# Yue Yao

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I am a 4th year PhD student at **Carnegie Mellon University** studying **programming languages**. My research applies **semantic methods**, most notably the method of logical relations, to interesting applied and theoretical problems pertaining to **substructural types** and **concurrency**, including **session types**. Towards these ends, my research also involves (linear) type theories and mechanizing results in a theorem prover. My research aims to enable the design of practical, multiparadigm languages equipped with sophisticated type systems and strong theoretical guarantees. I am advised by Stephanie Balzer.

## Recent Publications

Runming Li, **Yue Yao**, and Robert Harper. 2026. Mechanizing Synthetic Tait Computability in Istari. In *Proceedings of the 15th ACM SIGPLAN International Conference on Certified Programs and Proofs*. To appear

Stephanie Balzer, Farzaneh Derakhshan, Robert Harper, and **Yue Yao**. 2023. Logical Relations for Session-Typed Concurrency. *CoRR*. 2309.00192. Available at https://arxiv.org/abs/2309.00192. To appear in ESOP 2026.

**Yue Yao**, Grant Iraci, Cheng-En Chuang, Stephanie Balzer, and Lukasz Ziarek. 2025. Semantic Logical Relations for Timed Message-Passing Protocols. In *Proc. ACM Program. Lang.* (POPL)

Tarakaram Gollamudi, Jules Jacobs, **Yue Yao**, and Stephanie Balzer. 2025. A Semantic Logical Relation for Termination of Intuitionistic Linear Logic Session Types. In *11th International Workshop on Coq for Programming Languages (CoqPL)*

Farzaneh Derakhshan, Stephanie Balzer, and **Yue Yao**. 2024. Regrading Policies for Flexible Information Flow Control in Session-Typed Concurrency. In *38th European Conference on Object-Oriented Programming (ECOOP 2024)*

## Education

Ph.D. in Computer Science — 09/2022 - Present
**Carnegie Mellon University (CMU)** — Pittsburgh, PA
*Computer Science Department (CSD)*
Advised by Stephanie Balzer.

M.S. in Computer Science — 09/2018 - 12/2019
**Carnegie Mellon University (CMU)** — Pittsburgh, PA
*Computer Science Department (CSD)*
Thesis: *Work-Efficient Schedulers*. Committee: Umut Acar (Chair) and Randal Bryant.

B.S. in Electrical and Computer Engineering — 09/2014 - 09/2018
**Shanghai Jiao Tong University (SJTU)** — Shanghai, China
*University of Michigan - Shanghai Jiao Tong University Joint Institute (UM-SJTU JI)*
Graduated with distinction.

## Professional Experiences

Compiler Engineer — Full-time, 04/2020 - 08/2022
**NVidia Corp.** — Austin, TX
*Worked on PTX compiler support for Ampere, Hopper and Blackwell GPUs.*

Compiler Engineer — Intern, 05/2019 - 08/2019
**NVidia Corp.** — Austin, TX
*Worked on reasoning about CUDA program performance through cost semantics.*

Hardware Testing Engineer — Intern, 12/2017 - 06/2018
**Apple Inc.** — Shanghai, China
*Worked on developping diagnostic and testing frameworks for Apple Watch Series 4.*

## Teaching

15-312: Foundations of Programming Languages, CMU — Teaching Assistant for Fall 2019, Fall 2022
*Led recitations; wrote and graded assignments and exams.*

VE280: Programming and Elementary Data Structures, SJTU — Teaching Assistant for Fall 2017, Summer 2018
*Led recitations; graded assignments and wrote exams; developped and deployed a new secure autograder.*

VE480: Introduction to Operating Systems, SJTU — Teaching Assistant for Summer 2017
*Reworked course projects; managed the course server.*

VP260: Honors Physics II, SJTU — Teaching Assistant for Summer 2016
*Graded assignments and exams; led recitations.*

VG101: Introduction to Computers and Programming, SJTU — Teaching Assistant for Fall 2016
*Wrote exams and reworked a course project.*

## Services

- Co-reviewed for Symposium on Principles of Programming Languages (POPL 2026).
- Served on the POPL 2026 Artifact Evaluation Commitee.

## Honors

- *Outstanding Graduate Award* from SJTU, May 2018.
- *John Wu & Jane Sun Merit Scholarship*, Nov 2017.
- *Academic Excellence Scholarship* from SJTU, Nov 2017.
- *Outstanding Teaching Assistant Award* from UM-SJTU-JI, May 2017.

## Skills

- **Programming Languages**: OCaml, Standard ML, C/C++, Rust, Python, Golang, Haskell, Scheme, Racket.
- **Proof Assistants**: Rocq (Coq), Istari, Agda.
- **Domains**: Programming Langauges, Formal Verfication, Type Theories, Semantic methods, Concurrency and Parallelism, Compilers.

## Research Artifacts

Istari-STC — `https://github.com/runmingl/istari-stc`
Artifact of *Mechanizing Synthetic Tait Computability in Istari*.
We mechanized proofs of canonicity for a core dependent type theory and the cost-aware logical framework.
The proofs use Synthetic Tait Computability in the Istari prover, a Martin-Lof style computational type theory.

LAgnoLR — `https://github.com/balzers/LAgnoLR`
Artifact of *A Language-Agnostic Logical Relation for Message-Passing Protocols*.
A Rocq (Coq) mechanization of a semantic logical relation for intuitionistic linear logic session types.

TILLST Type-checker — `https://dl.acm.org/do/10.5281/zenodo.13937290/full/`
Artifact of *Semantic Logical Relations for Timed Message-Passing Protocols*.
A type checker for the Timed Intuitionistic Linear Logic Session Type (TILLST) language.
Approved by the POPL 2025 Artifact Evaluation Committee.

SINTEGRITY — `https://doi.org/10.4230/DARTS.10.2.4`
Artifact of *Regrading Policies for Flexible Information Flow Control in Session-Typed Concurrency*.
An IFC type checker supporting security-polymorphic definitions and regrading policies.
Approved by the ECOOP 2024 Artifact Evaluation Committee.

# Publications and Technical Reports

### Programming Languages

Stephanie Balzer, Farzaneh Derakhshan, Robert Harper, and Yue Yao. Logical relations for session-typed concurrency, 2023. To appear in ESOP 2026

Runming Li, Yue Yao, and Robert Harper. Mechanizing Synthetic Tait Computability in Istari. In *Proceedings of the 15th ACM SIGPLAN International Conference on Certified Programs and Proofs*, CPP '26, New York, NY, USA, 2026. Association for Computing Machinery. To appear

Yue Yao, Grant Iraci, Cheng-En Chuang, Stephanie Balzer, and Lukasz Ziarek. Semantic logical relations for timed message-passing protocols. *Proc. ACM Program. Lang.*, 9(POPL), January 2025

Tarakaram Gollamudi, Jules Jacobs, Yue Yao, and Stephanie Balzer. A semantic logical relation for termination of intuitionistic linear logic session types. In *11th International Workshop on Coq for Programming Languages (CoqPL)*, 2025

Tesla Zhang, Asher Kornfeld, Rui Li, Sonya Simkin, Yue Yao, and Stephanie Balzer. Mechanizing a proof-relevant logical relation for timed message-passing protocols, 2025

Tesla Zhang, Sonya Simkin, Rui Li, Yue Yao, and Stephanie Balzer. A language-agnostic logical relation for message-passing protocols, 2025

Farzaneh Derakhshan, Stephanie Balzer, and Yue Yao. Regrading Policies for Flexible Information Flow Control in Session-Typed Concurrency. In Jonathan Aldrich and Guido Salvaneschi, editors, *38th European Conference on Object-Oriented Programming (ECOOP 2024)*, volume 313 of *Leibniz International Proceedings in Informatics (LIPIcs)*, pages 11:1–11:29, Dagstuhl, Germany, 2024. Schloss Dagstuhl – Leibniz-Zentrum für Informatik

Yue Yao. Work-efficient schedulers. Master's thesis, Carnegie Mellon University, 2019

### Approximate Logic Synthesis

Chang Meng, Zhuangzhuang Zhou, Yue Yao, Shuyang Huang, Yuhang Chen, and Weikang Qian. HEDALS: Highly efficient delay-driven approximate logic synthesis. *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, 42(11):3491–3504, 2023

Zhuangzhuang Zhou, Yue Yao, Shuyang Huang, Sanbao Su, Chang Meng, and Weikang Qian. DALS: Delay-driven approximate logic synthesis. In *2018 IEEE/ACM International Conference on Computer-Aided Design (ICCAD)*, pages 1–7, 2018

Yue Yao, Shuyang Huang, Chen Wang, Yi Wu, and Weikang Qian. Approximate disjoint bi-decomposition and its application to approximate logic synthesis. In *2017 IEEE International Conference on Computer Design (ICCD)*, pages 517–524, 2017