# WANG YUPEI

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**Research interest: Interpretability of neural networks, NLP applications in Education**

## EDUCATION

**Institute of Information Processing, Beijing Normal University** **Sept 2022 – Jun 2025**
*Computational Linguistics ( supervisor: Renfen Hu )* ***86.37/100***

**School of Mathematics and Statistics, Beijing Jiaotong University** **Sept 2018 – Jun 2022**
*Information and Computational Science* ***3.72/4 (rank 2/73)***

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

- Numerical Computation (90 [U])
- Equations of Mathematical Physics (A/90+ [U])
- Theory of Information and Coding (88 [U])
- Modern Algebra (87 [U])
- Theory and Algorithms for Optimization (A-/85+ [U])
- Foundations of Natural Language Processing (93 [G])
- Frontier of Cognitive Neuroscience in Linguistic Research (92 [G])
- Big Data Driven Artificial Intelligence (90 [G])
- Lexical Semantics (94 [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. Submitted to *the 2024 Conference on Empirical Methods in Natural Language Processing* (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*.

## RESEARCH

**ML-Based Automated Essay Scoring Using Linguistic Features** **Mar 2020 – Jun 2021**

- We developed an automated scoring model for essays written by learners of Chinese as a second language (L2) using ordinal logistic regression. Our model integrates 90 linguistic complexity features, 5 writing error features, and n-gram TF-IDF features, outperforming several LSTM-based neural models. Our prompt-independent feature set enhances score interpretability. We also developed L2C-Rater, a tool for automated Chinese L2 essay scoring. [paper] [code] [demo]

**Automated Assessment of Essay Prompt Relevance** **Sept 2021 – Apr 2022**

- Developed an automated essay relevance assessment method using a composite reference text from prompts and exemplar essays, which was then integrated into the previous automated essay scoring model to improve relevance identification and overall scoring accuracy. [Beijing Jiaotong University Outstanding Bachelor's Thesis Award]

**Interpretability of Neural Language Models in Automated Essay Scoring** **Mar 2023 – Feb 2024**

- Investigating neural language models' decision-making in automated essay scoring, we developed a counterfactual method to analyze model behaviors. By manipulating linguistic elements in essays, we found fine-tuned pre-trained models align better with human graders than LLMs, but focus mainly on sentence-level features. LLMs, however, showed sensitivity to both sentence-level and overall essay structure. These insights into neural models' functioning in essay evaluation suggest ways to improve automated grading systems, advancing more effective and comprehensive essay assessment tools. [paper] [code]

**LLM-Based Essay Quality Comparison and Automated Scoring Method** **Mar 2024 – Present**

- Inspired by our observations in interpretability research, we developed a novel essay scoring method using LLMs. We found that while LLMs struggle with absolute essay scores, they excel at gauging relative essay quality. Leveraging this insight, we designed an algorithm that uses LLMs to compare essays' relative quality, determining the score range for evaluated essays. Preliminary results show our approach outperforms fine-tuned pre-trained models in low-resource scenarios. [arxiv soon]

**Knowledge Representation and Processing for Intelligent Ancient Text Curation** **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 usage detection and automatic allusion identification, with corresponding evaluation baselines. Explored the potential of this resource for evaluating Chinese language capabilities in LLMs and for Chinese language education. [To be published in Nov 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.

**Beijing Institute of Big Data Research** | Data Analysis Intern **Jun 2022 - Aug 2022**

- Constructed and managed datasets using `Label Studio`.
- Fine-tuned pre-trained language models like BERT for text classification and named entity recognition tasks leveraging PyTorch and 🤗Transformers library.

**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 | Graduate** **Renfen Hu**

- I served as a teaching assistant during the Spring 2023, Fall 2023, and Spring 2024 semesters. Each semester, I was responsible for 2-4 tutorial sessions, providing supplementary explanations on machine learning and natural language processing theory and practice.
- Organized four competitions on Kaggle to help students learn through practical experience. [23S], [23A], [24S1], [24S2]

**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 gradually improved 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 large language models.

## 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.

## LANGUAGE

**College English Test - 6** | 615 / 710

**TOEFL iBT** | Scheduled for Sept 2024

**Working in English environment when interning at Cummins.**

## SKILLS

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