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 security. I strive to push the boundary of the way human and computer programs interact by program synthesis. Specifically, my work falls into the following research directions:

Deduction-Guided Machine Learning for Program Synthesis
We explore how to build a tight bond between logical and statistical reasoning for program synthesis that enables reliability **[ASE'23]** and multi-modality **[FSE'19, ASE'24]** in addition to scalability **[VLDB'19, CAV'20, ASE'22]**. This new paradigm serves as a building block for various automated programming scenarios, including: data wrangling **[VLDB'19, FSE'19, CAV'20, ASE'23, ASE'24]**, smart contract reasoning **[ASE'20, OOPSLA'22b, ASE'22]**, code transpilation **[OOPSLA'22a]**, user interaction **[ASE'23]** and regularized explanation for deep learning models **[PLDI'22]**.

Secure and Efficient Infrastructure for Blockchains and Zero-Knowledge Proofs
We explore practical implications for security and efficiency in modern blockchain systems/applications and zero-knowledge proofs, including: security analysis of smart contracts **[ASE'20, S&P'22, ASE'22]** and zero-knowledge proof circuits **[PLDI'23b, USENIX Security'24]**, data layout optimization **[OOPSLA'22b]**, DeFi attack synthesis **[CCS'24]** and secure blockchain modular services **[IACR'24]**.

Program Synthesis and Verification for Complex Software Systems
We explore effective approaches for scaling program synthesis and verification on complex software systems that strengthen their robustness, maintainability and security, e.g., reasoning about web browser layout engines **[ASPLOS'22, PLDI'23a]**, explaining predictions of deep learning models **[PLDI'22]** and synthesizing deep logical attacks for DeFi protocols **[CCS'24]**.

EDUCATION

2017–2023 **University of California, Santa Barbara, CA, USA**
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

04/2024–Present **University of California, Santa Barbara**
Postdoctoral Scholar | Host: Tevfik Bultan, Yu Feng

07/2022–04/2024 **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)

[IACR'24] **Stateless and Verifiable Execution Layer for Meta-Protocols on Bitcoin**
Hongbo Wen, Hanzhi Liu, Shuyang Tang, Tianyue Li, Shuhan Cao, Domo, Yanju Chen, Yu Feng
Cryptology ePrint Archive, 2024

[ASE'24] **Refinement Types for Visualization**
Jingtao Xia, Junrui Liu, Nicholas Brown, Yanju Chen, Yu Feng
Proceedings of the IEEE/ACM International Conference on Automated Software Engineering (ASE), 2024

[CCS'24] **FORAY: Towards Effective Attack Synthesis against Deep Logical Vulnerabilities in DeFi Protocols**
Hongbo Wen, Hanzhi Liu, Jiaxin Song, Yanju Chen, Wenbo Guo, Yu Feng
Proceedings of the 2024 ACM SIGSAC Conference on Computer and Communications Security (CCS), 2024

[Dissertation] **Deduction-Powered Neural Program Synthesis: A Synergistic Perspective**
Yanju Chen
University of California, Santa Barbara, 2024

[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

PROFESSIONAL MEMBERSHIP AND SERVICE

2025 **Program Committee** - Object-oriented Programming, Systems, Languages, and Applications (SPLASH/OOPSLA)

2025 **Program Committee** - USENIX Security Symposium (USENIX Security)

2024 **Artifact Evaluation Committee** - ACM Conference on Computer and Communications Security (CCS)

2024 **Program Committee** - International Workshop on the Future of No-Code Digital Apprentices (AutoMates@IJCAI)

2024 **Reviewer** - ACM Transactions on Architecture and Code Optimization (TACO)

2024 **Artifact Evaluation Committee** - Programming Language Design and Implementation (PLDI)

2024 **Extended Review Committee** & **Artifact Evaluation Committee** - European Conference on Object-Oriented Programming (ECOOP)

2024 **Artifact Evaluation Committee** - Verification, Model Checking, and Abstract Interpretation (VMCAI)

2023 **Reviewer** - ACM Transactions on Software Engineering and Methodology (TOSEM)

2023 **Reviewer** - ACM Transactions on Architecture and Code Optimization (TACO)

2023 **Program Committee** - Systems, Programming, Languages, and Applications: Software for Humanity (SPLASH) Student Research Competition

2023 **Program Committee** - International Workshop on the Future of No-Code Digital Apprentices (AutoMates@IJCAI)

2023 **Artifact Evaluation Committee** - Programming Language Design and Implementation (PLDI)

2023 **Extended Review Committee** & **Artifact Evaluation Committee** - European Conference on Object-Oriented Programming (ECOOP)

2023 **Artifact Evaluation Committee** - Verification, Model Checking, and Abstract Interpretation (VMCAI)

2022 **Artifact Evaluation Committee** - Programming Language Design and Implementation (PLDI)

2021 **Artifact Evaluation Committee** - Programming Language Design and Implementation (PLDI)

2020 **Artifact Evaluation Committee** - Object-oriented Programming, Systems, Languages, and Applications (SPLASH/OOPSLA)

2020 **Student Volunteer** - Principles of Programming Languages (POPL)

2017 **Student Volunteer** - AAAI Conference on Artificial Intelligence (AAAI)

Teaching Assistantships

University of California, Santa Barbara

Spring 2024	CS 190J: Blockchain Technologies and Security
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	Ethereum Foundation Academic Award
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

- **ZKSwift: A Programming Language for High-Performance ZK Circuits**

11/2023 ProgCrypto: Programmable Cryptography Conference @ DevConnect — Istanbul, Turkey

- **Program Synthesis for All: A Synergistic Perspective**

04/2023 Purdue CS Research Seminar — Purdue University, IN, 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

- **Deep Learning in Open-Domain Dialogue Systems**

05/2018 Guest Lecture, CS291K (Deep Learning) University of California, Santa Barbara, CA, USA