Angel (Leyi) Cui

Pittsburgh, PA 15213 angellc@cmu.edu leyicui-angel.github.io

Education

Carnegie Mellon University, School of Computer Science *Aug 2025 - Expected May 2030*
PhD in Software Engineering, Advisor: Prof. Rohan Padhye

- Relevant Courses: Software Engineering Research, Program Analysis
- Research Focus: AI for Software Engineering; Security; Software Engineering for AI; Program Analysis

Columbia University, Columbia Engineering *Sep 2024 – May 2025*
MS in Computer Science, Software Systems Track

- Relevant Courses: Operating Systems, Programming Languages, Formal Verification, Code Generation

Columbia University, Barnard College *Sep 2020 – Dec 2023*
BA in Computer Science, Minor in Dance

- Relevant Courses: Program Synthesis, CS Theory, AI, ML, Cloud Computing, Cryptography, Databases

Academic Positions

Doctoral Research - PASTA Lab, Carnegie Mellon University *Pittsburgh, PA*
PhD Student; Advisor: ***Prof. Rohan Padhye*** *Aug 2025 – Current*

- Evaluated correctness of LLM-generated date/time code by AI-guided differential testing [12]
- Extending Z3 SMT solver with symbolic encodings for reasoning about date and period constraints [13]
- Evaluating DateSMT on LLM and grammar synthesized constraints and real-world constraints from legal clauses and Python code; proposed to apply DateSMT as an oracle to evaluate LLM's ability on date reasoning

ARiSE Lab, Columbia University *New York, NY*
Research Assistant; Advisor: ***Prof. Baishakhi Ray, Prof. Junfeng Yang*** *Sep 2024 – Feb 2025*

- Researching methods to reduce vulnerabilities in LLM generated code
- Proposed and engineered CWEval and CWEval-bench, a set of new framework and datasets for evaluating LLM-generated code functionality and security [4]

Software Design and Analysis Lab, Carnegie Mellon University *Pittsburgh, PA*
Research Assistant; Advisor: ***Prof. Eunsuk Kang, Prof. Matthew L. Bolton*** *May 2023 – Feb 2025*

- Extended Fuzzy Mental Model Finite State Machines (FMMs) for modeling human mental model, developed an Alloy-based model checker and an analysis tool to detect mode confusions in FMMs [1][3]
- Researched use cases and HCI aspect for ATLAS, a tool that solves the constrained LTL learning problem through an encoding in a first-order relational logic and reduction to an instance of the MaxSAT problem [2]

Barnard Programming Language Lab, Columbia University *New York, NY*
Research Assistant, Advisor: ***Prof. Mark Santolucito*** *May 2022 – May 2025*

- Formalized, engineered, and evaluated a machine-learning based run-time validation system for maintaining the system integrity for system migrations [9]; migrated Spiral Analysis, a legacy medical software, to the cloud
- Finetuned and benchmarked an LLM pipeline for generating Temporal Stream Logic (TSL) spec [10]
- Designed and implemented user interfaces, and conducted user studies for TSL [6] [7]

Industry Positions

Amazon AWS *Arlington, VA*
Applied Scientist Intern, Automated Reasoning *Jun 2025 - Aug 2025*

- Proposed and implemented CloudGym, the first LLM-based cloud emulators for cloud testing at scale [11]
- Built an evaluation pipeline and benchmark suite from real AWS SDK code to assess the fidelity of existing cloud service emulators and CloudGym

Apple *Jiangmen, China*
Apple Teacher for programming and music *Jun 2021 – Aug 2021*

- Taught 50+ kids computer programming and music in rural areas to promote education equality

ByteDance *Beijing, China*
Game Producer and Planner *Oct 2020 – May 2021*

- Sole producer of Hui Su Sha Tang, a music game with 545k views, 41k downloads, and a rating of 8.1/10.0

Selected Publications

Peer Reviewed

[1] **Fuzzy Mental Model: A Formalism for Reasoning About Confusion in Human Technology Interaction**
International Journal of Human-Computer Interaction
Matthew L. Bolton, ***Leyi Cui***, Eunsuk Kang

[2] **Constrained LTL Specification Learning from Examples** DOI
ICSE 2025: 47th IEEE/ACM International Conference on Software Engineering
Chengjian Zhang, Parv Kapoor, Ian Dardik, ***Leyi Cui***, Romulo Meira-Goes, David Garlan, Eunsuk Kang

[3] **A Formal Approach to the Analysis of Human-Machine Interaction with Fuzzy Logic** DOI
SPLASH 2024: Student Research Competition
Leyi Cui

[4] **CWEval: Outcome-driven Evaluation on Functionality and Security of LLM Code Generation**
LLM4Code 2025
Jinjun Peng, ***Leyi Cui***, Kele Huang, Junfeng Yang, Baishakhi Ray

[5] **Interactively Assisting Glaucoma Diagnosis with an Expert Knowledge-distilled Vision Transformer**
CHI Late Break Work 2025
Ziheng 'Leo' Li, Haowen 'John' Wei, Kuang Sun, ***Leyi Cui***, David Li, Steven K. Feiner, Kaveri A. Thakoor

[6] **Towards Reactive Synthesis as a Programming Paradigm** DOI
PLATEAU 2024: 14th annual workshop on the intersection of HCI and PL
Leyi Cui, Raven Rothkopf, Mark Santolucito

[7] **Towards the Usability of Reactive Synthesis: Building Blocks of Temporal Logic** DOI
PLATEAU 2023: 13th annual workshop on the intersection of HCI and PL
Raven Rothkopf, ***Angel Leyi Cui***, Hannah Tongxin Zeng, Arya Sinha, Mark Santolucito

[8] **On the Two-dimensional Resilient Consensus**
ICCSNT 2019: IEEE 7th International Conference on Computer Science and Network Technology
Leyi Cui

Preprints

[9] **NeuroMigrate: Machine Learning Based Run-time Validation as a Safety Net for System Migrations**
Under Submission
Leyi Cui, Elifia Muthia, Seth Pullman, Baishakhi Ray, Mark Santolucito

[10] **Combining LLM Code Generation with Formal Specifications and Reactive Program Synthesis**
Arxiv, Under Submission
William Murphy, Nikolaus Holzer, Feitong Qiao, ***Leyi Cui***, Raven Rothkopf, Nathan Koenig, Mark Santolucito

[11] **CloudGym: LLM-Powered Cloud Emulation at Scale**
Under Preparation
Leyi Cui et al.

[12] **Chronically Buggy: Analyzing Date/Time Pitfalls In Open-Source and LLM-Generated Python Code**
Under Submission
Shrey Tiwari, Serena Chen, Alexander Joukov, Peter Vandervelde, ***Leyi Cui***, Ao Li, Rohan Padhye

[13] **DateSMT: SMT-Based Reasoning for Calendrical Arithmetic**
Under Submission
Leyi Cui

Selected Posters and Presentations

A Formal Approach to the Analysis of Human-Machine Interaction with Fuzzy Logic
Angel (Leyi) Cui
SPLASH 2024: Student Research Competition, **Graduate Student Second Place** *Oct 2024*

Towards Reactive Synthesis as a Programming Paradigm
Angel (Leyi) Cui, Raven Rothkopf, Mark Santolucito
PLATEAU 2024 @ US Berkeley *Feb 2024*

Safe and Reliable Medical Records: Assessing the Robustness of OpenEMR
Angel (Leyi) Cui, Eunsuk Kang
Columbia University DSI Research Fair, **Best Overall Prize** *Nov 2023*
Carnegie Mellon University REUSE Poster Session *Aug 2023*

Advancing the Usability of Temporal Stream Logic
Angel (Leyi) Cui, Raven Rothkopf, Mark Santolucito
Barnard College Summer Research Institute Poster Session *Aug 2022*

Scholarships, Prizes, and Honors

Columbia University, 2025 Andrew P. Kosoresow Memorial Award for **Excellence in Teaching and Service**
SPLASH 2024: Student Research Competition, **Graduate Student Second Place**
Barnard College, Columbia University, **Dean's List**, **Computer Science Departmental Honors**
2023 Columbia University Undergraduate Computer and Data Science Research Fair **Best Overall Prize**
2023 CMU Research Experiences for Undergraduates in Software Engineering Program **Scholarship Recipient**
Fall 2023 Beyond Barnard Internship Program **Grant Recipient**
2022 Columbia University DevFest **Best Design Prize**
2020 Byte Camp Game Design Track **Winner**
2019 CRC (FRC) Robotics Competition **National 2nd Place**
2018 MIT Energy Hackathon **Third Place, MIT Track Winner**

Teachings and Mentorship

Mentor, CMU Paths to AI Research, Carnegie Mellon University *Fall 2025*
Mentees: 3

Mentor, Graduate Application Support Program, Carnegie Mellon University *Fall 2025*
Mentees: 3

Teaching Assistant, Computer Science Theory, Columbia University *Fall 2022 - Spring 2025*
Instructor: Tal Malkin, Xi Chen, Toniann Pitassi, Josh Alman; Students: 400+

Mentor, Barnard Peer Mentoring Program, Barnard College *2022 - 2024*
Mentees: 6

Mentor, Application Development Initiative, Columbia University *Spring 2022*
Mentees: 3; Students: 30+

Invited Talks

ADI Mentorship's Panel, Columbia University *April 2025*

Service

Program Committee for AAAI 2026
Artifact Evaluation Program Committee for TACAS 2026
Artifact Evaluation Program Committee for iFM 2025
Artifact Evaluation Program Committee for TACAS 2025

Skills

Languages: Java, Python, C++, C, C#, HTML/CSS/JS, SQL, Alloy, LTL, TSL, R

Frameworks/Libraries: CUDA, Flask, Django, React, MySQL, MongoDB, TensorFlow, Pandas, NumPy, Selenium

Tools: Unity, Linux, Git, Docker, MATLAB, Figma, Adobe Premier, GarageBand

Clubs: Columbia Application Development Initiative; Barnard Better, Enhance, and Advance Research Series in Computer Science; Columbia University Ballet Ensemble (CUBE); Barnard & Columbia Chorus

Activities: Screenwriter of comic "The Female Prince Consort" adapted from Huang Mei Opera