

Haozhe Ji (计昊哲)

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RESEARCH INTERESTS

My research is driven by the goal of developing **theoretically grounded and scalable methods** to improve neural language models in the areas of **natural language generation** and **language model alignment**. Specifically, my work aims to develop practical algorithms and systems that address the fundamental limitations of the standard paradigm of language modeling in a principled manner.

Firstly, in terms of the probabilistic model, my research explores **theoretically more expressive model families** beyond auto-regressive models (ARMs) that possess a strong local inductive bias, to facilitate more accurate modeling of the growing volume of data. This includes practical realization of energy-based models [2], latent variable models [6], and semi-parametric models [8].

Secondly, in terms of the learning objective, my research advocates for **quality-aware learning objectives** beyond maximum likelihood estimation (MLE) that is biased towards coverage. These new objectives are theoretically grounded in probability metrics that facilitate quality assessment, including reverse KL divergence [1] and total variation distance [3] to accommodate the growth of high-quality data annotations in various forms.

EDUCATION

Tsinghua University, Beijing, China
Ph.D. Student, Computer Science and Technology
Advisor: Minlie Huang

September 2020 - Present

Tsinghua University, Beijing, China
B.E., Electronic Engineering

September 2016 - July 2020

RESEARCH HIGHLIGHT

Policy optimization: *Efficient Exact Optimization (EXO)*

- Policy optimization as probability matching under reverse KL divergence. [1]
- Theoretically **unbiased** estimation of the PPO objective, while more **efficient** and stable.
- **Consistently outperforms PPO and DPO** across academic benchmarks to realistic user instruction data, and models scaled up to hundreds of billions of parameters.
- Has been integrated into HuggingFace [TRL](#) library.

Reward shaping: *Principled Multi-Objective Aggregation*

- Automatic aggregation of multiple objectives to improve on all evaluation dimensions.
- In reward aggregation, greatly improves the efficiency and **instance-level performance on all dimensions** over manual interpolation in Best-of-*N* evaluation.
- In language model decoding, outperforms all heuristic decoding methods with **guaranteed perplexity improvement** in aligning with human texts. [2]

TALK

Beyond the Theoretical Limits of Language Modeling

June 2024

Towards Efficient Exact Optimization of Language Model Alignment

March 2024

PREPRINTS

PUBLICATIONS

- [1] **Towards Efficient Exact Optimization of Language Model Alignment**
Haozhe Ji, Cheng Lu, Yilin Niu, Pei Ke, Hongning Wang, Jun Zhu, Jie Tang, Minlie Huang
International Conference on Machine Learning (ICML), 2024.
- [2] **Language Model Decoding as Direct Metrics Optimization**
Haozhe Ji, Pei Ke, Hongning Wang, Minlie Huang
International Conference on Learning Representations (ICLR), 2024.
- [3] **Tailoring Language Generation Models under Total Variation Distance**
Haozhe Ji, Pei Ke, Zhipeng Hu, Rongsheng Zhang, Minlie Huang
International Conference on Learning Representations (ICLR), 2023.
(Oral / Notable top 5%)
- [4] **Curriculum-Based Self-Training Makes Better Few-Shot Learners for Data-to-Text Generation**
 Pei Ke, **Haozhe Ji**, Zhenyu Yang, Yi Huang, Junlan Feng, Xiaoyan Zhu, Minlie Huang
International Joint Conference on Artificial Intelligence (IJCAI), 2022.
- [5] **LaMemo: Language modeling with look-ahead memory**
Haozhe Ji, Rongsheng Zhang, Zhenyu Yang, Zhipeng Hu, Minlie Huang
North American Chapter of the Association for Computational Linguistics (NAACL), 2022. *(Oral)*
- [6] **DiscoDVT: Generating Long Text with Discourse-Aware Discrete Variational Transformer**
Haozhe Ji, Minlie Huang
Empirical Methods in Natural Language Processing (EMNLP), 2021. *(Oral)*
- [7] **Jointgt: Graph-text joint representation learning for text generation from knowledge graphs**
 Pei Ke, **Haozhe Ji**, Yu Ran, Xin Cui, Liwei Wang, Linfeng Song, Xiaoyan Zhu, Minlie Huang
Findings of the Association for Computational Linguistics (Findings of ACL), 2021.
- [8] **Language generation with multi-hop reasoning on commonsense knowledge graph**
Haozhe Ji, Pei Ke, Shaohan Huang, Furu Wei, Xiaoyan Zhu, Minlie Huang
Empirical Methods in Natural Language Processing (EMNLP), 2020. *(Oral)*
- [9] **Generating commonsense explanation by extracting bridge concepts from reasoning paths**
Haozhe Ji, Pei Ke, Shaohan Huang, Furu Wei, Minlie Huang
Asia-Pacific Chapter of the Association for Computational Linguistics (AACL), 2020.
- [10] **Sentilare: Linguistic knowledge enhanced language representation for sentiment analysis**
 Pei Ke*, **Haozhe Ji***, Siyang Liu, Xiaoyan Zhu, Minlie Huang
Empirical Methods in Natural Language Processing (EMNLP), 2020.
- [11] **Denoising distantly supervised open-domain question answering**
 Yankai Lin, **Haozhe Ji**, Zhiyuan Liu, Maosong Sun
Annual Meeting of the Association for Computational Linguistics (ACL), 2018.

RESEARCH

EXPERIENCE

CoAI Lab, Tsinghua University

Ph.D. Candidate (Supervisor: Minlie Huang)

September 2020 - Present

Alignment Group, Zhipu AI

Research Intern (Supervisor: Hongning Wang)

March 2024 - Present

Natural Language Computing group, Microsoft Research Asia
Research Intern (Supervisors: Shaohan Huang, Furu Wei)

July 2019 - July 2020

AWARDS	Tang Junyuan (唐君远) Scholarship , Tsinghua University	2023
	Sohu Scholarship , Tsinghua University	2022
	Yang Huiyan (杨惠妍) Scholarship , Tsinghua University	2021
	Comprehensive Merit Scholarship , Tsinghua University	2019
	Comprehensive Merit Scholarship , Tsinghua University	2017
	Gold Medal , 32nd China Physics Olympiads (CPhO)	2015
	Distinguished Honor Roll (Top 1%), American Mathematics Contest 12 (AMC12)	2015
SERVICES	Reviewer/Program Committee: ACL, EMNLP, NAACL, ARR	
	Contributor of <code>huggingface/trl</code>	
TEACHING	I was the Head TA of the undergraduate course Artificial Neural Network, instructed by Minlie Huang (2021 Fall, 2022 Fall, 2023 Fall).	
	I coauthored the NLP textbook <i>Modern Natural Language Generation</i> (in Chinese). Specifically, I mainly drafted the fourth chapter <i>Transformer-based Language Generation Model</i> .	