

# Zhenqiao Song

CMU – Pittsburgh, Pennsylvania, US

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## Education

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### Carnegie Mellon University

Pittsburgh, US

Jan. 2024-Now

- Ph.D. in Language Technologies Institute. Advisor: Prof. Lei Li

### University of California, Santa Barbara

Santa Barbara, US

Sep. 2022-Dec. 2023

- Ph.D. in Computer Science (transfer to CMU). Advisor: Prof. Lei Li

### Fudan University

Shanghai, China

Sep. 2017-Jun. 2020

- M.S. in Computer Science. Advisor: Prof. Xiaoqing Zheng
- Shanghai Outstanding Graduate Student

### Xiamen University

Xiamen, China

Sep. 2013-Jun. 2017

- B.S. in Computer Science. Advisor: Prof. Jinsong Su
- Ranked 3/138 peers

## Research Interests

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My primary research focus on Generative AI and Foundation Models for biology and chemistry. I am also interested in machine translation, multilingual NLP and LLM evaluation.

## Employment

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### Google Deepmind

New York City, US

May. 2025-Now

Student researcher working with Ankur Parikh and David Belanger, Protein Function Team

- Research Project on Enzyme Design

### NEC Laboratories America

Princeton, US

Jun. 2024-Sep. 2024

Intern working with Martin Renqiang Min, Machine Learning Department

- Research Project on Protein Complex Design

### Broad Institute of Harvard and MIT

Boston, US

Jun. 2023-Sep. 2023

Visting scientist intern working with Wengong Jin, Eric and Wendy Schmidt Center

- Research Project on Protein Design based on Protein Surface

### ByteDance AI Lab

Shanghai, China

Jul. 2020- Aug. 2022

FTE, working with Dr. Hao Zhou and Dr. Lei Li, MLNLC team.

- Research Work on Deep Generative Models for Natural Language
- Industrial Applications on Natural Language Generation
  - Multilingual Advertising Title Generation
    - Implement a multilingual Ad title generation model incorporating eight languages, including English, Chinese, Japanese, Vietnamese, Russian and so on. It is used in an online advertising system of ByteDance, and the profit arises from \$4,000/day to \$200,000/day.
  - Advertisement Classification System
    - Implement an advertisement classification model incorporating over 200 categories. It achieves over 90% online average accuracy on all categories and the profit is over 4 million dollars one year.

### ByteDance AI Lab

Shanghai, China

Jun. 2019-Jun. 2020

Intern, advised by Jiaze Chen, MLNLC Team

- Research Work on Deep Generative Models for advertising bidding
  - Developing the bidword generation model in the Sponsored Search Auction system of ByteDance and achieves over \$300 million every year.

## Publications

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- [1] **Zhenqiao Song**, Tianxiao Li, Lei Li, and Martin Renqiang Min. “PPDiff: Diffusing in Hybrid Sequence-Structure Space for Protein-Protein Complex Design”. In: *Forty-second International Conference on Machine Learning (ICML)*. 2025.
- [2] **Zhenqiao Song**, Yunlong Zhao, Wengong Jin, Wenxian Shi, Yang Yang, and Lei Li. “Generative Enzyme Design Guided by Functionally Important Sites and Small-Molecule Substrates”. In: *Forty-first International Conference on Machine Learning (ICML)*. 2024.
- [3] **Zhenqiao Song**, Tinglin Huang, Lei Li, and Wengong Jin. “SurfPro: Functional Protein Design Based on Continuous Surface”. In: *Forty-first International Conference on Machine Learning (ICML)*. 2024.
- [4] Tinglin Huang, **Zhenqiao Song**, Rex Ying, and Wengong Jin. “Protein-Nucleic Acid Complex Modeling with Frame Averaging Transformer”. In: *Thirty-eighth Conference on Neural Information Processing Systems (NeurIPS)*. 2024.
- [5] Kexun Zhang, Yee Man Choi, **Zhenqiao Song**, Taiqi He, William Yang Wang, and Lei Li. “Hire a Linguist!: Learning Endangered Languages with In-Context Linguistic Descriptions”. In: *Proceedings of the 62th Annual Meeting of the Association for Computational Linguistics (ACL)*. 2024.
- [6] **Zhenqiao Song** and Lei Li. “Importance Weighted Variational Bayes for Protein Sequence Design”. In: *Proceedings of the 2023 International Conference on Machine Learning (ICML)*. 2023.
- [7] Wenda Xu, Danqing Wang, Liangming Pan, **Zhenqiao Song**, Markus Freitag, William Yang Wang, and Lei Li. “Instructscore: Towards explainable text generation evaluation with automatic feedback”. In: *Proceedings of the 2023 EMNLP (EMNLP)*. 2023.
- [8] **Zhenqiao Song**, Hao Zhou, Lihua Qian, Jingjing Xu, Shanbo Cheng, Mingxuan Wang, and Lei Li. “switch-GLAT: Multilingual Parallel Machine Translation Via Code-Switch Decoder”. In: *International Conference on Learning Representations (ICLR)*. 2022.
- [9] Yiran Chen, **Zhenqiao Song**, Xianze Wu, Danqing Wang, Jingjing Xu, Jiaze Chen, Hao Zhou, and Lei Li. “MTG: A Benchmarking Suite for Multilingual Text Generation”. In: *Proceedings of the 2022 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL Findings)*. 2022.
- [10] **Zhenqiao Song**, Jiaze Chen, Hao Zhou, and Lei Li. “Triangular Bidword Generation for Sponsored Search Auction”. In: *Proceedings of the 14th ACM International Conference on Web Search and Data Mining (WSDM)*. 2021, pp. 707–715.
- [11] **Zhenqiao Song**, Xiaoqing Zheng, and Xuanjing Huang. “Jointly learning bilingual word embeddings and alignments”. In: *Machine Translation*. Springer, 2021, pp. 1–19.
- [12] Jingbing Wang, Zhuolin Hao, Minping Zhou, Jiaze Chen, Hao Zhou, **Zhenqiao Song**, Jinghao Wang, Jiandong Yang, and Shiguang Ni. “Generating personalized titles incorporating advertisement profile”. In: *Database Systems for Advanced Applications: 26th International Conference, DASFAA 2021, Taipei, Taiwan, April 11–14, 2021, Proceedings, Part III* 26. Springer. 2021, pp. 529–540.
- [13] **Zhenqiao Song**, Xiaoqing Zheng, Lu Liu, Mu Xu, and Xuan-Jing Huang. “Generating responses with a specific emotion in dialog”. In: *Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics (ACL)*. 2019, pp. 3685–3695.
- [14] Jinsong Su, **Zhenqiao Song**, Yaojie Lu, Mu Xu, Changxing Wu, and Yidong Chen. “Exploring Implicit Semantic Constraints for Bilingual Word Embeddings”. In: *Neural Processing Letters*. Vol. 48. 2. Springer, 2018, pp. 1073–1088.

## Preprint

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- [15] **Zhenqiao Song**, Ramith Hettiarachchi, Chuan Li, Jianwen Xie, and Lei Li. “Natural Language Guided Ligand-Binding Protein Design”. In: <https://arxiv.org/abs/2506.09332> (2025).

- [16] Qihao Duan, Bingding Huang, **Zhenqiao Song**, Irina Lehmann, Lei Gu Gu, Rol Eils, and Benjamin Wild. "JanusDNA: A Powerful Bi-directional Hybrid DNA Foundation Model". In: <https://arxiv.org/abs/2505.17257> (2025).
- [17] Wenduo Cheng\*, **Zhenqiao Song\***, Yang Zhang\*, Shike Wang, Danqing Wang, Muyu Yang, Lei Li, and Jian Ma. "DNALONGBENCH: A Benchmark Suite for Long-Range DNA Prediction Tasks". In: <https://www.biorxiv.org/content/10.1101/2025.01.06.631595v1> (2025), pp. 2025–01.
- [18] **Zhenqiao Song**, Yunlong Zhao, Wenxian Shi, Yang Yang, and Lei Li. "Functional Geometry Guided Protein Sequence and Backbone Structure Co-Design". In: *arXiv preprint arXiv:2310.04343* (2023).
- [19] **Zhenqiao Song**, Yunlong Zhao, Yufei Song, Wenxian Shi, Yang Yang, and Lei Li. "Joint Design of Protein Sequence and Structure based on Motifs". In: *arXiv preprint arXiv:2310.02546* (2023).
- [20] Lu Liu, **Zhenqiao Song**, and Xiaoqing Zheng. "Improving Coreference Resolution by Leveraging Entity-Centric Features with Graph Neural Networks and Second-order Inference". In: *arXiv preprint arXiv:2009.04639* (2020).

## Honors and Awards

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- MIT EECS Rising Stars 2025
- China National Scholarship. 2020
- Shanghai Outstanding Graduate Student Award. 2020

## Academic Services

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- Organizer of the Second Generative AI and Biology workshop (GenBio) in ICML 2025
- Organizer of the first Generative AI and Biology workshop (GenBio) in NeurIPS 2023
- Organizer of the 2022 SoCal (Southern California) NLP Symposium
- **Journal Reviewer:** Nature Communication, Nature Machine Intelligence, Medicine, TMLR
- **Conference Reviewer:** ACL 2020-2024, EMNLP 2020-2024, NLPCC 2022-2023, IJCAI 2023-2024, ICML2023-2025, NeurIPS 2023-2025, ICLR 2023-2026, COLM 2024-2025, AISTATS 2025-2026

## Students Advising

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- Graduate Students
  - Krish Vijayan (2025.7- Now, CMU master)
  - Jacky Chen (2024.9-2025.1, University of Pittsburgh PhD)
  - Ramith Hettiarachchi (2024.9-2025.1, CMU PhD)
  - Xiwei Cheng (2024.6-2025.4, UCSD master -> NEU PhD)
  - Yujia Gao (2024.1-2024.5, CMU master)
- Undergraduate Students
  - Junting Zhou (2025.6 – Now, Peking University)
  - Charles Novak (2025.6 – Now, CMU)
  - Jingyu Zhu (2024.6-2024.9, Peking University)
  - Yufei Song (2023.1-2023.12, UCSB -> UCLA master)
- Interns at ByteDance AI Lab
  - Lu Liu (Fudan University Master, 2021.6 - 2021.9, now ByteDance NLP researcher)

- Yiran Chen (Fudan University Master, 2021.6 - 2021.9, now startup NLP researcher)

## Invited Talk

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- Sep. 2025: Invited talk at AstraZeneca about "Generative AI for Functional Protein Design"
- Jun. 2025: Invited talk at Google Deepmind Protein Design/Function Team
- Apr. 2025: Invited talk at Tsinghua University Air Institute GenSI open day!
- Aug. 2024: Invited talk at Tsinghua University Air Institute!
- Jul. 2024: Invited talk at Fudan University NLP Group!
- Oct. 2023: Invited talk at Jiangmen!
- May 2023: Invited talk at BytaDance Research!

## Teaching

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- **Teaching Assistant** at CMU: CMU 11781/02741, Generative AI for Biomedicine at Fall 2025
- **Teaching Assistant** at UCSB: CS 190I Deep Learning at Winter 2023; CS 165B Machine Learning at Spring 2023
- **Teaching Assistant** at Fudan University: Data Structures and Algorithms; Linear Algebra