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Songning Lai

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Education

Shandong University 2020.9 — 2024.6 (expected)
Bachelor in Communication Engineering

- *Overall GPA:* ***83.53/100.00*** *WES-GPA:* ***3.30/4.00***

Research Interests

My research interests focus on practical problems in **artificial intelligence** and **the potential applications of Deep Learning in various fields**. I believe that advanced technologies like DL can have a positive impact on society. My research includes **bioinformatics, multimodal sentiment analysis, domain generalization, and the interpretability of multimodal models**. I am committed to contributing to meaningful causes that bring benefits to society through the development of practical DL solutions.

Publications

1. **Predicting Lysine Phosphoglycerylation Sites using Bidirectional Encoder Representations with Transformers & Protein Feature Extraction and Selection** [pdf]
   Songning Lai, Xifeng Hu, Jing Han, Chun Wang, Subhas Mukhopadhyay, Zhi Liu* and Lan Ye*
   Oral and ***Best Paper Award****– IEEE Conference on International Congress on Image and Signal Processing, BioMedical Engineering and Informatics (CISP-BMEI 2023)—IEEE Xplore, EI Compendex*

2. **Classifying Crime Types using Judgment Documents from Social Media** [pdf]
   Haoxuan Xu, Zeyu He, Mengfan Shen, **Songning Lai**, Ziqiang Han* and Yifan Peng*
   IEEE Conference on International Seminar on Artificial Intelligence, Networking and Information Technology (AINIT 2023)—IEEE Xplore, EI Compendex

3. **BERT_PLPS: A BERT-based Model for Predicting Lysine Phosphoglycerylation Sites** [pdf]
   Songning Lai, Yankun Cao, Pengwei Wang*, Lan Ye* and Zhi Liu*
   Under review in the journal BMC Bioinformatics ***(JCR Q2 IF:3.307, CCF C)***

4. **Shared and Private Information Learning in Multimodal Sentiment Analysis with Deep Modal Alignment and Self-supervised Multi-Task Learning** [pdf]
   Songning Lai, Xifeng Hu, Yulong Li, Zhaoxia Ren*, Zhi Liu* and Danmin Miao*
   Under review in the journal IEEE Transactions on Affective Computing ***(JCR Q1 IF:13.99, CCF B)***

5. **Multimodal Sentiment Analysis: A Survey**
   Songning Lai, Haoxuan Xu, Xifeng Hu, Zhaoxia Ren* and Zhi Liu*
   Under review in the journal Displays ***(JCR Q2 IF:3.074)***

6. **Cross-Domain Car Detection Model with Integrated Convolutional Block Attention Mechanism**
   Haoxuan Xu, **Songning Lai(co-first author)** and Yang Yang*
   Under review in the journal Image and Vision Computing ***(JCR Q1 IF:3.86)***

Selected Awards

National awards–9 awards in total

- First Prize in China Undergraduate Mathematical Contest in Modeling **(Top 0.6%)**
- First Prize in MathorCup University Mathematical Modeling Challenge National **(Top 3%)**
- Broze Medal in China Collegiate Algorithm Design & Programming Challenge Contest

Provincial awards

- Second Prize in National Undergraduate Electronics Design Contest (Shandong Province)
- Second Prize in National Crypto-math Challenge Second (East China Competition)

School awards

- More than **35** university-level awards, including academic competition, social practice, innovation and entrepreneurship, sports, aesthetic education, volunteer, scholarship and other aspects, are not displayed here

Others

- IEEE/EI (CISP-BMEI 2022) **Best Paper Award**
- The invention patent is under examination: The invention relates to a method and system for recognizing lysine phosphate glycerylation site
- Computer software copyright first copyright owner
- Computer software copyright third copyright owner

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Laboratory Research Projects

- Research on key scientific issues of accurate diagnosis and intelligent risk assessment of coronary heart disease based on multimodality radiomics———**NO. ZR2019ZD05 Natural Science Foundation of Shandong Province**
- Research on Physiological Data Aggregation and Mining techniques———**2018YFC0831006-3 Key R&D plan**
- Development of AI image recognition and monitoring system for early gastric cancer———**2021CXGC010506 Key R&D plan of Shandong Province**
- Intelligent wearable medical ultrasound equipment———**CXGC010504 Major Innovation Project of Shandong Province**

Research Experiences

Privacy-Awareness, Responsibility and Trustworthy (PART) Lab **2023.4 — Present**
Research Intern, Advisor: Prof. Di Wang *KAUST*

- Faithful CLIP-based Concept Bottleneck Models(In collaboration with KAUST).–Work hard for **AAAI 2024** in a few months!
- Towards Consistent Multimodal Explanation via Data Influence (In collaboration with KAUST).–Work hard for ICLR 2024 in a few months!

Shandong University Intelligent Medical Information Processing Research Center **2022.8 — Present**
Research Intern, Advisor: Prof. Zhi Liu *Shandong University*

- Bioinformatics: Involving knowledge in the field of single-cell transcriptomics and spatial transcriptomics. Learn and complete the basic single-cell transcript data analysis process, such as quality control, dimensionality reduction (PCA), clustering and visualization (TSNE, UMAP), cell annotation, functional enrichment analysis, and pseudotime analysis. Protein post-translational modification - lysine phosphorylation and glycosylation site prediction task.
- Scientific research achievement: IEEE CISP-BMEI 2023 Best Paper Award; a journal under review in the journal BMC Bioinformatics(JCR Q2); an invention patent is under examination.
- Multimodal sentiment analysis: A journal under review in the journal IEEE Transactions on Affective Computing(JCR Q1); A journal under review in the journal Image and Vision Computing(JCR Q1).

Shandong University Signal Processing and Artificial Intelligence Research Institute **2023.3 — 2023.6**
Research Intern, Advisor: Prof. Yang Yang *Shandong University*

- Vehicle detection: A comprehensive framework for cross-domain target detection is developed. By fine-tuning the target detector using the image generator in the target domain based on source domain training, high-accuracy cross-domain target detection is achieved in the absence of the target domain, improving mAP by 18.55% over original target detection results.
- Scientific research achievement: A journal under review in the journal Image and Vision Computing(JCR Q1).

McMaster University **2022.10 — 2023.2**
Research Intern, Advisor: Prof. Xiaolin Wu *McMaster University, Canada*

- Mainly working on domain generalization, trying to use all domain generalization algorithms (about 10) to explore graphic perception problems (such as graphic concavity and convexity, and graphic quantity).invention patent is under examination.

Human-Machine Intelligence System Research Center **2022.1 — 2022.8**
Research Intern, Advisor: Prof. Dong Xuan *Shandong University*

- Mainly working on machine vision and robotic arm control, helping graduate students complete their projects: binocular camera recognition, robotic arm grabbing ping pong balls, AGV intelligent cars, etc.

Projects

All project descriptions, including published articles, are available here.

Serviece

- Reviewer: European Conference on Artificial Intelligence(ECAI)
- Monitor of Chongxin College of Shandong University (The class was awarded as Shandong Provincial Excellent Class and Shandong University Top Ten Class)

Skills

- Tools and Languages
  - Python, C, MATLAB, R, Git, LaTeX, MarkDown, design software(such as PS, AI and SAI, and have won the **first prize** of the city and the **second prize** of the province in computer painting competition.)
- Deep Learning Research
  - Pytorch, MATLAB, matplotlib, OpenCV, Numpy, Streamlit