

# Jiahao LI (Jarvis)

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## 🎓 Education

<b>City University of Hong Kong (CityUHK)</b> Ph.D. Student in Computer Science Research Direction: Autonomous Driving and 3D Scene Reconstruction	<b>2024.09 - Present</b> Supervisor: Prof. Jianping Wang
<b>The Chinese University of Hong Kong (CUHK)</b> Master of Science in Computer Science Research Direction: 2D Object Detection and Image Captioning	<b>2021.09 - 2022.11</b> Supervisor: Prof. Kin Hong Wong
<b>Hong Kong Baptist University (HKBU)</b> Bachelor of Science in Computer Science and Technology Research Direction: Quantum Finance and Graph NN	<b>2017.09 - 2021.07</b> Supervisor: Prof. Hui Zhang, Prof. Zhiyuan Li, Prof. Raymond Lee

## 📖 Publications

- [1] Huang, C., Liu, Y., **Li, J.**, Tian, H., Chen, H. (2023). Application of YOLOv5 for mask detection on IoT. *Applied and Computational Engineering*, 29, 1-11.
- [2] **Lee, J.**, Huang, Z., Lin, L., Guo, Y., & Lee, R. (2023). Chaotic Bi-LSTM and attention HLCO predictor-based quantum price level fuzzy logic trading system. *Soft Computing*, 27(18), 13405-13419.

## 🔑 Projects

<b>The 17th F1Tenth Grand Prix (CPS-IoT 2024)</b> FSM Speed Team Member <ul style="list-style-type: none"><li>Our team (FSM Speed) won the championship.</li><li>In the lap time race, our team implemented a map-based algorithm involving an AMCL localization module, RaceLine generation module, and MPC control module.</li><li>In the head-to-head competition, the classical follow the gap algorithm is optimized. The speed and steer-angle in the next timestamp are calibrated based on the farthest point from the ego vehicle and current speed.</li><li>Project Page: <a href="https://xyunaaa.github.io/research/f1tenth/">https://xyunaaa.github.io/research/f1tenth/</a>.</li></ul>	<b>2024.04 - 2024.05</b> Hong Kong
<b>Adaptive Error Aware Cost Volume for Stereo Matching (AEACV-Stereo)</b> First Author <ul style="list-style-type: none"><li>We propose a dynamic sampling strategy based on an error map to accelerate iterative stereo matching algorithm.</li><li>We propose a noise-filtering cost volume method for improved disparity prediction accuracy in ill-posed regions.</li><li>Code: <a href="https://github.com/JarvisLee0423/AEACV-Stereo">https://github.com/JarvisLee0423/AEACV-Stereo</a>.</li></ul>	<b>2023.10 - 2024.03</b> Beijing
<b>Image Caption with Full-Transformer</b> First Author <ul style="list-style-type: none"><li>Proposed an Image Captioning algorithm based on Full-Transformer.</li><li>Proposed a BERT-based Encoder to process text information.</li><li>Proposed an Encoder based on Vision-Outlooker to process image information.</li><li>Code: <a href="https://github.com/JarvisLee0423/Captioning-and-Answering-with-Transformer">https://github.com/JarvisLee0423/Captioning-and-Answering-with-Transformer</a>.</li></ul>	<b>2021.09 - 2022.06</b> Hong Kong
<b>Complex Networks and the Applications in Deep Learning</b> First Author <ul style="list-style-type: none"><li>Apply complex graph theory (random graphs ER, WS, BA) to neural networks and construct random networks.</li><li>Study the relationship between network computation graph topology and network performance.</li><li>Network performance is measured and explored through time complexity and space complexity.</li><li>Code: <a href="https://github.com/JarvisLee0423/RandWiredNN-Model">https://github.com/JarvisLee0423/RandWiredNN-Model</a>.</li></ul>	<b>2020.09 - 2020.12</b> Zhuhai
<b>Live Long and Prosper: How Herring and Mackerel Affect Scottish Fisheries</b> Team Leader <ul style="list-style-type: none"><li>Mathematical Contest in Modeling (MCM 2020) Meritorious Winner.</li></ul>	<b>2020.03 - 2020.04</b> Zhuhai

- Use linear regression to predict sea surface temperature changes over the next 50 years to explore the impact of climate change on herring and mackerel migrations.
- Proposed an economic model of the relationship between fishing revenue and fishing location and protein decay using Gaussian distribution simulation.

## Working Experience

### ByteDance - PICO MR Team

2022.06 - 2024.02

Computer Vision Algorithm Engineer (Full-Time)

Beijing

- 3DoF PICO-VR Live Stream:
  - Implemented stereo disparity estimation system for distorted spherical cameras.
  - Implemented distortion direction exchange system to change the distortion direction from vertical to horizontal.
  - Fixed the OpenCV bug to generate depth from distorted spherical disparity and generate mesh from depth.
- Full 3D Object Reconstruction from two video views:
  - Applied consistency and robust depth estimation methods to generate depths for each frame of both videos.
  - Applied SLAM to generate pose for each frame of both videos.
  - Reconstructed half objects from each video.
  - Applied Point-Registration algorithm to match the half objects of each video to generate the full 3D object.
- Neural Network 3D Scene Reconstruction:
  - Applied Monocular Depth Network to estimate depth for each view of the scene.
  - Applied RAFT-based Stereo Matching Network to estimate disparity for each view of the scene.
- Neural Network based Depth Inference Accuracy upper boundary exploring:
  - Applied RAFT-based large vision model to explore the upper boundary of the stereo matching method.
  - Applied Multi-View Stereo based large vision model to explore the upper boundary of the depth estimation method.
  - Applied Monocular-based large vision model to explore the upper boundary of the depth estimation method.
  - Applied DINO and iBOT based large vision model to extract better vision feature for depth estimation tasks.
  - Used large model to distill the small model to get better performance.
- Depth Inference Code-base development and maintain:
  - Developed the depth inference codebase based on aipack, which is the code-engine in ByteDance.
  - Implemented useful backbone for vision tasks, like ResNet, EfficientNet, MobileNet, Vision Transformer and so on.
  - Implemented useful components for depth estimation tasks, like Cost Volume, Correlation, ConvGRU and so on.
  - Transferred all previous depth codebase with no accuracy dropping.

### 3D Print Lab

2020.06 - 2020.08

Research Assistant (Intern)

Zhuhai

- VR Exhibition Development:
  - Used Unity to implement a VR Exhibition system, including real-time viewing and editing.
  - Implemented the object edition function, including pick-up object, scale, rotation, translation, and wall absorption.
  - Implemented the view edition function, including view translation and projection, light-condition changing.