Kaiyu Yang

Postdoctoral Scholar @ Caltech

☎ 734-389-9696
✉ kaiyuy@caltech.edu
https://yangky11.github.io

ACADEMIC APPOINTMENTS

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

> Advisors: Pietro Perona & 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

Preprint — **A Survey on Deep Learning for Theorem Proving**

Zhaoyu Li, Jialiang Sun, Logan Murphy, Qidong Su, Zenan Li, Xian Zhang, Kaiyu Yang, and Xujie Si.
In submission, 2024

Preprint — **Autoformalizing Euclidean Geometry**

Logan Murphy, Jack Sun, Zhaoyu Li, Anima Anandkumar, Xujie Si[†], and Kaiyu Yang[†] († equal advising).
In submission, 2024

Preprint — **SciGLM: Training Scientific Language Models with Self-Reflective Instruction Annotation and Tuning**

Dan Zhang, Ziniu Hu, Sining Zhoubian, Zhengxiao Du, Kaiyu Yang, Zihan Wang, Yisong Yue, Yuxiao Dong, Jie Tang.
In submission, 2024

Preprint	**Towards Large Language Models as Copilots for Theorem Proving in Lean** Peiyang Song, <u>Kaiyu Yang</u>, and Anima Anandkumar. *In submission*, 2024
NeurIPS 2023	**LeanDojo: Theorem Proving with Retrieval-Augmented Language Models** <u>Kaiyu Yang</u>, Aidan Swope, Alex Gu, Rahul Chalamala, Peiyang Song, Shixing Yu, Saad Godil, Ryan Prenger, and 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, <u>Kaiyu Yang</u>, and Jia Deng. *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2023
TMLR 2023	**Learning Symbolic Rules for Reasoning in Quasi-Natural Language** <u>Kaiyu Yang</u> and Jia Deng. *Transactions on Machine Learning Research (TMLR)*, 2023
EMNLP 2022	**Generating Natural Language Proofs with Verifier-Guided Search** <u>Kaiyu Yang</u>, Jia Deng, and Danqi Chen. *Empirical Methods in Natural Language Processing (EMNLP)*, 2022, **Oral presentation**
ICML 2022	**A Study of Face Obfuscation in ImageNet** <u>Kaiyu Yang</u>, Jacqueline Yau, Li Fei-Fei, Jia Deng, and Olga Russakovsky. *International Conference on Machine Learning (ICML)*, 2022
NeurIPS 2020	**Strongly Incremental Constituency Parsing with Graph Neural Networks** <u>Kaiyu Yang</u> and Jia Deng. *Neural Information Processing Systems (NeurIPS)*, 2020
NeurIPS 2020	**Rel3D: A Minimally Contrastive Benchmark for Grounding Spatial Relations in 3D** Ankit Goyal, <u>Kaiyu Yang</u>, Dawei Yang, and 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** <u>Kaiyu Yang</u>, Klint Qinami, Li Fei-Fei, Jia Deng, and Olga Russakovsky. *Conference on Fairness, Accountability, and Transparency (FAT*)*, 2020
ICML 2019	**Learning to Prove Theorems via Interacting with Proof Assistants** <u>Kaiyu Yang</u> and Jia Deng. *International Conference on Machine Learning (ICML)*, 2019
ICCV 2019	**SpatialSense: An Adversarially Crowdsourced Benchmark for Spatial Relation Recognition** <u>Kaiyu Yang</u>, Olga Russakovsky, and Jia Deng. *International Conference on Computer Vision (ICCV)*, 2019
ECCV 2016	**Stacked Hourglass Networks for Human Pose Estimation** Alejandro Newell, <u>Kaiyu Yang</u>, and 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
ICML Travel Award   2019
International Conference on Machine Learning (ICML)
SEAS Travel Grant   2019
School of Engineering and Applied Science (SEAS), Princeton University
Outstanding Teaching Assistant Award   2015, 2016
Tsinghua University

MEDIA

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

TALKS

Towards an AI Mathematician

     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 |

A Study of Face Obfuscation in ImageNet

International Conference on Machine Learning (ICML)	7/2022
NeurIPS Workshop on "ImageNet: Past, Present, and Future"	12/2021
CVPR Workshop on "Learning from Limited and Imperfect Data (L2ID)"	6/2021

Learning Symbolic Rules for Reasoning in Quasi-Natural Language

| Princeton NLP Group | 7/2021 |

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

| Conference on Fairness, Accountability, and Transparency (FAT*) | 1/2020 |

Learning to Prove Theorems via Interacting with Proof Assistants

| Princeton Programming Languages Group | 10/2019 |
| International Conference on Machine Learning (ICML) | 6/2019 |

RESEARCH MENTORING

Jiacheng Chen	2023 – Present
Undergraduate student @ South China University of Technology	
Peiyang Song	2023 – 2024
Undergraduate student @ UCSB	
Rahul Chalamala	2023
Undergraduate student @ Caltech	
Shixing Yu	2022 – 2023
Master's student @ UT Austin → Ph.D. student @ Cornell	
Gene Chou	2021
Undergraduate student @ Princeton → Ph.D. student @ Cornell	
Jacqueline Yau	2019 – 2020
Master's student @ Stanford → Machine Learning Engineer @ Apple	

TEACHING EXPERIENCE

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

European Conference on Computer Vision (ECCV), 2024

Reviewer

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

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)

ACM Transactions on Programming Languages and Systems (TOPLAS)

Computer Vision and Pattern Recognition (CVPR)

International Conference on Computer Vision (ICCV)

European Conference on Computer Vision (ECCV)

Nature Human Behaviour

European Research Council (ERC) Advanced Grant 2023

Volunteer

Neural Information Processing Systems (NeurIPS)

Session Chair

Caltech SURF Seminar Day

Committee Member

Caltech CMS Graduate Admission Committee