Weize Li

11/F, Block C, Qidi science and technology building, Tsinghua Science and Technology Park, Haidian District, Beijing

+86 198-0115-3062 | liweize0224@gmail.com | ericlee0224.github.io/ | github.com/EricLee0224

Education

Beijing University of Civil Engineering and Architecture *Beijing, China*

B.Eng in Mechatronic Engineering (National First-class Discipline Program) *Sept 2018 - July 2022*

- **[Top1%]** Outstanding Undergraduate Thesis Award, Beijing Education Commission, 2022.
- **[Silver Award]** Beijing Challenge Cup: Entrepreneurial Plan Competition (AI System-Track), 2022.
- Thesis Title: Investigating Anomaly Detection in Power System Data through Deep Learning.

Research Interest

My **long-term research goal** is to build machines that efficiently understand the physical world, then apply their knowledge to generate and edit the digital world, enhancing AI's adaptability for continuous learning and innovation in both real and virtual domains.

Computer Vision Neural-Symbolic Reasoning; 3D Scene Understanding; Anomaly Detection.

Computer Graphics 3D Scene Editing; Language-guided Generation; Neural Rendering.

Machine Learning Few-shot Learning; Domain Adaptation.

Research Experience

Institute for AI Industry Research (AIR), Tsinghua University *Beijing, China*

Research Intern @ **DISCOVER Lab** | Advisor: **Prof. Hao Zhao** and **Dr. Qiang Zhou** *May 2022 - Present*

- **Topic:** Neuro-symbolic 3D-aware Scene Editing; Car Reconstruction in Autonomous Driving Simulator; Anomaly Detection.

Institute of Automation, Chinese Academy of Sciences *Beijing, China*

Visiting Student @ **IIS Research Center** | Advisor: **Dr. Chengfei Zhu** and **Prof. Shuxiao Li** *Feb 2022 - Aug 2022*

- **Topic:** Industry Anomaly Detection; Cross -domain few-shot Learning; Model Deployment.

Beijing University of Civil Engineering and Architecture *Beijing, China*

Research Assistant @ **Urban Power Grid Research Group** | Advisor: **Prof. Miao Yu** *Sept 2020 - Dec 2021*

- **Topic:** Power System Data Analysis; Time-series Data Anomaly detection.

Publications

(* denotes equal contribution; † denotes corresponding author.)

Conference Proceedings

PAD: A Dataset and Benchmark for Pose-agnostic Anomaly Detection

Qiang Zhou*, **Weize Li***, Lihan Jiang, Guoliang Wang, Guyue Zhou, Shanghang Zhang, Hao Zhao

NeurIPS 2023 *Datasets and Benchmarks Track (Under Review-6/6/8/8)*, 2023

Journal Articles

IRFLMDNN: Hybrid Model for PMU Data Anomaly Detection and Re-Filling with IRF and LM Algorithm Optimized DNN

Miao Yu†, Chenyu Yang*, **Weize Li***, Weijie Du, Jinglin Li

Neural Comput. Appl. 2023

Patents

Power low frequency oscillation data anomaly monitoring system v1.0[s]

Miao Yu, **Weize Li**, Chenyu Yang, Jinglin Li, Jingxuan Hu, Weijie Du, Shouzhi Zhang

Chinese Computer Software Patent. *No.2022SR0277090*, 2022

Power low frequency oscillation data acquisition system v1.0[s]

Miao Yu, Chenyu Yang, **Weize Li**, Jinglin Li, Jingxuan Hu, Weijie Du, Shouzhi Zhang

Chinese Computer Software Patent. *No.2022SR0281546*, 2022

Selected Projects

Neuro-symbolic 3D scene editing with language-guided.

AIR-SUN Research Project | Advised by **Prof. Hao Zhao** ***In Progress***

- **Motivation:** To introduce neuro-symbolic methods into 3D scene editing tasks, integrating neural networks with symbolic reasoning. By utilizing natural language instructions and scene images, this approach empowers ordinary users to achieve intuitive, precise, and efficient editing of complex 3D scenes.
- **Method:** We fuses the neural networks and symbolic reasoning, designing a DSL to convert natural language instructions into executable editing programs, while neural networks ensure 3D-aware scene comprehension for precise execution.

Novel view synthesis and 3D reconstruction for Cars in Autonomous driving simulator.

AIR-SUN Research Project | Advised by **Prof. Hao Zhao**, **Prof. Yiyi Liao** *In Progress*

- **Motivation:** To enhance the quality of car modeling and generate novel views within ours NeRF-based autonomous driving simulator-*MARS*. The goal is to create a more realistic and diverse simulation environment and improve the authenticity of the simulated scenes, making them more challenging and representative of real-world scenarios.
- **Method:** Investigating potential improvements to the *Zero-123* and *Make-It-3D* models for novel view synthesis from a single car image. Created a dataset that focuses on the 'car' category, filtered from the Objaverse, and fine-tuning the models on it.

Dataset and Benchmark for Pose-agnostic Anomaly Detection.

AIR Summer Research | Advised by **Dr. Qiang Zhou**, **Prof. Shanghang Zhang**, **Prof. Hao Zhao** *May 2023*

- **Motivation:** Existing anomaly detection datasets lack comprehensive visual information from various pose angles, resulting in unrealistic assumptions. Real-world anomalies can arise from different poses, making it necessary to study pose-agnostic anomaly detection. Moreover, the absence of a standardized experimental setup obstructs fair comparisons between methods, emphasizing the need for a consensus on experimental settings in this field.
- **Approach:** We defined the Pose-agnostic Anomaly Detection (PAD) setup and developed a large-scale dataset composed of Lego toy objects. We benchmarked 11 state-of-the-art methods for PAD. Additionally, we proposed the first NeRF-based framework for object anomaly detection.
- **Contribution:** My contributions to this project include dataset design and collection, benchmark establishment, module design, chart creation, writing, and lead the rebuttal process.

McADTR: Multi-class Anomaly Detection Transformer with Heterogeneous Knowledge Distillation.

AIR Summer Research | Advised by **Dr. Qiang Zhou**, **Prof. Hao Zhao**, **Prof. Li Yi** *Oct 2022*

- **Motivation:** Existing methods need to train models separately for different classes, and a unified framework is needed. Anomaly detection methods based on reconstruction are vulnerable to "identical mapping", i.e., they can recover normal and anomalous samples well enough to make them still indistinguishable.
- **Method:** We follow the typical teacher-student architecture, where fixed pre-trained CNN as teachers provide a priori knowledge of reconstruction capabilities, and well-designed ViT with learnable query as student to train on AD dataset and circumvent 'identical mapping' by utilizing the ability to learn global features at a shallow layer.

Medical Device Product Anomaly Detection Model Deployment.

Visiting Research Project | Advised by **Dr. Chengfei Zhu**, **Prof. Shuxiao Li** *May 2022*

- **Motivation:** State-of-the-art anomaly detection methods excel within specific datasets, but for real-world Medical Device scenarios, challenges arise due to the lack of negative samples for training and significant domain gaps, hindering the effectiveness of straightforward transfer applications.
- **Contribution:** My contributions to this project include deploying anomaly detection and localization models using OpenCV and C#. Visualize anomaly regions by using heatmap. State-of-the-art methods are reproduced for evaluation on our dataset. Experiment with different finetune parameters to get the best cross-domain few-shot transfer performance.

Power System Data Analysis and System Design.

Research Assistant Project | Advised by **Prof. Miao Yu** *Dec 2021*

- **Motivation:** Explored the application of ML/DL methods instead of classical data analysis methods to improve the reliability of power systems. Carried out systematic scientific research training through projects.
- **Contribution:** My contributions to this project include assisted in the development and code debugging of power system monitoring software; Undertaked the routine group meetings to share state-of-the-art works on ML applications; Explored the anomaly detection for power system time series data, and proposed an anomaly detection method applied to PMU data as collaborator.

Skills

Programming Python (PyTorch, NumPy, Scikit-learn. etc.), MATLAB, C/C#, HTML/CSS.

Tools Linux, Git, Shell (Bash/Tmux), LaTeX(Overleaf/Markdown), Slurm, Adobe Illustrator.

Language Chinese (Native), English (Proficiency).