Kairui Zhang

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PROFILE

my research interests lie in multimodal learning and reinforcement learning. I am deeply passionate about computer vision and natural language processing. With a willingness to take on new challenges, I am aspired to be an engineer who can make a significant impact on the world.

EDUCATION

University of Bristol **2022.9 – present**

MSc in Engineering Mathematics (2023 QS Rank 61)

Hohai University **2018.9 – 2022.6**

BSc in Robotics Engineering (University of 211 Project; 985 Project Innovation Platform)

- Grades: 86.97/100
- Class President
- Dissertation: distinction
- Key Marks: Artificial Intelligence Techniques (90)

WORK EXPERIENCE

Changzhou Guli High-End Equipment Innovation Center **2021.6 – 2021.7**

The goal is to achieve path planning and obstacle avoidance for mobile robots.

- Helped to connect the Scout-mini robot controller and Jetson TX2 via CAN bus.
- Installed OpenCV in C++, get image matrix with Intel RealSense depth camera D435i.
- Performed the obstacle avoidance task with rplidar.

PROJECT EXPERIENCE

Scoring Protein-Protein Interactions **2023.1 – present**

- Objective: Predict whether two proteins can interact with machine learning method.
- Solution:

- Investigate the correlation between energy-based metrics and 3D structure-based metrics with regards to the labelling of protein interactions.
- Train various scalable models to determine this relationship.

Direction Embedding for Text-Image Synthesis. **2022.11 – present**

- Objective: Enhance the performance of text-image generation models, as they have a challenge in generating multiple objects with accurate colour and orientation.
- Solution:

- Replicate the DALL-E2 model using high-performance computing systems, which will cover CLIP, diffusion prior model, diffusion model and U-Net.
- Train a model that can extract explicit directional information from the input text, concatenate it with the image embeddings, and feed it into a diffusion model.

Autonomous Landing of UAV for UAV-UGV Cooperation **2021.4 – 2022.6**

- Objective: Land a UAV on a mobile platform autonomously in weak communication environments. Supported by the National Natural Science Foundation of China (61703138); the Fundamental Research Funds for the Central Universities (B200202224).
- Solution:

- Automatically collected and labelled datasets in a simulated environment in ROS based on OpenCV and traditional computer vision methods.
- Boosted the training dataset with Deep Convolutional Generative Adversarial Networks (DCGAN). The detection accuracy is improved by 4.17%.
- Detected the landmark based on YOLOX and estimate depth with the size of the moving platform in the image.
- Landed the drone on a UGV using DDPG, a deep reinforcement learning method.
- Built a real drone, deploy the program on Raspberry Pi 4B, and successfully land the drone autonomously.

- Achievement: We have a paper published in CAAI Transactions on Intelligent Systems, one of the top journals in China. Recently another article was submitted in Robotica journal Article.

Gesture Recognition Based UGV Navigation **2021.3 – 2021.4**

- We navigate UGV by Gesture Recognition with Shuffle Net. We train the model with our own dataset, and run it in RaspberryPi.

Robot for High Voltage Insulator Coating **2020.5 – 2021.5**

- This is a National College Students' innovation and entrepreneurship training program. I was in charge of PLC coding section in our team.

PUBLICATIONS

ZHANG Pengpeng,WEI Changyun,ZHANG Kairui,et al.Self-learning approach to control parameter adjustment for quadcopter landing on a moving platform[J].CAAI Transactions on Intelligent Systems,2022,17(5):931-940.[doi:10.11992/tis.202107040]

AWARDS

Hohai University School Scholarship **2021.5**

SKILLS

IT Skills:

- Programming: proficient in Python, experienced in C/C++, MATLAB, Bash, familiar with MySQL, HTML5, CSS, JavaScript and Vue.
- Deep learning framework: proficient in PyTorch, experienced in TensorFlow1.14.0
- Python libraries: Matplotlib, NumPy, Pandas, scikit-learn, SciPy, xgboost, polars
- Applications: experienced in LATEX, Microsoft Office, ROS, Git, VS Code, Jupyter, slurm
- Operating Systems: familiar with Linux (Ubuntu, CentOS), Windows
- Chinese National Computer Rank Examination Grade II (C++) and Grade III (computer network)

Language:

Mandarin Chinese (native), English (IELTS 6.5, Fluent working English)