Junzhou Chen

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Education

Hohai University   Intelligent science and technology   bachelor   2020 – 2024

- As a member of the Robotics and Computer Vision Laboratory at Hohai University, I have been involved in multiple research projects. My primary research focus has been on robotics and artificial intelligence.
- I am one of the founding members of Xuanjia Ling Technology Co., Ltd, and I hold the position of overseeing the research, development, and sales of law enforcement traffic equipment.

Awards and Certificates

National Excellent Completion   **National College Students' innovation and entrepreneurship training program 2022**   June 2022

University Excellent Completion   **National College Students' innovation and entrepreneurship training program 2023**   June 2023

Provincial Third Prize   **China Internet innovation and Entrepreneurship Competition**   May 2021

National Second Prize   **Chinese undergraduate computer design contest**   August 2022

National Third Prize   **Chinese undergraduate computer design contest**   August 2021

National Third Prize   **Teddy Cup data mining competition**   June 2023

ROS Junior Engineer   January 2021

Science and technology innovation scholarship   April 2022

Jiangsu Province Technology Transfer Broker   December 2022

Sartup Experience

Xuanjia Ling Technology Co., Ltd   March 2021 – present

Product manager & *Chief financial officer*

- As a college student entrepreneur, my primary responsibility is to commercialize our team's product, the "Canine Interactive Vest" for police dogs.
- I am responsible for product data processing, practical and ergonomic design, as well as product marketing.
- As the entrepreneurial journey continues, I have accumulated extensive experience in product design and development. I have gained a thorough understanding of the complete product development process through practical implementation.

The company is currently engaged in deep cooperation with Jiangsu Red-Blue Police Technology Co., Ltd. and Jiangsu Tsinghua Research Institute to develop specialized equipment for traffic police and traffic control. We have developed mature products such as tethered drones, anti-ramming vehicle interception systems, and Gaode intelligent audio-visual warning systems. These products have been deployed in several locations, including certain Traffic Police Detachments in Nanjing, a city in Inner Mongolia, and a city in Heilongjiang, with positive feedback.

Throughout the entrepreneurial journey, we have learned a great deal. We believe that valuable technology is developed to address societal issues and make the world a better place, creating value for this

era. However, we have also faced challenges, including social issues, limited technological resources, and networking constraints. Currently, we are facing numerous difficulties in our entrepreneurial path, but we remain confident in overcoming them and emerging as a successful venture.

Project Experience

Multi-vehicle Fleet Control Platform   November 2020 - May 2022

Vehicle Design and Interface Design

This project is a joint development initiative between our team and the Institute of Automation, Chinese Academy of Sciences. In this project, I am responsible for the design of individual vehicles within the vehicle swarm and the interface design.

- Designing, assembling, and programming the cluster of vehicles, with the vehicles controlled using ESP8266 and connected through a local area network for coordination.
- Tuning PID parameters of the vehicles, analyzing and controlling vehicle dynamics, and designing a QR code recognition system on the top of the vehicles to establish a foundation for visual identification and localization.
- The project is based on the Linux system and ROS framework, primarily utilizing C++ and Python for implementation.
- Project link: https://www.bilibili.com/video/BV1Ry4y1E7ED/

Fig. 1. Environment of Multi-vehicle Fleet Control Platform

In the depicted environment, the vehicles navigate using a network connection via a local area network to communicate with the host. The top-mounted camera provides visual data for vehicle positioning. It enables simultaneous acquisition of position, angle, speed, and acceleration information for multiple vehicles. In this project, I utilize the ESP8266 as the main control board for individual vehicles. I establish basic control commands for the vehicles, allowing the host to communicate with and control the entire vehicle cluster through the local area network. Additionally, a top-mounted QR code is implemented, enabling the camera to differentiate vehicle IDs and establish a foundation for visual identification and localization.

Research on Methods to Bridge the Language Barrier between Animals and Machines

May 2021 - October 2022

Equipment Design and Dataset Establishment

- In the project, we equip police dogs with smart vests to provide real-time feedback on the dog's current posture, geographical location, and video information. Additionally, we use sensors on both sides of the vest to convey information to the animals. This project is a key project in Jiangsu Province and has received recognition as an excellent completion in the training and innovation program. I serve as the second-in-command of the team.

- Throughout the project, my responsibilities include designing the equipment for the police dogs, establishing the dataset, and processing the dog's motion data using machine learning techniques to build a real-time posture data model.

Fig. 2. Image of the Police Dog Vest

The project has developed a self-decision-making intelligent police dog system with a three-dimensional instruction set. This system includes complete hardware and software components, consisting of a three-dimensional instruction set and a self-decision-making police dog autonomous navigation system. It encompasses a smart vest for the police dog, a police dog helmet, a web-based interface, and an Android app.

This innovation brings about a groundbreaking change in the traditional human-dog interface. It employs a three-dimensional instruction set composed of various signals, including voice control, microelectronic signals, and ultrasonic waves. It defines a new paradigm for human-dog interaction, enabling multidimensional command systems to train and command police dogs. Moreover, it achieves self-decision-making capabilities for autonomous navigation and operations by police dogs. Ultimately, this intelligent system empowers police dogs with enhanced intelligence, thereby boosting their effectiveness in operational scenarios.

Research on Medical Image Processing Methods

October 2022 - Present

Segmentation of Overlapping Cell Images

- The project collaborates with a medical image processing company in Nanjing to develop AI-based pathological analysis of cervical cell slice images. This project has the potential to significantly improve the early diagnosis rate of cancer in patients while greatly reducing the workload of medical professionals.

- In this project, the focus is on cell segmentation in Barr's cell slice images, with the technical challenge lying in the segmentation of overlapping cells. To address the limitations of traditional network architectures, an innovative HARU-Net network model has been developed, achieving segmentation accuracy at the state-of-the-art (SOTA) level.
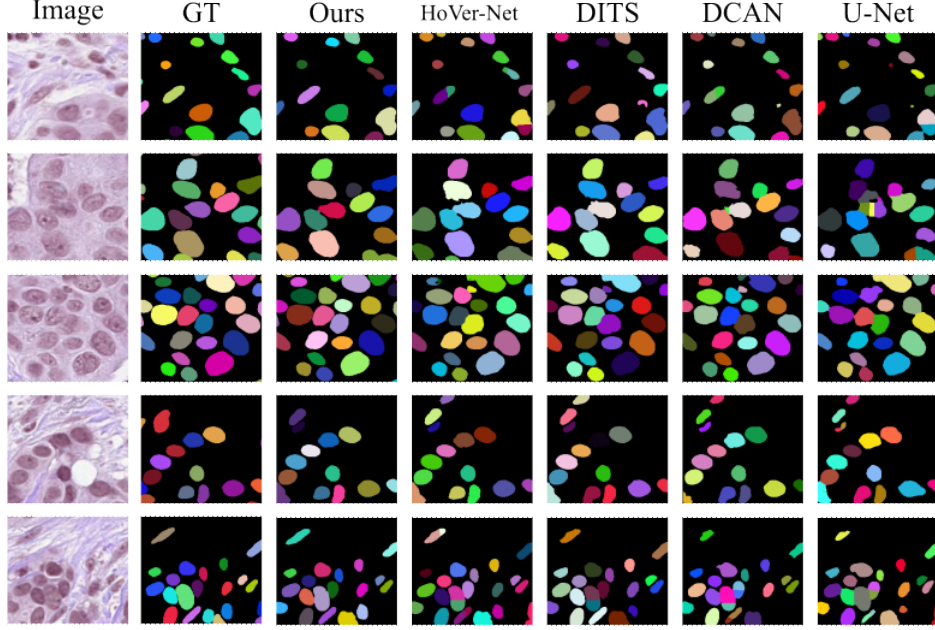- Code link: https://github.com/Junzhou-Chen/HARU-Net

Fig. 3. Comparison of Cell Nucleus Instance Segmentation Results

We proposed a novel neural network model called HARU-Net, based on the U^2Net and a hybrid attention mechanism, to address the complex problem of cell nucleus segmentation. Building upon the U^2Net, HARU-Net combines attention mechanisms with Residual U-blocks to effectively handle these challenging images. The HARU-Net model incorporates a contextual encoding layer to learn contextual features and integrates hybrid attention learning modules in each layer to focus on specific regions of interest. It predicts both foreground and contour images of the cell nucleus and combines them to obtain the final instance segmentation results. Compared to traditional networks, HARU-Net can better capture fine details in the images, leading to improved segmentation accuracy and robustness.

Experimental evaluations were conducted on four publicly available datasets (BNS, MoNuSeg, CoNSep, and CPM-17), and HARU-Net achieved state-of-the-art performance across all of them, demonstrating its effectiveness and superiority. Two related papers are currently under review. I am the first author of both:

- *Enhancing Nucleus Segmentation with HARU-Net: A Hybrid Attention based Residual U-Blocks Network*
- *CFHA-Net: Context Fusion with Hybrid Attention Network for Nucleus Segmentation*