanxu Zhang, Tongzhen Liu, Haolan Hu, Fire Detection System Based on Deep Learning Quadrotor UAV (**P.R.China Software Copyright** No.2022SR0916949)
- **Zhongming Huang,** Yuxiang Wang, Haolan Hu, A Video Fire Detection Method Based on Features of Time Sequences (**P.R.China Patent** for Invention, Application Number: CN202211245746.X)
- 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.China Patent** for Utility Models, Application Number: CN202221074321.2)

1: the authors contributed equally in the paper work.

Active Research

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.

Research and Competition Experiences

Title: Semantic Road Segmentation Based on Adapted Poly-YOLO Jun. 2022 — Sep. 2022

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 rose 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.

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.

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 the ability to compare features between healthy livers and those with small liver cancers 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).

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

- 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 Third Prize |** 12nd National Mathematics Competition for College Students (NMCCS 2020) Dec. 2020

Activities and Services

- **Student Researcher** | The Robot Lab of Tiangong University Sep. 2020 — Sep. 2021
- **Vice Stage Director** | WULA YoungTime 2020 Music Festival (1000+ Audience, $50000 Sponsorship) Mar. 2020 — Aug. 2020
- **Student Union Member** | School of International Education, Tiangong University Sep. 2019 — Sep. 2020
- **Chamber Chorus Member** | The Art Ensemble of Tiangong University Sep. 2019 — Sep. 2020