Kaiyu Yang

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PROFESSIONAL APPOINTMENTS

Meta Fundamental AI Research (FAIR) — New York, NY
Research Scientist — 6/2024 – Present

California Institute of Technology — Pasadena, CA
Computing, Data, and Society Postdoctoral Fellow — 9/2022 – 5/2024

Advisors: Pietro Perona and Yisong Yue

EDUCATION

Princeton University — Princeton, NJ
Ph.D. in Computer Science — 7/2022

Advisor: Jia Deng

University of Michigan — Ann Arbor, MI
M.S. in Computer Science and Engineering — 8/2018

Tsinghua University — Beijing, China
B.Eng. in Computer Science — 7/2016
B.S. in Mathematics and Applied Mathematics — 7/2016

RESEARCH INTERESTS

AI · Machine Learning · LLMs for Theorem Proving and Mathematical Reasoning

PUBLICATIONS

* Equal contribution. † Equal advising

Preprint **PyEuclid: A Versatile Formal Plane Geometry System in Python**

Zhaoyu Li*, Hangrui Bi*, Jialiang Sun*, Zenan Li, Kaiyu Yang, Xujie Si.
In submission, 2025

Preprint **Spectral Journey: How Transformers Predict the Shortest Path**

Andrew Cohen, Andrey Gromov, Kaiyu Yang, Yuandong Tian.
In submission, 2025

Preprint **Formal Mathematical Reasoning: A New Frontier in AI**

Kaiyu Yang, Gabriel Poesia, Jingxuan He, Wenda Li, Kristin Lauter, Swarat Chaudhuri, Dawn Song.
In submission, 2025

Preprint **Towards Large Language Models as Copilots for Theorem Proving in Lean**

Peiyang Song, Kaiyu Yang, Anima Anandkumar.
In submission, 2025

ICLR 2025 **Proving Olympiad Inequalities by Synergizing LLMs and Symbolic Reasoning**

Zenan Li*, Zhaoyu Li*, Wen Tang, Xian Zhang, Yuan Yao, Xujie Si, Fan Yang, Kaiyu Yang†, Xiaoxing Ma†.
International Conference on Learning Representations, 2025

NeurIPS 2024 **SciInstruct: A Self-Reflective Instruction Annotated Dataset for Training Scientific Language Models**

Dan Zhang, Ziniu Hu, Sining Zhoubian, Zhengxiao Du, Kaiyu Yang, Zihan Wang, Yisong Yue, Yuxiao Dong, Jie Tang.
Neural Information Processing Systems (NeurIPS), 2024

COLM 2024 **A Survey on Deep Learning for Theorem Proving**

Zhaoyu Li, Jialiang Sun, Logan Murphy, Qidong Su, Zenan Li, Xian Zhang, Kaiyu Yang, Xujie Si.
Conference on Language Modeling (COLM), 2024

ICML 2024 **Autoformalizing Euclidean Geometry**

Logan Murphy*, Kaiyu Yang*, Jialiang Sun, Zhaoyu Li, Anima Anandkumar, Xujie Si.
International Conference on Machine Learning (ICML), 2024

NeurIPS 2023 **LeanDojo: Theorem Proving with Retrieval-Augmented Language Models**

Kaiyu Yang, Aidan Swope, Alex Gu, Rahul Chalamala, Peiyang Song, Shixing Yu, Saad Godil, Ryan Prenger, Anima Anandkumar.
Neural Information Processing Systems (NeurIPS), 2023, **Oral presentation**

CVPR 2023 **Infinite Photorealistic Worlds using Procedural Generation**

Alexander Raistrick*, Lahav Lipson*, Zeyu Ma*, Lingjie Mei, Mingzhe Wang, Yiming Zuo, Karhan Kayan, Hongyu Wen, Beining Han, Yihan Wang, Alejandro Newell, Hei Law, Ankit Goyal, Kaiyu Yang, Jia Deng.
Conference on Computer Vision and Pattern Recognition (CVPR), 2023

TMLR 2023 **Learning Symbolic Rules for Reasoning in Quasi-Natural Language**

Kaiyu Yang and Jia Deng.
Transactions on Machine Learning Research (TMLR), 2023

EMNLP 2022 **Generating Natural Language Proofs with Verifier-Guided Search**

Kaiyu Yang, Jia Deng, Danqi Chen.
Empirical Methods in Natural Language Processing (EMNLP), 2022, **Oral presentation**

ICML 2022 **A Study of Face Obfuscation in ImageNet**

Kaiyu Yang, Jacqueline Yau, Li Fei-Fei, Jia Deng, Olga Russakovsky.
International Conference on Machine Learning (ICML), 2022

NeurIPS 2020 **Strongly Incremental Constituency Parsing with Graph Neural Networks**

Kaiyu Yang and Jia Deng.
Neural Information Processing Systems (NeurIPS), 2020

NeurIPS 2020 **Rel3D: A Minimally Contrastive Benchmark for Grounding Spatial Relations in 3D**

Ankit Goyal, Kaiyu Yang, Dawei Yang, Jia Deng.
Neural Information Processing Systems (NeurIPS), 2020, **Spotlight presentation**

FAT* 2020 **Towards Fairer Datasets: Filtering and Balancing the Distribution of the People Subtree in the ImageNet Hierarchy**

Kaiyu Yang, Klint Qinami, Li Fei-Fei, Jia Deng, Olga Russakovsky.
Conference on Fairness, Accountability, and Transparency (FAT)*, 2020

ICML 2019 **Learning to Prove Theorems via Interacting with Proof Assistants**

Kaiyu Yang and Jia Deng.
International Conference on Machine Learning (ICML), 2019

ICCV 2019 **SpatialSense: An Adversarially Crowdsourced Benchmark for Spatial Relation Recognition**

Kaiyu Yang, Olga Russakovsky, Jia Deng.
International Conference on Computer Vision (ICCV), 2019

ECCV 2016 **Stacked Hourglass Networks for Human Pose Estimation**

Alejandro Newell, Kaiyu Yang, Jia Deng.
European Conference on Computer Vision (ECCV), 2016

AWARDS AND GRANTS

Neurosymbolic AI for Autonomy 2023
Co-authored proposal awarded by Caltech's Center for Autonomous Systems and Technologies

Siebel Scholar 2022
42 computer science graduate students awarded annually from selected institutions worldwide

Outstanding Reviewer 2020, 2021
Top 20% at the Conference on Computer Vision and Pattern Recognition (CVPR)

Google Cloud Research Credits 2019
Google Cloud Platform

Outstanding Teaching Assistant Award 2015, 2016
Tsinghua University

MEDIA

An AI Tool that Allows LLMs to be used in Lean for Proof Automation 2024
MarkTechPost

Can LLMs Generate Mathematical Proofs that can be Rigorously Checked? 2023
MarkTechPost

Exploring the Tradeoff Between Privacy and Algorithm Performance 2022
Princeton Insights

Researchers Devise Approach to Reduce Biases in Computer Vision Data Sets 2020
Princeton Engineering News

AI Is Biased. Here's How Scientists Are Trying to Fix It 2019
Wired

INVITED TALKS

Towards an AI Mathematician

Brown University	Host: Robert Lewis, 9/2024
University of California, Los Angeles	5/2024
University of Chicago	Host: Haifeng Xu, 4/2024
FAIR, Meta AI	Host: Kristin Lauter, 4/2024
University of Texas, Austin	Host: Swarat Chaudhuri, 3/2024

Towards Large Language Models as Copilots for Theorem Proving

Lean Together Annual Meeting	1/2024

Theorem Proving via Machine Learning

Lean for the Curious Mathematician Colloquium	9/2023

LeanDojo: Theorem Proving with Retrieval-Augmented Language Models

Neural Information Processing Systems (NeurIPS) Oral Presentation	12/2023
Stanford Software Research Lunch	10/2023
Conference on Artificial Intelligence and Theorem Proving (AITP)	9/2023
Hoskinson Center for Formal Mathematics, CMU	Host: Jeremy Avigad, 5/2023
Rutgers University	Host: Alex Kontorovich, 7/2023

Neurosymbolic Reasoning, From Formal Logic to Natural Language

University of California, Los Angeles	Host: Guy Van den Broeck, 2/2023
University of California, Santa Barbara	Host: Lei Li, 11/2022
University of Southern California	Host: Xiang Ren, 10/2022

Teaching Machines to Reason Symbolically

OpenAI	3/2022
Google	Host: Denny Zhou, 2/2022
University of Pennsylvania	Host: Mayur Naik, 2/2022
NSF "Understanding the World Through Code" Program	Host: Swarat Chaudhuri, 1/2022

Generating Natural Language Proofs with Verifier-Guided Search

N2Formal Group, Google	Host: Markus Rabe, 7/2022

RESEARCH MENTORING

Zhaoyu Li 2025 – Present
PhD student @ University of Toronto

Jiacheng Chen 2024 – Present
Undergraduate @ South China University of Technology

Peiyang Song 2023 – 2024
Undergraduate @ UCSB → Undergraduate @ Caltech

Rahul Chalamala 2023
Undergraduate @ Caltech → Researcher @ Together AI

Shixing Yu 2022 – 2023
Master's student @ UT Austin → Ph.D. student @ Cornell

Gene Chou 2021
Undergraduate @ Princeton → Ph.D. student @ Cornell

Jacqueline Yau 2019 – 2020
Master's student @ Stanford → Ph.D. student @ UIUC

TEACHING EXPERIENCE

Advanced Large Language Model Agents Spring 2025
Guest Co-instructor, UC Berkeley & MOOC

CS 159: Large Language Models for Reasoning 2024/5
Guest Lecturer, Caltech

COS 484/584: Natural Language Processing 2021/2 – 2021/5
Teaching Assistant, Princeton University

Data Structures and Algorithms 2013/8 – 2016/7
Head Teaching Assistant, Tsinghua University

SERVICE

Organizer

The 3rd Workshop on Mathematical Reasoning and AI @ NeurIPS 2023

Tutorial on Machine Learning for Theorem Proving @ NeurIPS 2023

Area Chair

International Conference on Machine Learning (ICML), 2025

European Conference on Computer Vision (ECCV), 2024

Reviewer

National Academies Workshop Proceedings: "AI to Assist Mathematical Reasoning"

European Research Council (ERC) Advanced Grant 2023

International Conference on Machine Learning (ICML)

Neural Information Processing Systems (NeurIPS)

International Conference on Learning Representations (ICLR)

Journal of Machine Learning Research (JMLR)

IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)

Computer Vision and Pattern Recognition (CVPR)

International Conference on Computer Vision (ICCV)

European Conference on Computer Vision (ECCV)