Xinjie He

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Research Interests

AI for math, formal verification in Lean 4, automated theorem proving, agentic systems, large language model reasoning.

Education

University of California, Los Angeles **Los Angeles, CA**
Ph.D. in Mathematics | GPA 3.8/4.0 *Aug 2023 – Expected May 2028*
Advisors: Ernest Ryu and Terence Tao

Carnegie Mellon University **Pittsburgh, PA**
B.S. and M.S. in Mathematical Sciences, Honors Program | GPA 3.97/4.0 *Aug 2019 – May 2023*

Projects

UCLA Moonshot | *Agentic proof search and automated paper verification* **Apr 2026 – Present**

- Co-led a team of 14. Built the UCLA Moonshot Harness, which **placed second of four AI systems** evaluated on unpublished research mathematics, alongside entries from OpenAI and Princeton.
- Designed the system's advisor-solver architecture and memory framework, using the advisor to keep the solver focused through long proof attempts.
- Led development of a follow-up system for math paper verification. Split paper-review requests into independent checks and combined the results into ranked error reports. On 17 papers with 40 documented errors, section-by-section verification found **32 errors**, compared with 26 and 25 for two baseline approaches.
- Released both systems publicly: github.com/1stproof/batch-2 and xinjiegit.github.io/UCLAMoonshot-math-verifier.

Integrated Explicit Analytic Number Theory Network | *with Terence Tao* **Dec 2025 – Present**

- Built AI agents that repair Lean 4 repositories when upstream theorems change, automating maintenance of large-scale formal math libraries.
- Automate updates to analytic number theory results when sharper numerical bounds become available. Packaged the workflow as reusable agent skills.

Publications and Preprints

- **Xinjie He** and Amit Sahai. *Refuting a Conjecture of Umans and Wang on Arithmetic-Progression Divisor Covers.* arXiv:2608.06681, 2026.
- **Xinjie He**, Hyunsik Chae and Ernest K. Ryu. *An Agentic Bug-Hunt in SymPy.* NeurIPS 2026 Workshop on Mathematical Reasoning and AI (MATH-AI), 2026.
- **Xinjie He**, Katarzyna Wyczesany and Tomasz Tkocz. *A Sharp Gaussian Tail Bound for Sums of Uniforms.* Israel Journal of Mathematics, 1–16, 2025.
- Yuxuan Liu, Jingmin Sun, **Xinjie He**, Griffin Pinney, Zecheng Zhang and Hayden Schaeffer. *PROSE-FD: A Multimodal PDE Foundation Model for Learning Multiple Operators for Forecasting Fluid Dynamics.* NeurIPS 2024 Foundation Models for Science Workshop, 2024.

Mentoring and Outreach

IPAM Research in Industrial Projects for Students (RIPS) **Los Angeles, CA**
Academic Mentor, Harmonic team *Jun – Aug 2026*

- Mentored an undergraduate team of 4 on an industry-sponsored formalization project. Built Lean 4 infrastructure to formalize CS algorithms and their costs in a modular way. Produced Lean 4 library ResourceAwareLean.

Technical Skills

Programming Languages: Python, Lean, C, MATLAB, SML, LaTeX
ML / AI: agentic systems, PyTorch, LLM fine-tuning, reinforcement learning (GRPO)