

YANJU CHEN

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RESEARCH INTERESTS

Making programming more efficient and accessible for users of all levels is my long-term pursuit. I am a researcher working on programming languages, software engineering and artificial intelligence. I strive to push the boundary of the way human and computer programs interact by program synthesis. Specifically, my work falls into the following three research directions:

Multi-Modal Specification

This direction explores how a synthesizer captures user intent beyond classical programming-by-example (PBE) tasks. MARS [FSE'19] is one of the **first** PBE synthesizers that incorporate multi-modal specification, which inspires follow-up works that formalize code snippet [OOPSLA'22a] and its graph representation [ASE'22] as specification.

Deduction-Guided Machine Learning

This direction explores how to build a tight bond between logical and statistical reasoning. CONCORD [CAV'20] is one of the **first** synthesizers that utilize feedback from logical reasoning to improve the search performed by statistical reasoning. POE [PLDI'22] extends such a bond to visualization question answering. Follow-up works exploit such approach on conversion from imperative to function program [OOPSLA'22a], as well as smart contract invariant generation [ASE'22].

New Scopes of Program Synthesis and Verification

This direction explores broader scopes of program synthesis and verification and how it could maximize the productivity and efficiency of problem solving for users of all levels, including summarization of loop behavior [ASE'20], gas optimization via data type refactoring [OOPSLA'22b], synthesizing tree traversal programs for modern web browsers [ASPLOS'22, PLDI'23a], finding smart contract invariants using reinforcement learning [ASE'22], and automatic bug detection in zero-knowledge proofs [PLDI'23b, ePrint'23].

EDUCATION

- 2017–2023 **University of California, Santa Barbara, CA, USA**
(Expected) Ph.D. in Computer Science
Committee: Yu Feng (advisor), Isil Dillig, Nadia Polikarpova, Xifeng Yan
- 2014–2017 **Sun Yat-sen University, Guangzhou, China**
M.S. in Computer Science
Advisor: Rong Pan
- 2010–2014 **Sun Yat-sen University, Guangzhou, China**
B.S. in Computer Science
Advisor: Rong Pan

PROFESSIONAL APPOINTMENTS

- 07/2022–Present **Veridise Inc.**
Chief Research Scientist
- 09/2019–10/2019 **University of Washington**
Visiting Researcher | Mentor: Rastislav Bodik
- 06/2019–09/2019 **The University of Texas at Austin**
Visiting Researcher | Mentor: Isil Dillig
- 07/2015–06/2017 **iPIN Inc.**
Research Intern | Mentor: Rong Pan

PUBLICATIONS & MANUSCRIPTS

(* Equal Contribution)

- [USENIX Security'24] **Practical Security Analysis of Zero-Knowledge Proof Circuits**
Hongbo Wen, Jon Stephens, Yanju Chen, Kostas Ferles, Shankara Pailoor, Kyle Charbonnet, Isil Dillig, Yu Feng
Proceedings of the 33rd USENIX Security Symposium (USENIX Security), 2024
- [ASE'23] **Fast and Reliable Program Synthesis via User Interaction**
Yanju Chen, Chenglong Wang, Xinyu Wang, Osbert Bastani, Yu Feng
Proceedings of the IEEE/ACM International Conference on Automated Software Engineering (ASE), 2023
- [PLDI'23b] **Automated Detection of Under-constrained Circuits in Zero-Knowledge Proofs**
Shankara Pailoor*, Yanju Chen*, Franklyn Wang, Clara Rodríguez, Jacob Van Geffen, Jason Morton, Michael Chu, Brian Gu, Yu Feng, Isil Dillig
Proceedings of the ACM SIGPLAN International Conference on Programming Language Design and Implementation (PLDI), 2023
- [PLDI'23a] **Conflict-Driven Synthesis for Layout Engines**
Junrui Liu, Yanju Chen, Eric Atkinson, Yu Feng, Rastislav Bodik
Proceedings of the ACM SIGPLAN International Conference on Programming Language Design and Implementation (PLDI), 2023
- [ASE'22] **Learning Contract Invariants Using Reinforcement Learning**
Junrui Liu*, Yanju Chen*, Bryan Tan, Isil Dillig, Yu Feng
Proceedings of the IEEE/ACM International Conference on Automated Software Engineering (ASE), 2022
- [OOPSLA'22b] **Synthesis-Powered Optimization of Smart Contracts via Data Type Refactoring**
Yanju Chen*, Yuepeng Wang*, Maruth Goyal, James Dong, Yu Feng, Isil Dillig
Proceedings of the ACM on Programming Languages (OOPSLA), 2022
- [OOPSLA'22a] **Automated Transpilation of Imperative to Functional Code Using Neural-Guided Program Synthesis**
Benjamin Mariano, Yanju Chen, Yu Feng, Greg Durrett, Isil Dillig
Proceedings of the ACM on Programming Languages (OOPSLA), 2022
- [PLDI'22] **Visualization Question Answering Using Introspective Program Synthesis**
Yanju Chen, Xifeng Yan, Yu Feng
Proceedings of the ACM SIGPLAN International Conference on Programming Language Design and Implementation (PLDI), 2022
ACM SIGPLAN Distinguished Paper Award
- [ASPLOS'22] **Tree Traversal Synthesis Using Domain-Specific Symbolic Compilation**
Yanju Chen, Junrui Liu, Yu Feng, Rastislav Bodik
Proceedings of the ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2022
- [S&P'22] **SAILFISH: Vetting Smart Contract State-Inconsistency Bugs in Seconds**
Priyanka Bose, Dipanjan Das, Yanju Chen, Yu Feng, Christopher Kruegel, Giovanni Vigna
Proceedings of the IEEE Symposium on Security and Privacy (S&P), 2022
- [ASE'20] **Demystifying Loops in Smart Contracts**
Benjamin Mariano, Yanju Chen, Yu Feng, Shuvendu Lahiri, Isil Dillig
Proceedings of the IEEE/ACM International Conference on Automated Software Engineering (ASE), 2020
- [CAV'20] **Program Synthesis Using Deduction-Guided Reinforcement Learning**
Yanju Chen, Chenglong Wang, Osbert Bastani, Isil Dillig, Yu Feng
Proceedings of the International Conference on Computer Aided Verification (CAV), 2020
- [FSE'19] **Maximal Multi-Layer Specification Synthesis**
Yanju Chen, Ruben Martins, Yu Feng
Proceedings of the ACM Joint Meeting on European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE), 2019
- [VLDB'19] **TRINITY: An Extensible Synthesis Framework for Data Science**
Ruben Martins, Jia Chen, Yanju Chen, Yu Feng, Isil Dillig
Proceedings of the VLDB Endowment (VLDB), 2019

[AAAI'17] **Automatic Emphatic Information Extraction from Aligned Acoustic Data and Its Application on Sentence Compression**

Yanju Chen, Rong Pan

Proceedings of the AAAI Conference on Artificial Intelligence (AAAI), 2017

ACADEMIC SERVICES

- 2024 Verification, Model Checking, and Abstract Interpretation (VMCAI) - Artifact Evaluation Committee
- 2023 ACM Transactions on Architecture and Code Optimization (TACO) - Reviewer
- 2023 Systems, Programming, Languages, and Applications: Software for Humanity (SPLASH) Student Research Competition - Program Committee
- 2023 International Workshop on the Future of No-Code Digital Apprentices (AutoMates@IJCAI) - Program Committee
- 2023 Programming Language Design and Implementation (PLDI) - Artifact Evaluation Committee
- 2023 European Conference on Object-Oriented Programming (ECOOP) - Artifact Evaluation Committee
- 2023 Verification, Model Checking, and Abstract Interpretation (VMCAI) - Artifact Evaluation Committee
- 2022 Programming Language Design and Implementation (PLDI) - Artifact Evaluation Committee
- 2021 Programming Language Design and Implementation (PLDI) - Artifact Evaluation Committee
- 2020 Object-oriented Programming, Systems, Languages, and Applications (SPLASH/OOPSLA) - Artifact Evaluation Committee
- 2020 Principles of Programming Languages (POPL) - Student Volunteer
- 2017 AAAI Conference on Artificial Intelligence (AAAI) - Student Volunteer

TEACHING ASSISTANTSHIPS

University of California, Santa Barbara

- Winter 2022 CS 595N: Research Seminar
- Spring 2021 CS 190I: Program Synthesis
- Winter 2021 CS 595N: Research Seminar
- Winter 2020 CS 162: Programming Languages
- Spring 2019 CS 130A: Data Structures and Algorithms - I
- Winter 2019 CS 4: Computer Science Bootcamp
- Fall 2018 CS 165A: Artificial Intelligence
- Summer 2018 CS 8: Introduction to Computer Science
- Spring 2018 CS 16: Problem Solving with Computers - I
- Fall 2017 CS 40: Foundations of Computer Science

HONORS & AWARDS

- 2023 UCSB Computer Science Outstanding PhD Student of the Year
- 2022 ACM SIGPLAN PAC Award - OOPSLA
- 2022 ACM SIGPLAN PLDI Distinguished Paper Award
- 2022 ACM SIGPLAN PAC Award - PLDI
- 2017 AAAI Student Scholarship

RECENT TALKS

- **Program Synthesis for All: A Synergistic Perspective**
 - 04/2023 Florida State CS Research Seminar Florida State University, FL, USA
 - 04/2023 Purdue CS Research Seminar Purdue University, IN, USA
 - 03/2023 Stevens CS Research Seminar Stevens Institute of Technology, NJ, USA
 - 03/2023 UConn CSE Research Seminar University of Connecticut, CT, USA
 - 03/2023 Binghamton CS research seminar SUNY Binghamton, NY, USA
 - 03/2023 UIC CS research seminar University of Illinois at Chicago, IL, USA
 - 02/2023 Berkeley Programming Systems Seminar University of California, Berkeley, CA, USA
 - 02/2023 Stanford Software Research Seminar Stanford University, CA, USA
 - 01/2023 UCSB Graduate Research Seminar University of California, Santa Barbara, CA, USA
- **Synthesis-Powered Optimization of Smart Contracts via Data Type Refactoring**
 - 12/2022 OOPSLA'22 Auckland, New Zealand
- **Formal Verification for Zero-Knowledge Circuits**
 - 07/2022 0xPARC Summer Residency New York City, NY, USA
- **Visualization Question Answering Using Introspective Program Synthesis**
 - 06/2022 PLDI'22 San Diego, CA, USA
- **Program Synthesis for Complex Software Systems**
 - 05/2022 PhD Proposal Talk University of California, Santa Barbara, CA, USA
- **Attack Synthesis for Blockchain Security**
 - 04/2022 Guest Lecture, CS292C (Computer-Aided Reasoning for Software) University of California, Santa Barbara, CA, USA
- **A Symbolic Virtual Machine for Automated R1CS Verification**
 - 04/2022 0xPARC ZK Learning Group #2 New York City, NY, USA
- **Tree Traversal Synthesis Using Domain-Specific Symbolic Compilation**
 - 03/2022 ASPLOS'22 Lausanne, Switzerland
- **Multi-Modal Program Synthesis**
 - 04/2021 Guest Lecture, CS190I (Program Synthesis) University of California, Santa Barbara, CA, USA
- **Program Synthesis for Data Science**
 - 02/2021 Tutorial, ISEC'21 Synthesis4SE Workshop Bhubaneswar, India
- **Bridging Logical Reasoning and Machine Learning in Program Synthesis**
 - 12/2020 PhD Major Area Examination Talk University of California, Santa Barbara, CA, USA
- **Program Synthesis Using Deduction-Guided Reinforcement Learning**
 - 07/2020 CAV'20 Los Angeles, CA, USA
- **Deep Learning in Open-Domain Dialogue Systems**
 - 05/2018 Guest Lecture, CS291K (Deep Learning) University of California, Santa Barbara, CA, USA