

# Kaiyu Yang

Research Scientist @ Meta, FAIR

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<https://yangky11.github.io>

## PROFESSIONAL APPOINTMENTS

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Meta, Fundamental AI Research (FAIR)  
Research Scientist

New York, NY  
6/2024 – Present

California Institute of Technology  
Computing, Data, and Society Postdoctoral Fellow

Pasadena, CA  
9/2022 – 5/2024

Advisors: Pietro Perona and Yisong Yue

## EDUCATION

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Princeton University  
Ph.D. in Computer Science

Princeton, NJ  
7/2022

Advisor: Jia Deng

University of Michigan  
M.S. in Computer Science and Engineering

Ann Arbor, MI  
8/2018

Tsinghua University  
B.Eng. in Computer Science  
B.S. in Mathematics and Applied Mathematics

Beijing, China  
7/2016  
7/2016

## RESEARCH INTERESTS

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

## PUBLICATIONS

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| Preprint | <b>SciGLM: Training Scientific Language Models with Self-Reflective Instruction Annotation and Tuning</b><br>Dan Zhang, Ziniu Hu, Sining Zhoubian, Zhengxiao Du, <u>Kaiyu Yang</u> , Zihan Wang, Yisong Yue, Yuxiao Dong, Jie Tang.<br><i>In submission</i> , 2024 |
| Preprint | <b>Towards Large Language Models as Copilots for Theorem Proving in Lean</b><br>Peiyang Song, <u>Kaiyu Yang</u> , and Anima Anandkumar.<br><i>In submission</i> , 2024   |
| Preprint | <b>A Survey on Deep Learning for Theorem Proving</b><br>Zhaoyu Li, Jialiang Sun, Logan Murphy, Qidong Su, Zenan Li, Xian Zhang, <u>Kaiyu Yang</u> , and Xujie Si.<br><i>In submission</i> , 2024   |

- ICML 2024     **Autoformalizing Euclidean Geometry**  
 Logan Murphy\*, Kaiyu Yang\* (\* equal contribution), Jialiang Sun, Zhaoyu Li, Anima Anandkumar, and 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, 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, Kaiyu Yang, and 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, and 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, and 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, 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**  
Kaiyu Yang, 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**  
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, and Jia Deng.  
*International Conference on Computer Vision (ICCV)*, 2019
- ECCV 2016     **Stacked Hourglass Networks for Human Pose Estimation**  
 Alejandro Newell, Kaiyu Yang, and Jia Deng.  
*European Conference on Computer Vision (ECCV)*, 2016

## AWARDS AND GRANTS

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<b>Neurosymbolic AI for Autonomy</b>	2023
<i>Co-authored proposal awarded by Caltech's Center for Autonomous Systems and Technologies</i>	
<b>Siebel Scholar</b>	2022
<i>42 computer science graduate students awarded annually from selected institutions worldwide</i>	
<b>Outstanding Reviewer</b>	2020, 2021
<i>Top 20% at the Conference on Computer Vision and Pattern Recognition (CVPR)</i>	
<b>Google Cloud Research Credits</b>	2019
<i>Google Cloud Platform</i>	
<b>ICML Travel Award</b>	2019
<i>International Conference on Machine Learning (ICML)</i>	
<b>SEAS Travel Grant</b>	2019
<i>School of Engineering and Applied Science (SEAS), Princeton University</i>	
<b>Outstanding Teaching Assistant Award</b>	2015, 2016
<i>Tsinghua University</i>	

## MEDIA

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<b>Can LLMs Generate Mathematical Proofs that can be Rigorously Checked?</b>	2023
<i>MarkTechPost</i>	
<b>Exploring the Tradeoff Between Privacy and Algorithm Performance</b>	2022
<i>Princeton Insights</i>	
<b>Researchers Devise Approach to Reduce Biases in Computer Vision Data Sets</b>	2020
<i>Princeton Engineering News</i>	
<b>AI Is Biased. Here's How Scientists Are Trying to Fix It</b>	2019
<i>Wired</i>	

## INVITED TALKS

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### Towards an AI Mathematician

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
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### Theorem Proving via Machine Learning

Lean for the Curious Mathematician Colloquium	9/2023
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### 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
<b>Generating Natural Language Proofs with Verifier-Guided Search</b>	
N2Formal Group, Google	Host: Markus Rabe, 7/2022

## RESEARCH MENTORING

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<b>Jiacheng Chen</b>	2023 – Present
<i>Undergraduate @ South China University of Technology</i>	
<b>Peiyang Song</b>	2023 – 2024
<i>Undergraduate @ UCSB → Undergraduate @ Caltech</i>	
<b>Rahul Chalamala</b>	2023
<i>Undergraduate @ Caltech → Researcher @ Together AI</i>	
<b>Shixing Yu</b>	2022 – 2023
<i>Master’s student @ UT Austin → Ph.D. student @ Cornell</i>	
<b>Gene Chou</b>	2021
<i>Undergraduate @ Princeton → Ph.D. student @ Cornell</i>	
<b>Jacqueline Yau</b>	2019 – 2020
<i>Master’s student @ Stanford → Ph.D. student @ UIUC</i>	

## TEACHING EXPERIENCE

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<b>CS 159: Large Language Models for Reasoning</b>	2024/5
<i>Guest Lecturer, Caltech</i>	
<b>COS 484/584: Natural Language Processing</b>	2021/2 – 2021/5
<i>Teaching Assistant, Princeton University</i>	
<b>Data Structures and Algorithms</b>	2013/8 – 2016/7
<i>Head Teaching Assistant, Tsinghua University</i>	

## SERVICE

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### 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