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Songning Lai

Chongxin College, Shandong University

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EDUCATION

Shandong University

Bachelor in Communication Engineering

2020.9 — 2024.6 (expected)

- Overall GPA: 83.53/100.00

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

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

Haoxuan Xu, Zeyu He, Mengfan Shen, Songning Lai, Ziqiang Han and Yifan Peng

Oral and Best Paper Award— 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

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

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 Visual Intelligence

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 Contemporary Undergraduate Mathematical Contest in Modeling National (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 Electronic 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

SELECTED PROJECTS

All project descriptions, including published articles, are available [here](#).

BERT_PLPS: A BERT-based Model for Predicting Lysine Phosphoglycerylation Sites

- We propose a novel and efficient computational method, BERT_PLPS, to predict lysine phosphoglycerylation sites.
- The dynamic masking strategy is used to replace the original static masking strategy, which effectively improves the anti-noise ability of the model.
- Several groups of experiments are designed to compare and explore the adaptability of various data dimensionality reduction algorithms for amino acid sequence task learning.
- Experiments on the public benchmark data sets verify the feasibility of the model. Moreover, our current approach outperforms the current state-of-the-art methods.

Shared and Private Information Learning in Multimodal Sentiment Analysis with Deep Modal Alignment and Self-supervised Multi-Task Learning

- A function based on the covariance matrix is proposed as a second-order statistic to measure the distribution of features between aligned and drawn-out modes.
- To train the network to learn shared information between modalities, a differentiable loss function is designed.
- A self-supervised learning strategy generation module is utilized to guide the multimodal task to focus on modality-specific private information.
- Comprehensive experiments are conducted on three benchmark datasets for multimodal sentiment analysis to validate the feasibility of this designed module, which outperforms the current state-of-the-art methods.

Cross-Domain Car Detection Model with Integrated Convolutional Block Attention Mechanism

- 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.
- An improved CycleGAN-based image generator that learns the primary features of blackout vehicles through a target domain image generation module with an integrated convolutional attention mechanism is created.
- The overall detection performance of the Faster R-CNN model is enhanced by using generalized cross union as the loss function of the target detection framework, combined with the Convolutional Block Attention Module.
- An effective data augmentation method is employed to expand the dataset effectively, even with a limited training set.

Course Project MIT Intelligent Car (Electrical Engineering And Computer Science I)

- Implemented system simulation based on models and algorithms.
- Utilized signals and systems for system control, so that intelligent vehicles could drive stably and avoid collisions.
- Built a posteriori probability through the probability model, judged the labyrinth elements, and selected the path.
- Used amplifier to build circuit, combined with photosensitive resistor to move the vehicle towards light source.

Course Project YOLOV5, LPRNet neural network and SE5 realize license plate detection

- Implemented LPRNet neural network for license plate recognition model based on pytorch.
- Improved classification accuracy by modifying network parameters and network structure.
- Completed the model transformation and run it on SE5 computing platform.

Course Project MIT Intelligent Car (Electrical Engineering And Computer Science I)

- Designed Intelligent vehicle system on python 2.6 platform.
- Implemented system simulation based on models and algorithms.
- Utilized signals and systems for system control, so that intelligent vehicles could drive stably and avoid collisions.
- Built a posteriori probability through the probability model, judged the labyrinth elements, and selected the path.
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Course Project YOLOV5, LPRNet neural network and SE5 realize license plate detection

- Implemented LPRNet neural network for license plate recognition model based on pytorch.
- Improved classification accuracy by modifying network parameters and network structure.
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SKILLS

- Tools and Languages
 - Python, C, MATLAB, R, Git, ~~TeX~~TeX, 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