

Yuchen Li

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EDUCATION

Carnegie Mellon University

August 2020 – 2025 (expected)

- Ph.D. student in Machine Learning, advised by Prof. Andrej Risteski
- Research interests: machine learning, natural language processing, and data mining
- I work on (1) improving mathematical understanding of language models (training dynamics, efficient sampling, mechanistic interpretability), and (2) developing principled approaches to self-supervised learning

Pittsburgh, PA

GPA: 4.24/4.33

Simons Institute for the Theory of Computing

August 2024 - December 2024

- Visiting graduate student for the “Modern Paradigms in Generalization” program

Berkeley, CA

University of Illinois at Urbana-Champaign

August 2015 - May 2019

- B.S. Statistics and Computer Science; second major in Mathematics; minor in Electrical Engineering
- Research mentors: Prof. Jiawei Han, Prof. AJ Hildebrand, Prof. Pramod Viswanath
- Summa Cum Laude; Highest Distinction in both majors
- Bronze Tablet Scholar: top 3% in the graduating class
- John R. Pasta Outstanding Undergraduate Award 2018: 2 out of about 400 computer science undergraduate junior students

Urbana-Champaign, IL

GPA: 4.0/4.0

WORK

Research Intern, Microsoft Corporation

May 2024 - August 2024

- Working on understanding “data quality” for language model post training

New York City, NY, United States

Student Researcher Intern, Google LLC

May 2023 - December 2023

- Worked on efficient parallel decoding / sampling for language models
- Proposed a theoretical framework for reasoning about generative masked language models, and empirical guidelines for training them

Remote and New York City, NY, United States

Research Intern, ByteDance Ltd. (parent company of TikTok)

May 2022 - August 2022

- Worked on a research project about machine translation at the ByteDance AI Lab
- Investigating the effect of language similarity in machine learning models for multi-lingual translation

Remote, United States

Machine Learning Engineer, Quora, Inc.

August 2019 - August 2020

- Developed neural network models for predicting ads clickthrough rate
- Led team-wide initiative of improving system robustness and reducing on-call burden in the Ads Ranking team
- Developed features for modeling the ads and the users
- Improved backend for cost-efficient low-latency online serving of machine learning models
- Launched online A/B testing to compare different model variants based on a set of key business metrics

Mountain View, CA, United States

Software Engineer Intern, Facebook, Inc.

May 2018 - August 2018

- Designed and implemented a platform for investigating machine learning feature importance
- Proposed and developed feature perturbation and statistical analysis methods

Menlo Park, CA

PUBLICATIONS

(* indicates equal contribution or alphabetical order)

1. Edoardo Botta*, **Yuchen Li***, Aashay Mehta*, Jordan T. Ash, Cyril Zhang, Andrej Risteski. *On the Query Complexity of Verifier-Assisted Language Generation*. 2025.
2. **Yuchen Li**, Alexandre Kirchmeyer*, Aashay Mehta*, Yilong Qin*, Boris Dadachev*, Kishore Papineni*, Sanjiv Kumar, Andrej Risteski. *Promises and Pitfalls of Generative Masked Language Modeling: Theoretical Framework and Practical Guidelines*. International Conference on Machine Learning (ICML) 2024.
3. Kaiyue Wen, **Yuchen Li**, Bingbin Liu, Andrej Risteski. *Transformers are uninterpretable with myopic methods: a case study with bounded Dyck grammars*. Conference on Neural Information Processing Systems (NeurIPS) 2023.
4. **Yuchen Li**, Yuanzhi Li, Andrej Risteski. *How Do Transformers Learn Topic Structure: Towards a Mechanistic Understanding*. International Conference on Machine Learning (ICML) 2023.
5. Ashwini Pokle *, Jinjin Tian *, **Yuchen Li** *, Andrej Risteski. *Contrasting the landscape of contrastive and non-contrastive learning*. Conference on Artificial Intelligence and Statistics (AISTATS) 2022.
6. **Yuchen Li**, Andrej Risteski. *The Limitations of Limited Context for Constituency Parsing*. Association for Computational Linguistics (ACL) 2021.
7. Xinwei He *, A.J. Hildebrand *, **Yuchen Li** *, Yunyi Zhang *. *Complexity of Leading Digit Sequences*. Journal of Discrete Mathematics & Theoretical Computer Science, vol. 22 no. 1, Automata, Logic and Semantics 2020.
8. Yu Shi *, Jiaming Shen *, **Yuchen Li**, Naijing Zhang, Xinwei He, Zhengzhi Lou, Qi Zhu, Matthew Walker, Myunghwan Kim and Jiawei Han. *Discovering Hypernymy in Text-Rich Heterogeneous Information Network by Exploiting Context Granularity*. Conference on Information and Knowledge Management (CIKM) 2019.
9. Hongyu Gong, **Yuchen Li**, Suma Bhat and Pramod Viswanath. *Context-Sensitive Malicious Spelling Error Correction*. The Web Conference (WWW) 2019.
10. **Yuchen Li** *, Zhengzhi Lou *, Yu Shi, and Jiawei Han. *Temporal Motifs in Heterogeneous Information Networks*. In Proceedings of the 14th International Workshop on Mining and Learning with Graphs (MLG) 2018.

TALKS

Towards Mathematical Understanding of Modern Language Models

- CMU Artificial Intelligence Seminar Series Pittsburgh, PA, February 2025
- Flatiron Institute Transformers Reading Group New York City, NY, August 2024
- Seminar on Foundational Artificial Intelligence Virtual, April 2024
 - Recording (Chinese audio, English slides): <https://www.bilibili.com/video/BV1F1421R7kb>

Transformers are uninterpretable with myopic methods: a case study with bounded Dyck grammars

- DeepMath Conference on the Mathematical Theory of Deep Neural Networks Virtual, November 2023
 - Recording: <https://www.youtube.com/live/BZ34XH4ffEc?si=LjXAIYyWQWys4zG5&t=20360>

How Do Transformers Learn Topic Structure: Towards a Mechanistic Understanding

- Prof. Graham Neubig's lab (NeuLab), CMU Language Technologies Institute Pittsburgh, PA, May 2023
- Machine Learning Reading Group, University of Illinois at Urbana-Champaign (UIUC) Virtual, April 2023

The Limitations of Limited Context for Constituency Parsing

- Association for Computational Linguistics (ACL) Conference Virtual, August 2021
- NEC Laboratories Europe Virtual, July 2021
- Approximately Correct Machine Intelligence (ACMI) Lab, CMU Virtual, June 2021

TEACHING

Teaching Assistant, Advanced Introduction to Machine Learning

August 2022 - December 2022

Pittsburgh, PA

- Taught one recitation session on optimization
- Held weekly office hours; created and graded homework problems
- Course webpage: <https://www.cs.cmu.edu/~nihars/teaching/10715-Fa22/index.html>
- Instructor: Prof. Nihar Shah

Teaching Assistant, Probabilistic Graphical Models

January 2022 - May 2022

Pittsburgh, PA

- Taught two recitation sessions (about algorithmic reduction and causality, respectively)
- Mentored nine teams of student projects (topics include natural language processing, information retrieval, 3D computer vision, and causality)
- Held weekly office hours; created and graded homework and quiz problems
- Course webpage: <https://andrejristeski.github.io/10708-22/>
- Instructors: Prof. Andrej Risteski and Prof. Hoda Heidari

Volunteer Teaching Assistant, Data Science Bootcamp

May 2019

Urbana, IL

- Contributed to creating a Python tutorial focusing on NumPy and Matplotlib libraries.
- Helped in the class section for about 20 math graduate students and answered their programming questions
- Program webpage: <https://ravat1.github.io/2019DSB-website/>
- Instructor: Prof. Uma Ravat

Member, Eta Kappa Nu (HKN) Honors Society Alpha Chapter at UIUC

August 2016 - May 2019

Urbana, IL

- Contributed to its educational website Weber's Wiki
- Developed and taught two Analog Signal Processing midterm review sessions, each with about 40 students attending

SERVICE

Reviewer, Academic Research Conferences

- International Conference on Machine Learning (ICML) 2024, 2025
- Artificial Intelligence and Statistics (AISTATS) 2022, 2024
- International Conference on Learning Representations (ICLR) 2023, 2024
- Journal of Machine Learning Research (JMLR) 2024
- Conference on Neural Information Processing Systems (NeurIPS) 2021, 2023
- Mathematics of Modern Machine Learning Workshop at NeurIPS 2023
- Knowledge and Logical Reasoning Workshop at ICML 2023

Volunteer, Conference on Neural Information Processing Systems (NeurIPS)

2023

- Signed up to help with conference logistics during December 11-16

New Orleans, LA

Session Chair, Learning Theory Alliance Mentorship Workshop

2023

- Volunteered in this mentorship workshop centered on communicating one's research verbally for undergraduate, masters, PhD students, and postdocs interested in learning theory and adjacent fields
- Hosted a session in which participants gave research talks and the audience discussed learnings and provided feedback

Online

Mentor, CMU Computer Science Graduate Application Support Program

2020

- Connected with potential applicants, particularly those from underrepresented groups
- Offered feedbacks on their application materials and answered their questions related to graduate school application

Pittsburgh, PA

Student Member, CMU Machine Learning Graduate Programs Admissions Committee

multiple years

- Assisted in faculty-led tasks and meetings for reviewing and admitting applicants
- Contributed preliminary reviews for over 100 applicants to CMU Machine Learning Masters and PhD programs

Pittsburgh, PA

SKILLS

- Proficient in *Python, PyTorch, TensorFlow, Jax, C, SQL, MATLAB, PHP*
- Intermediate in *C++, R, Haskell*
- Basic in *Java, JavaScript*