WANG YUPEI

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Research Interest: Neural Model Interpretablity, Computational Linguistics, AI for Education

EDUCATION

Department of Digital Humanities, Beijing Normal University **Sept 2022 – Jun 2025**
Computational Linguistics (Advisor: Renfen Hu) ***86.37/100***

School of Mathematics and Statistics, Beijing Jiaotong University **Sept 2018 – Jun 2022**
Information and Computation Science ***3.72/4***

SELECTED COURSEWORK [U] denotes undergraduate courses, [G] denotes graduate courses.

- Mathematical Statistics ([U])
- Information Theory ([U])
- Theory & Algorithms for Optimization ([U])
- Foundations of Natural Language Processing ([G])
- Frontier of Cognitive Neuroscience in Linguistic Research ([G])
- Big Data Driven Artificial Intelligence ([G])
- Lexical Semantics ([G])

PAPERS

Yupei, W., & Renfen, H. (2021). A Prompt-independent and Interpretable Automated Essay Scoring Method for Chinese Second Language Writing. In *Proceedings of the 20th Chinese National Conference on Computational Linguistics* (CCL 2021 Oral, *cited by 13*).

Yupei, W., & Renfen, H., & Zhe, Z. (2024). Beyond agreement: Diagnosing the rationale alignment of automated essay scoring methods based on linguistically-informed counterfactuals. In *Findings of the Association for Computational Linguistics: EMNLP 2024*.

Kaijie, M., & Ziliang, Q., & **Yupei, W.**, & Renfen, H. (2024). Construction and Application of Ancient Chinese Allusion Resource Database. Accepted by *Journal of Chinese Information Processing (CSSCI)*.

RESEARCH

ML-Based Interpretable Automated Essay Scoring (AES) System **Mar 2020 – Jun 2021**

- Developed an AES model for Chinese L2 essays using ordinal logistic regression, incorporating 90 linguistic complexity features, 5 writing error features, and n-gram TF-IDF features.
- The model outperforms several LSTM-based neural models and enhances score interpretability with a prompt-independent feature set.
- Developed and open-sourced L2C-Rater, a tool for Chinese L2 AES. [paper] [code] [demo]

Automated Essay Prompt Adherence Assessment via Semantic Matching **Sept 2021 – Apr 2022**

- Developed a semantic matching-based approach for essay prompt-adherence assessment using composite reference texts derived from prompts and exemplar essays.
- Integrated this method into the previous AES system to improve prompt adherence assessment and overall scoring accuracy. [Beijing Jiaotong University Outstanding Bachelor's Thesis Award]

Interpretability of Neural Language Models in AES **Mar 2023 – Feb 2024**

- Investigated the decision-making processes of neural language models in AES by developing a counterfactual method that intervenes on linguistic elements in essays.
- Discovered that fine-tuned pre-trained models align better with human graders but focus primarily on sentence-level features, while LLMs demonstrate sensitivity to both sentence-level and overall essay structure. [paper] [code]

A Few-Shot Comparative Learning Approach to Enhance LLMs' Performance in AES **Mar 2024 – Present**

- Developed an iterative comparison mechanism for LLMs to assess essay quality through sequential pair-wise evaluations.
- Initial experiments indicate superior performance over fine-tuned BERT in low-resource scenarios. [arxiv soon]

Construction and Application of Ancient Chinese Allusion Resource Database **Oct 2022 – Mar 2024**

- Developed a knowledge base of 23,000 allusions and an annotated corpus with over 30,000 entries.
- Designed two tasks—allusion detection and allusion recognition—with corresponding evaluation baselines.
- Used this resource to evaluate Chinese language capabilities in LLMs and to enhance Chinese language education. [To be published in November 2024]

INDUSTRY EXPERIENCE

Cummins China | Natural Language Processing (NLP) Intern **Mar 2022 – Jun 2022**

- Developed a system allowing users to customize engineering datasets using natural language inputs.
- Created a domain-specific knowledge corpus from scratch and developed a hybrid retrieval algorithm combining rule-based methods and vector similarity.

Du Xiaoman Technology (Baidu Financial) | NLP Intern **Dec 2023 - Mar 2024**

- Reproduced experiments from research papers on LLM technologies, delivering weekly team presentations on pre-training, fine-tuning, and human preference learning algorithms.
- Participated in an LLM-driven game project, focusing on fine-tuning models to emulate specific animated and literary characters. Developed methods to assess knowledge boundaries and control model responses.

TEACHING EXPERIENCE

Python Programming and Data Analysis | Undergraduate & Graduate **Renfen Hu**

- Served as a teaching assistant during the Spring 2023, Fall 2023, Spring 2024 and Fall 2024 semesters.
- Responsible for 4 tutorial sessions each semester, providing supplementary explanations on machine learning and natural language processing theory and practice.
- Organized 5 competitions on Kaggle to help students learn from practice. [23S], [23F], [24S1], [24S2], [24F]

Natural Language Processing | Graduate **Renfen Hu**

- Drafted a basic manual on linear algebra, and based on this manual, conducted four supplementary classes totaling 12 hours. These classes introduced fundamental linear algebra knowledge required for NLP research from a geometric intuition perspective to students with no prior background.
- Responsible for 4 tutorial sessions, demonstrating the code implementation of common NLP tasks. During this process, I maintained a practical tutorial repository. This library covers model training and fine-tuning based on PyTorch and 🤗Transformers, including models such as TextCNN, LSTM, BERT, T5, Qwen, and others, for tasks like text classification and machine translation, as well as asynchronous API calls for LLMs.

COMPETITIONS (Team-based. Served as team leader in the competition marked with *)

The Interdisciplinary Contest in Modeling (ICM)* | Finalist **Feb 5 – 9, 2021**

- Developed an influence network and similarity model to assess artists' impact and music relationships. Identified "infectious" musical traits and tracked shifts in artistic influence, highlighting pivotal moments in music history.

Contemporary Undergrad Math Contest in Modeling (CUMCM)* | First Prize of Beijing Division **Sep 10 – 13, 2020**

- Designed a quadratic programming model to optimize bank lending to SMEs, balancing profit and risk. Crafted strategies for businesses with and without credit history using invoice data. Accounted for strategy adaptations during unexpected events like pandemics.

SKILLS

- Python
- PyTorch
- CMD & Shell
- R
- 🤗Transformers
- Git
- LaTeX