Junjie Jiang（江俊杰）

Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences
Emal: jj.jiang@siat.ac.cn & junj.chiang1102@gmail.com Homepage: https://junjiechiang.github.io

ABOUT

I am currently a research assistant at Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences, supervised by Prof. Zhile Yang and A/Prof. Chengke Wu. Previously, I graduated from Shenyang Ligong University with a bachelor's degree in 2022. My current research is the integration of large pre-trained language models and knowledge engineering and its application in knowledge-intensive domains.

EDUCATION

Shenyang Ligong University **B. Eng** **Sep.2018-Jun.2022**

- Core Curriculums: Advanced Mathematics, Linear Algebra, Probability Theory, C language programming, Digital Image Processing, Robot Dynamics, ROS Robot System
- Thesis: Research and application of face recognition based on deep learning

Shenzhen Institute of Advanced Technology, CAS **Visiting Student** **Jun.2022-Present**

- Research direction: the intersection of natural language processing, knowledge engineering, computer vision and machine learning, and their applications in areas such as smart construction and smart grids.

PUBLICATIONS

- **Jiang, J.**, Yang, Z., Wu, C., Guo, Y., Yang, M., & Feng, W*. (2023). A compatible detector based on improved YOLOv5 for hydropower device detection in AR inspection system. ***Expert Systems with Applications***, 225, 120065. (**JCR Q1 IF 8.5)**
- Yang, M., Wu, C., Guo, Y., He, Y., Jiang, R., **Jiang, J.**, Yang, Z*. (2024). A teacher-student deep learning strategy for extreme low resolution unsafe action recognition in construction projects. ***Advanced Engineering Informatics***, 59, 102294. (**JCR Q1 IF 8.8)**
- **Jiang, J.**, Wu, C.*, Liu, Z., Guo, Y., Sun, W., & Yang, Z. (2024). Ontology-based distant supervision for extracting entity-property relations in construction documents. ***Automation in Construction***. (**JCR Q1 IF 10.3 Under Review AUTCON-S-24-00151**)
- Wu, C., **Jiang, J.**, Wu, X., Li, X., Guo, Y., & Yang, Z*. (2024). Large language model driven multi-modal information searching in construction management. ***Computers in Industry***. (**JCR Q1 IF 10 Submitted to the Journal**)

PATENTS

- Yang, Z., **Jiang, J.**, Guo, Y., Liu, X., Wu, C. Machine Vision-based Battery Surface Defect Detection Method and System and Related Device. Invention patent, **CN114972258B**, authorized.
- Guo, Y., **Jiang, J.**, Wu, C., Yang, Z., Hu, T. Method, System, and Related Equipment for Defect Detection Based on Battery Surface Images. Invention patent, **CN115272330A**, authorized.
- Yang, Z., **Jiang, J.**, Liu, X., Guo, Y., Wu, C. A Real-time Optimization Control Method for Charging and Discharging States of a Hybrid Energy Storage System. Invention patent, **CN115313447A**, authorized.
- Guo, Y., Zhu, J., **Jiang, J.**, Hu, T., Wang, L., Lu, J., He, Y., Wei, G. A Method and System for Predicting and Compensating the Spindle Error of CNC Machine Tools. Invention patent, **CN114690706B**, authorized.
- Yang, Z., An, Z., Guo, Y., Liu, X., **Jiang, J.** A Method for Generating Fault Prediction Models for Energy Storage Devices Under Extreme Conditions. Invention patent, **CN115310562A**, authorized.
- Yang, Z., Liu, X., Zhu, J., Wang, D., Yu, F., Tang, M., **Jiang, J**. A Method for Predicting the Lifespan of CNC Machine Tool Components Based on Deep Learning Techniques. Invention patent, **CN114676647B**, authorized.

RESEARCH EXPERIENCE

Research Assistant **Jun.2023-Present**

Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences *Shenzhen*

Domain knowledge enhanced large language model for the construction industry (Work in Progress)

- The research focuses on utilizing knowledge engineering to integrate domain knowledge into large language models for the construction industry.
- The aims are to 1) fill the gap of a few studies on large language models in the construction industry, 2) address the issue of existing studies on information extraction focusing on a single data source (e.g., BIM, XML, Ontology, etc), and 3) develop the dataset for construction-domain large language models.
- Hence, the research proposed to develop the first open-source construction-domain large language model adopting the foundation model, fine-tuning it with domain-knowledge, and ensuring its performance in NLP tasks.

Research on Intelligent Scheduling of Prefabricated Construction Project Management Based on Trusted Dynamic Knowledge Graphs (Young Scientists Fund of the National Natural Science Foundation of China)

- One part of the research is focused on the information searching in unstructured data (e.g., text, XML, and IFC) of construction projects that cannot be used efficiently and effectively across platforms (e.g., BIM).
- Hence, the LLM for Construction Management (LLM4CM) framework is proposed to enhance the ability to perform domain-specific tasks, which include: 1) Developed a vector database containing domain knowledge. 2) Designed a voting mechanism to explore the vector space to fully utilize the semantic features of the text. 3) Developed an agent-based approach to adaptively adopt the most suitable LLM for the task.
- Submitted Paper: Large language model driven multi-modal information searching in construction management.

Research on Automatic Modeling and Precision Completion Early Warning of Project Constraints Driven by Knowledge Graph Databases (China Postdoctoral Science Foundation Funded Project)

- Responsible for developing entity-property relation extraction for construction documents using a novel knowledge-based distant supervision framework.
- The aims are to 1) avoid the massive manual annotation of supervised learning for model training, 2) alleviate the cost of developing a KB covering abundant entities with similar semantics, and 3) improve the poor performance of traditional DL models.
- Hence, the Ontology for Relation Extraction (Ont4RE) approach is proposed, which includes 1) Established an ontology as an external KB, 2) Developed an ontology-based distant supervision strategy for automatic annotation, and 3) Developed BERT-based models that pre-trained on self-bulit construction corpus.
- Submitted Paper: Ontology-based distant supervision for extracting entity-property relations in construction documents.

Visiting Student **May.2022-Jan.2023**

Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences *Shenzhen*

Research and Application of Augmented Reality (AR) Technology in Power Plant Operation, Maintenance, and Inspection (University-Enterprise Cooperation Project)

- Responsible for the development of a hydropower device (object) detection algorithm in AR inspection system.
- The aims are to 1) alleviate the computation and usage of the object detection model for deploying it to AR systems, 2) solve the information loss when scale-different feature maps are fused as the person wearing the AR device keeps moving, and 3) optimize hyperparameters for DL model to adapt to working scenarios.
- Hence, the YOLO-Master based on improved YOLOv5 is proposed, which includes 1) Replaced the original backbone with MobileNetv3 to reduce the computation and usage, 2) Introduced Coordinate Attention mechanism to enhance the image features, and 3) Optimized hyperparameters configuration with genetic algorithm.
- Published Paper: A compatible detector based on improved YOLOv5 for hydropower device detection in AR

inspection system.

Undergraduate **Nov.2021-May.2022**

Shenyang Ligong University *Shenyang*

Research and application of face recognition based on deep learning. (Thesis)

- The thesis is focused on face recognition using deep learning algorithm.
- Two DL models (i.e., Retinaface and FaceNet) are utilized in the thesis because face recognition involves two phases (i.e., face detection and face recognition).
- The process includes 1) Detected five key points of the face for facial localization, 2) Mapped facial information into feature embeddings in Euclidean space, and 3) Compared embeddings in the input image with the face database through Euclidean distance.

WORK EXPERIENCE

Intern **May.2022-Jun.2022**

Zhongke Hangmai CNC Software Shenzhen Co., Ltd. *Shenzhen*

- Participated in a collaborative project with China Southern Power Grid, utilizing AR technology to optimize the operation and maintenance processes in power plants. Responsible for collecting and organizing an image dataset of hydropower devices, supporting object detection and localization in AR technology. Led the development and training of the YOLO-Master detector model, compatible with AR devices. Worked closely with backend engineers to integrate the model's output bounding box information with the backend system. The contract was valued at 800,000 RMB.

Database Engineer (Internship) **May.2020-Aug.2020**

Guangdong Creawor Technology Development Co., Ltd. *Guiyang*

- Participated in the development of the Data Business Analysis and Marketing Service Support System for China Mobile (Guiyang). Familiar with mainstream relational databases in the industry, and proficient in using SQL and Navicat to provide data support for Guiyang Mobile. Assisted the project team in maintaining the system and the precision marketing platform, meeting the needs of Guiyang Mobile's precision marketing.

AWARD

- Dean's Innovation Award - Outstanding Graduate Student **Jan.2024**
- The SEIC Outstanding Contribution Award **Dec.2022**
- Excellent Undergraduate Thesis of Shenyang Ligong University **Jun.2022**
- Third Prize in Robot Competition of the School of Mechanical Engineering **Nov.2019**

ACTIVITIES

- The 25th China Hi-Tech Fair **Shenzhen, Nov.2023**
- 2023 International Digital Energy Expo. **Shenzhen, Jul.2023**
- Shanghai Artificial Intelligence Technology Association Annual Conference and Forum on from GPT-3 to ChatGPT: Innovation and Practice in NLP Applications **Shanghai, Feb.2023**
- The 24th China Hi-Tech Fair **Shenzhen, Nov.2022**
- The 3rd International Symposium on New Energy and Electrical Technology **Henan, Aug.2022**
- Chinese Associate of Automation Student Member **Shenzhen, May.2022**
- IEEE Student Member **Shenyang, Mar.2022**

ADDITIONAL SKILLS

English Proficiency: CET 6 (473) / IELTS 6(5.5)

Technical Skills: Origin, Visio, Python, Git, Photoshop, Microsoft 365