XUANSHENG WU

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EDUCATION

University of Georgia 08/2021 – Present

- *Doctor of Philosophy in **Computer Science***

Shanghai University of International Business and Economics 09/2016 – 06/2020

- *Bachelor of Science in **Applied Statistic***

HONORS & AWARDS

- Rewarded **700+ Stars** on Github for first-author projects 09/2023
- 2021 Tencent Advertising Algorithm Competition - **Top 1.7%** 07/2021
- Baidu Python Good Coder - **1/22** 03/2021
- Shanghai Aijian Scholarship - **Top 1%** 01/2020
- Research Pioneer Award of Shanghai University of International Business and Economics - **Top 1%** 08/2019
- 2nd Prize of China Programming Contest for College Students - **Top 4.5%** 08/2019
- Single-subject Scholarship of Shanghai University of International Business and Economics - **1/125** 11/2017
- 1st Asian University Archery Championship - **3rd** in Men's Group 04/2017

INTERNSHIPS

Tencent – Tencent AI Lab 05/2023 – 08/2023

- Proposed a series of local and global explanation methods for interpreting transformer-based language models.
- Examined supervised instruction fine-tuning by comparing pre-trained and fine-tuned model explanations. We found that (1) instruction fine-tuned models more effectively recognize instruction from user prompts to drive the response generation; (2) instruction fine-tuning aligns feed-forward networks with user-oriented tasks; (3) instruction fine-tuning helps self-attention heads to encode more word-word relations about instruction verbs.

Baidu - Department of Natural Language Process 09/2020 – 04/2021

- Raised the Long Text Semantic Segmentation problem which leads to a significant negative impact of distorted paragraphs on downstream tasks (e.g., Machine Reading Comprehension, Query Generation, and ES Selection). Developed a document semantic segmenting model by designing training objectives and construction strategies with segmenting **F1=72.31%**. The model has been applied as a service to support Baidu Top-1 Search and FAQ Mining System.
- Investigated the bottleneck of the FAQ Mining System causing the low GPU utilization problem. Proposed a new architecture consisting of three components, namely Proxy, Scheduler, and Operator, which parallelly handles requests and schedules the GPU-based services dynamically according to the payload of each service. Designed a low-resource scheduling algorithm to assign services for different GPUs. Improved GPU Utilization by **2.9X** and QPS by **4.1X**.
- Worked with coworkers to improve searching experience of Baidu Top-1 Search under metrics **Good:Same:Bad=28:6:1** by optimizing services of Truncation Detection, Enumerate Answers, and Multi-Resources Recall.
- Deployed a query filter service for queries that require videos as answers (VQA) based on GBDT with **F1=93.43%**.

Pingan OneConnect Co., Ltd - Institute of Big Data 01/2019 – 06/2019

- Proposed to use Feature Context-Free Grammar for the Seq2SQL task, new solution supports 34 external patterns.

Shanghai Ronghao Investment and Management Co., Ltd 01/2018 – 02/2018

- Designed and tested a short-term trading strategy by analyzing over 40 millions transaction records.

RESEARCHES

Could Small Language Models Serve as System Cold-start Recommenders? 09/2022 – 09/2023

- Formalized the system cold-start recommendation problem and launched the first benchmark for this challenge.
- Provided a mathematical framework of the in-context recommendation under the Hidden Markov assumption and demonstrated that in-context recommendation ability could be enhanced by model and prompt pre-training.

- Proposed a corpus refinement method and a decoupled prompt pretraining method to enhance small language models, empowered BERT-mini (11M parameters.) achieves comparable performance with BERT-large (330M parameters).

DIRECT: Dual Interpretable Recommendation with Multi-aspect Word Attribution 04/2022 – 08/2022

- Proposed a review-based interpretable recommender system, predicting user preferences by averaging sentiment polarities of words weighted by word importance, where a word is important if it corresponds to an aspect of the item.
- Employed a concept-bottolneck layer and maximized the coding rate reduction on the space of aspect representations by leveraging a word-word affinity graph extracted from a pre-trained language model to learn discriminative aspects.
- Quantified experiments and case studies showed that DIRECT is comparable to SOTAs but provides clear explanations.

NoPPA: Non-Parametric Pairwise Attention Random Walk Model for Sentence Representation 09/2021 – 11/2021

- Proposed a novel sentence encoder by integrating the non-parametric self-attention into the bag-of-words model.
- Constructed a conjunction matrix between each two positional word embeddings to capture word-word relations, then applied a non-linear kernel between them to obtain feature embedding to describe this relationship.
- Evaluated NoPPA on eight different tasks and exceeded the bag-of-words-based baselines by **Acc=2.89%** on average.

2021 Tencent Advertising Algorithm Competition: Multimodal Video Ads Tagging 05/2021 – 07/2021

- Investigated that the baseline InceptionV3+Vggish+BERT+Resnet50-->NextVLAD-->ContextGate-->MLP has two issues: overfitting and outdated feature extractor, used the following solutions to improve it from 76.10% to **GAP=82.10%**.
- Removed the center frame modal as a redundant modal; tuned dropout rate; applied data augment strategies.
- Replaced the original InceptionV3 embedding with the embedding from the last two blocks of the EfficientNet to provide additional high and low level semantic information; Enhanced time information to the image flow by simply shifting parts of the embedding referring the idea of the Temporal Shift Model; Concatenated Word2Vec of ASR tokens with EfficientNet embedding to enhance relevant and suppress unnecessary information to the image flow.

Lifestyle-Based Cervical Cancer Screening 03/2018 –03/2019

- Improved the data engineering pipeline for feature selection and missing value handling, outperformed SOTA by 5%.

PROJECTS

Reproduction of Forward-Forward Algorithm 01/2023

- Reproduced the Forward-Forward algorithm proposed by Geoffrey Hinton, rewarded **140+** stars on Github.

DaPy: An open-source and easy-to-use data analysis framework for humans 09/2017 – Present

- Achieved comparable efficiency with Pandas by using MemoryView, Cache-Friendly Operations, and Binary Search Index.
- Implemented machine learning models (e.g., Decision Tree, Linear Regression, Language Model, Hidden Markov Model).

Distributed Archery Events Supporting System based on B/S+C/S Hybrid Architecture 12/2017 –12/2018

- Proposed "B/S + C/S Hybrid Layout Architecture" to support high efficiency and high stability concurrently.
- Designed a HTTP-based protocol with encryption to securely synchronize data among nodes under an LAN environment.
- Served 2018 Chinese University Archery Championships (peak of the system was **1430** visits per second).

PUBLICATIONS

- ***Understanding the Behavior Shift in LLMs after Supervised Fine-tuning***, under reviewing by NAACL 2024.
- ***Could Small Language Models Serve as Recommenders***, under reviewing by WWW 2024.
- ***DIRECT: Dual Interpretable Recommendation with Multi-aspects Word Attribution***, under reviewing by TIST.
- ***Black-box Backdoor Defense via Zero-shot Image Purification***, NIPS, 2023.
- ***Matching Exemplar as Next Sentence Prediction (MeNSP)***, AIED, 2023.
- ***NoPPA: Non-Parametric Pairwise Attention Random Walk Modelfor Sentence Representation***, Preprint, 2023.
- ***Rethinking the Impacts of Overfitting and Feature Quality on Small-scale Video Classification***, ACM MM, 2021.
- ***Lifestyle-based Approach for Cervical Cancer Screening***, Int. Conference on Data Science (ICDATA), 2018.
- ***Optimization of Value Average Strategy in China Stock Market***, China Collective Economy, 2018, 69(4).

SKILLS & HOBBIES

- Python, C, Linux, SQL, SPSS, MATLAB.
- Archery (part-time coach 2+ years), Basketball (core member in school team), Travelling w/ my girlfriend and family.