Xin Huang

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Biography

I am a second-year postgraduate from Beijing Institute of Technology, and I received B.Eng from China Agricultural University in 2022.

My research interests include deep learning (DL) and natural language processing (NLP), and I have been working on log-based anomaly detection and semantic communication leveraging NLP methods.

Education

Beijing Institute of Technology (985, QS 340) **Sep 2022 - Jun 2025:** *M.Eng*
Postgraduate Recommendation
Major in Network and Information Security

China Agricultural University (985, QS 534) **Sep 2018 - Jun 2022:** *B.Eng*
Major in Computer Science and Technology
GPA: 3.66/4.0 (91.5/100)

Publications

Log-based Anomaly Detection **Sep 2022 - Now:** *Cooperated with Peking University*

1. **Xin Huang***, Ting Zhang, and Wen Zhao. "LogIRL: A Log-based Anomaly Detection Method through Inverse Reinforcement Learning and Large Language Model", *European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML PKDD)*, 2024. **(CCF B, Under review)**
    - We devise an interactive environment and propose LogIRL, the inaugural inverse reinforcement learning (IRL)-based method integrated with a large language model (LLM) for log-based anomaly detection. During the pretraining stage, LogIRL leverages IRL to directly learn a policy at sequential level from expert demonstrations. Compared to reinforcement learning (RL), LogIRL obviates the necessity for manually crafting a suboptimal reward function.
    - We fine-tune an LLM with low-rank adaptation (LoRA) and utilize it for semantic-level inference, manually labeling the outputs, and providing semantic rewards. Subsequently, we further fine-tune the policy with RL and the rewards to obtain an anomaly detection model that integrates both semantic and sequential knowledge.
    - Experimental results confirm the superiority of LogIRL over baseline methods. LogIRL notably enhances precision while maintaining high recall compared to using LLMs alone for anomaly detection. Moreover, its heightened interpretability enhances its practical utility in real-world applications.
2. Ting Zhang, **Xin Huang***, Wen Zhao, Guozhao Mo, and Shaohuang Bian. "LogContrast: A Weakly Supervised Anomaly Detection Method Leveraging Contrastive Learning", *International Conference on Software Quality, Reliability, and Security (QRS)*, 2023. **(CCF C, Oral)**
    - We propose LogContrast, a log-based anomaly detection method that leverages weakly supervised contrastive learning to address the problems of scarce and erroneous log labels in reality. This approach only uses a portion of the labels for supervised training, thus reducing the training bias caused by noisy log labels.
    - We explore the role of log semantics and log key sequence features in anomaly detection tasks, and explain the characteristics of these two features through t-SNE visualization: log semantic features tend to distribute normal and abnormal logs more uniformly on the hypersphere

surface, while log key features can separate normal and abnormal logs into different clusters and better adapt to constantly evolving logs.

3. Ting Zhang, **Xin Huang***, Wen Zhao, Shaohuang Bian, and Peng Du. "LogPrompt: A Log-based Anomaly Detection Framework Using Prompts", *International Joint Conference on Neural Networks (IJCNN)*, 2023. **(CCF C, Oral)**

   - We propose a log-based anomaly detection method named LogPrompt, which leverages prompt tuning to enable pretrained language models (PLMs), such as BERT, RoBERTa and ALBERT, to learn more about the representations of logs.
   - When fine-tuning a PLM, focal loss is used instead of cross entropy loss, which alleviates the problem of imbalanced among normal and anomalous log samples in the real world, greatly improving the recall and F1 score.

Semantic Communication **Sep 2022 - Now:** *Research topic of graduating thesis*

1. **Xin Huang** and Liang Zeng*. "Improving Autoencoder-Based Deep Joint Source-Channel Coding for Robust Text Transmission through Contrastive Learning", *IEEE Journal on Selected Areas in Communications (JSAC)*, 2024. **(CCF A, JCR Q1, IF=16.4, Under review)**
2. Chang Li, Liang Zeng*, **Xin Huang**, Xiaqing Miao, and Shuai Wang. "Secure Semantic Communication Model for Black-Box Attack Challenge Under Metaverse", *IEEE Wireless Communications*, 2023. **(JCR Q1, IF=12.9)**

   We introduce the development prospects of semantic communication in the context of the metaverse, as well as three methods to ensure semantic communication security: (1) secure communication model based on semantic block; (2) secure communication model based on semantic variable coding; and (3) secure communication model based on hybrid channel with hidden task.

* indicates corresponding author

Honors and Awards

- National Encouragement Scholarship **(National, 2020)**.
- "Optics Valley of China · Huawei Cup" The 19th China Post-Graduate Mathematical Contest in Modeling, **3rd Prize (National, 2023)**.
- Mathematical Contest in Modeling and Interdisciplinary Contest in Modeling (MCM/ICM), **Honorable Mention (International, 2020)**.
- The Chinese Mathematics Competitions (CMC), **3rd Prize (National, 2020)**.
- Contemporary Undergraduate Mathematical Contest in Modeling (CUMCM), **Beijing 2nd Prize, (National, 2019)**.

Certifications

- China Computer Federation Certified Software Professional (CCF-CSP): **220 scores**.

Work

Momenta **Oct 2021 - Jan 2022:** Mpilot, R&D Engineer (Intern)
I developed performance analysis tools for vehicle systems based on Python and C++.

Languages

- Mandarin - Native.
- English - CET-4: 564 scores; CET-6: 475 scores; TOEFL: preparing.