

# 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**, Semantic Road Segmentation Based on Adapted Poly-YOLO (Submitting)
- Zhongming Huang**, Shangyun Yang, 6-DoF Occluded Object Semantic Grasp Planning with De-occlusion Instance Segmentation, Paper presented at the 5<sup>th</sup> International Conference on Intelligent Autonomous Systems (ICoIAS' 2022) (In Press, **Best Presentation Award**)
- Zhongming Huang**<sup>1</sup>, Yuxiang Wang<sup>1</sup>, High Precision Small Hepatocellular Carcinoma Detection Using Improved EfficientNet with Self-Attention, Paper presented at 22<sup>nd</sup> IEEE/ACIS International Conference on Computer and Information Science (ICIS 2022) (EI Indexing)
- Zhongming Huang**<sup>1</sup>, Yuxiang Wang<sup>1</sup>, Haolan Hu, Xun Liu, Tongzhen Liu and Zhanxu Zhang, Dynamic Feature Extraction Using I-Vector for Video Fire Detection, Paper presented at 2022 3<sup>rd</sup> 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, Register Number: 2022SR0916949)
- Zhongming Huang**, Yuxiang Wang, Haolan Hu, A Dynamic Fire Detection Model Using I-Vector (P.R.C. Patent for Invention, Submitted)

1: the authors contributed equally in the paper work.

## Active Researches

**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)

- Discussed deeper theories of several fundamental neural network structures, especially those used in autonomous driving. Also, different tricks used in enhancing the network's performance have been tested by hand building different kind of networks from scratch.
- Aimed at the semantic road segmentation using object detection based methods, and make improvements upon the baseline models since the baseline model is not tuned for this specific scenario: 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 scenario. This work is presented in a paper.

**Title:** *High Precision Object Detection Based on Polygon Bounding Boxes*

Sep.2021 — Present

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

CA, United States (Remote)

- Planned to generate polygon localizations which wraps the object more precisely than traditional rectangular bounding boxes, shifting the coordination regression task on the rectangle corners to the vertices of a polygon bounding box.
- Designed to use YOLOv3 as the backbone, with the technique route being referred to the previous work Poly-YOLO, and the work was expected to be presented in a paper.

## Research and Competition Experiences

5<sup>th</sup> 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.

**22<sup>nd</sup> 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 3<sup>rd</sup> International Conference on Pattern Recognition and Machine Learning (PRML 2022) held on July 22, 2022 with the Best Presentation Award.

**The 16<sup>th</sup> “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 7<sup>th</sup> 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  
2022 3<sup>rd</sup> IEEE International Conference on Pattern Recognition and Machine Learning (PRML 2022)
- **President First-class Scholarship** Sep. 2020 & Sep. 2021  
First-class Scholarship of Tiangong University (Top 3% in Academics)
- **Provincial Second Prize** (Team Leader) Jun. 2021  
The 16<sup>th</sup> “Challenge Cup” National College Student’s Extracurricular Academic Science and Technology Contest
- **Provincial Second Prize** May 2021  
The 7<sup>th</sup> National College Students Engineering Training Comprehensive Ability Competition
- **Honorable Mention** (Team Leader) | 2021 U.S. College Student’s Interdisciplinary Contest in Modeling (ICM) Mar. 2021
- **National Grand Prize** | National English Competition for College Students (NECCS) Dec. 2020
- **National Third Prize** | 12<sup>nd</sup> National Mathematics Competition for College Students Dec. 2020