Zixin RAO

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EDUCATION EXPERIENCE

Minzu University of China (Project 985 & 211), China – Bachelor of Science **Sep. 2021 – Jun. 2025**

Major: Information and Computing Science **GPA:** 86/100

Relevant Courses: Elements of Information Theory (96), Mathematical Modeling (90), Data Structure (92), Mathematical Analysis (94), Probability and Mathematical Statistics (86), Python Language (88)

PUBLICATIONS

[1] **Zixin Rao**, Nan Xi, Tianyu Luan, Kang Dang, Jingjing Meng, Junsong Yuan. "Action Difference Reasoning via Knowledge-Aware Keypoint Graph" (Submitted to CVPR)

[2] **Zixin Rao**, Zeyan Liu, Youssef Mohamed. "DA-MTL: Multi-Task Learning for Detection and Attribution of LLM-Generated Text" (Submitted to PAKDD)

[3] **Zixin Rao**. "Study of Accuracy of NFLAT Model's Word-level Position Tagging Based on BCEloss Classification." (In preparation)

RESEARCH EXPERIENCE

Action Difference Reasoning via Knowledge-Aware Keypoint Graph

Collaborating Advisor: Junsong Yuan (State University of New York at Buffalo) **May 2024-Nov. 2024**

- We introduce the ADR task, which not only evaluates individual performance through numerical scoring but also generates detailed comparative analyses between performers.
- We create ADR-Sports, a comprehensive benchmark dataset based on Ego-Exo4D, designed specifically for ADR tasks. It includes performance scores and paired video samples annotated with action differences.
- We propose a novel knowledge-guided keypoint graph framework that effectively captures and reasons about kinematic differences between performers, significantly improving performance in both score prediction and action difference description.

Study of Text Attribution with Multi-task Learning and Transfer Learning between Languages

Collaborating Advisor: Zeyan Liu (University of Louisville) **Jul. 2024-present**

- Conducted multi-task learning for binary classification of MGT vs. human text and multi-class classification of MGT generation models.
- Improved performance using PCGrad, achieving an average increase of 1.56 percentage points in binary classification and 2.34 percentage points in multi-class classification.
- Researched the transferability of MGT detection tasks across languages, demonstrating the generalization of MGT detectors.
- Analyzed NELA features and the transferability of MGT generation models on the Multitude dataset, identifying three pairs of models with similar text generation features.

Study of Accuracy of NFLAT Model's Word-level Position Tagging Based on BCEloss Classification

Collaborating Advisor: Zhengxu Hou (Alibaba) **May 2023 – Dec. 2023**

- Incorporated word-level position tagging into the total loss using BCEloss to refine Named Entity predictions.
- Integrated multi-head attention networks and adversarial training strategies into the NFLAT (Non-Flat Lattice Transformer) model, enhancing its performance and robustness in complex text classification tasks.
- Conducted benchmark and optimization experiments on the Weibo, OntoNotes 4.0, and MSRA datasets, resulting in a 0.97 to 1.32 percentage point improvement in NER accuracy.

Studying Autism Behavior in the Media through Hierarchical Topic Modeling **Nov. 2022 – Jul. 2023**

- Collected and filtered media articles on autism, including news reports, blogs, and forum posts.
- Analyzed high-frequency words and representative documents for each theme to understand media descriptions and frameworks of autistic behavior.
- Applied actor-critic algorithms in deep learning to analyze the results.

INTERNSHIP/PROFESSIONAL EXPERIENCE

Algorithm Intern, Tianjin Dongrui Software Corporation **May 2023 – Aug. 2023**

- Conducted data cleaning and feature engineering as part of data preprocessing for multi-class classification using CNN on the Kaggle Flowers Recognition Dataset.
- Implemented random forest, XGBoost, and CNN algorithms on the Kaggle Flowers Recognition Dataset, achieving 99% accuracy with CNN.
- Developed a gender voice classification model using CNN on the CMU Arctic Speech Database, attaining 98% accuracy.
- Provided feedback to enhance the code quality, readability, and maintainability of algorithm implementations.

COMPETITION EXPERIENCE

Second Prize, National Mathematical Contest in Modeling (Top 15%) **Jan. 2023**

- Served as group leader, responsible for code implementation and modeling concepts.
- Completed the paper "Measurement Model and Empirical Analysis Based on a Modernization Indicator System".
- Conducted empirical verification of the modernization index system using Long Short-Term Memory.

Third Prize, The Chinese Mathematics Competition (Top 30%) **Aug. 2022**

- Led the group, focusing on problem-solving strategies and MATLAB modeling.
- Completed the report "Study on the Coupling Coordination of Digital Economy and Ecological Civilization Modernization".

HONORS AND AWARDS

Professional Second Class Scholarship, Central University of Nationalities, 2023 (Top 20%)

Professional First Class Scholarship, Central University of Nationalities, 2022 (**Top 5%**)

Second Prize, National College Student Mathematics Competition, Mathematics Major, Beijing, 2022 (Top 15%)

COMPUTER SKILLS

- ✓ **Programming Languages:** Python (dynamic typing, functional and object-oriented programming)
- ✓ **Runtime:** CPython
- ✓ **Concurrency:** threading, multiprocessing, asyncio, concurrent.futures
- ✓ **Database:** PostgreSQL, MySQL, SQLite, transaction management
- ✓ **Frameworks:** Pandas, NumPy (data manipulation and analysis), TensorFlow, PyTorch (machine learning)
- ✓ **Caching:** Redis, Memcached, caching mechanisms (cache invalidation, lazy caching)
- ✓ **Data Visualization:** Matplotlib (2D plotting), Seaborn (statistical visualization), Plotly (interactive plots), Bokeh (interactive display)
- ✓ **Messaging:** RabbitMQ, Celery, Kafka, message reliability, ordering, handling backlog and loss
- ✓ **Distributed Systems:** Design patterns, distributed task queues (Celery), caching strategies, messaging mechanisms, scaling with Kubernetes and Docker

LANGUAGE SKILLS

English: Fluent (TOEFL 100) **Chinese:** Native