

# 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  
6/2023 – Present

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

Pasadena, CA  
9/2022 – 5/2023

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>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   |
| 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   |

- ICML 2024     **Autoformalizing Euclidean Geometry**  
 Logan Murphy\*, Kaiyu Yang\*, Jialiang Sun, Zhaoyu Li, Anima Anandkumar, and Xujie Si. (\* equal contribution)  
*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. (\* equal contribution)  
*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
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
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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
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## RESEARCH MENTORING

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

## TEACHING EXPERIENCE

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

## 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