Xiaohong Chen

CONTACT

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RESEARCH INTERESTS

Logic and formal verification
Programming languages, formal semantics
Proof-certifying software, trustworthy language tools via proof generation

EDUCATION

Department of Computer Science, UIUC

Ph.D. student in Computer Science (2016–present; expected May'23)

- Dissertation topic: *Matching Logic*
- Advisor: Grigore Roşu

School of Mathematical Sciences, Peking University

Bachelor of Science, June 2014

- Highest distinction in general scholarship

PUBLICATIONS

(9 conference papers; 3 journal papers; 4 submissions under review)

B. Collie, T. Kasampalis, **X. Chen**, D. Guth, G. Roşu. *An efficient language-agnostic semantics-based interpreter*, **PLDI** (under review).

T. Trinh, **X. Chen**, N. Rodrigues, G. Roşu. *Automatic abstraction for fixpoint reasoning in matching logic*, **PLDI** (under review).

Z. Lin, **X. Chen**, T. Trinh, J. Wang, G. Roşu. *Generating proof certificates for a language-agnostic deductive program verifier*, **OOPSLA** (under review).

X. Chen, G. Roşu. *Defining binders in matching logic (featuring a case study of contexts in $\mathbb{K}$)*, Journal of Functional Programming (**JFP**) ICFP Special Issue (under review).

X. Chen, D. Lucanu, G. Roşu. *Capturing constrained constructor patterns in matching logic*, Journal of Logical and Algebraic Methods in Programming (**J'LAMP**), 2022.

X. Zhang, **X. Chen**, M. Sun. *Towards a unifying logical framework for neural networks*, International Colloquium on Theoretical Aspects of Computing (ICTAC), 2022.

X. Chen, Z. Lin, T. Trinh, G. Roşu. *Towards a trustworthy semantics-*

based language framework via proof generation, Computer-Aided Verification (**CAV**), 2021.

X. Chen, D. Lucanu, G. Roşu. *Matching logic explained*, Journal of Logical and Algebraic Methods in Programming (**J'LAMP**), 2021.

X. Chen, T. Trinh, N. Rodrigues, L. Peña, G. Roşu. *Towards a unified proof framework for automated fixpoint reasoning using matching logic*, **OOPSLA**, 2020.

X. Chen, G. Roşu. *A general approach to define binders using matching logic*, International Conference on Functional Programming (**ICFP**), 2020.

X. Chen, G. Roşu. *Matching μ-logic*, Logics in Computer Science (**LICS**), 2019.

J. Wang, **X. Chen**, J. Sun, S. Qin. *Improving probability estimation through active probabilistic model learning*, International Conference on Formal Engineering Methods (ICFEM), 2017

E. Palomar, **X. Chen**, Z. Liu, S. Maharjan, J. Bowen. *Component-based modelling for scalable smart city systems interoperability: A case study on integrating energy demand response systems*, Sensors **16**(11):1810, 2016.

P. Kong, Y. Li, **X. Chen**, J. Sun, M. Sun, J. Wang. *Towards concolic testing for hybrid systems* Formal Methods (**FM**), 2016.

(Best Paper) S. Li, **X. Chen**, Y. Wang, M. Sun. *A framework for off-line conformance testing of timed connectors*, Theoretical Aspects of Software Engineering (TASE), 2015.

X. Chen, J. Sun, M. Sun. *A hybrid model of connectors in cyber-physical systems*, International Conference on Formal Engineering Methods (ICFEM), 2014.

(technical reports, book chapters, workshop papers, short papers, etc.)

P. Bereczky, **X. Chen**, D. Horpácsi, T. Mizsei, L. Peña, J. Tušil. *Mechanizing matching logic in Coq*, Working Formal Methods Symposium (FROM), 2022.

M. Saxena, **X. Chen**, S. Song, S. Meng, L. Sha, G. Roşu. *Rewriting-based computer-interpretable clinical practice guidelines*, Technical Report `https://hdl.handle.net/2142/116016`, 2022.

X. Chen, G. Roşu. *The $\mathbb{K}$ vision for the future of programming language design and analysis*, Formal Methods in Outer Space, 2021.

Z. Lin, **X. Chen**, G. Roşu. *An interactive theorem prover for matching logic with proof object generation*, Technical Report `https://hdl.`

handle.net/2142/111650, 2021.

J. Tusil, **X. Chen**, G. Roşu. *Hyperproperties in matching logic*, Technical Report https://hdl.handle.net/2142/109298, 2021.

X. Chen, D. Lucanu, G. Roşu. *Connecting constrained constructor patterns and matching logic*, International Workshop on Rewriting Logic and Its Applications, 2020.

X. Chen, G. Roşu. $\mathbb{K}$—*A semantic framework for programming languages and formal analysis*, Book Chapter of the International School on Engineering Trustworthy Software Systems, 2020.

X. Chen, D. Lucanu, G. Roşu. *Initial algebra semantics in matching logic*, Technical Report https://hdl.handle.net/2142/107781, 2020.

M. Saxena, **X. Chen**, N. Rodrigues, G. Roşu. *Formal semantics of hybrid automata*, Technical Report https://hdl.handle.net/2142/106822, 2020.

X. Chen, G. Roşu. *A language-independent program verification framework*, Leveraging Applications of Formal Methods, Verification and Validation (ISoLA), 2018.

X. Chen, D. Park, G. Roşu. *A language-independent approach to smart contract verification*, Leveraging Applications of Formal Methods, Verification and Validation (ISoLA), 2018.

Z. Liu, **X. Chen**. *Model-driven design of object and component systems*, Book Chapter of the International School on Engineering Trustworthy Software Systems, 2016.

Awards

2022	Graduate College's Dissertation Completion Fellowship
2020	Mavis Future Faculty Fellowship
2018–2019	Yunni & Maxine Pao Memorial Fellowship
2012–2013	China National Scholarship

Grants

Assisted in proposal preparation for the following research grant:

2022–2023 *Trustworthy Formal Verification for Ethereum Smart Contracts via Machine-Checkable Proof Certificates*, Ethereum Foundation, Funded Amount: $30,000. News Article: https://shorturl.at/djtuz.

Talks

Verification in the RISC-Zero zkVM at the New England Systems Verification Day, slides available online: https://shorturl.at/ijzH0, 2022

Towards a trustworthy semantics-based language framework via proof generation at CAV, 2021.

A general approach to define binders using matching logic at ICFP, avail-

able online: `https://www.youtube.com/watch?v=TNO_jGr33VM`, 2020.

Towards a unified proof framework for automated fixpoint reasoning using matching logic at OOPSLA, available online: `https://www.youtube.com/watch?v=2JlaJPPilB0`, 2020.

(Tutorial) *Using the* $\mathbb{K}$ *framework to formalize functional languages* at ICFP, available online: `https://www.youtube.com/watch?v=VlQMi_N42B8`, 2020.

A language-independent program verification framework at the 7th International Symposium on Leveraging Applications of Formal Methods, Verification and Validation, Limassol, Cyprus, 2018.

A language-independent approach to smart contract verification at the 7th International Symposium on Leveraging Applications of Formal Methods, Verification and Validation, Limassol, Cyprus, 2018.

Towards concolic testing for hybrid systems at the 21st International Symposium on Formal Methods, Limassol, Cyprus, 2016.

Teaching Experience

2022	Guest Lecturer, Programming Language Design
2019 & 2020	Teaching Assistant, Software Engineering (I)
2018	Guest Lecturer, Programming Language Semantics
2015	Assistant Lecturer, Data Analysis
2014	Assistant Lecturer, Software Engineering

Advising Experience

Served as a mentor for the following students:

Nishant Rodrigues	PhD student at UIUC
Manasvi Saxena	PhD student at UIUC
Mircea Sebe	PhD student at UIUC
Adam Fiedler	MSc student at Masaryk University; now at Runtime Verification Inc.
Jan Tušil	MSc student at Masaryk University; now at Runtime Verification Inc.
Zhengyao Lin	undergrad at UIUC; now PhD student at CMU
John Wang	undergrad at UIUC

Work Experience

2022 — Verification Engineer, Runtime Verification Inc.

Helped establish RV Research—the new research institute at Runtime Verification Inc (`https://research.runtimeverification.com/`). Drafted open research problems for RV Research and recorded introduction videos. Organized weekly RV Research seminars.

2018–2019 — Verification Engineer, Runtime Verification Inc.

Designed the logical foundation of the $\mathbb{K}$ framework (`https://kframework.org`). Wrote the *Semantics of* $\mathbb{K}$ white paper. Helped design the symbolic execution engine of $\mathbb{K}$.

2015–2016 — Research assistant, Singapore University of Technology and Design.

Created probabilistic models for cyber-physical systems. Designed efficient and effective sampling algorithms. Proved asymptotic properties of the algorithms.

2014–2015 — Assistant lecturer, Birmingham City University.

Assisted in teaching two undergraduate courses: Data Analysis and Software Engineering.

Service

Local organization committee member at SPIN'22. Helped organizing the conference and publishing the conference proceedings.

Student volunteer at PLDI'21

Reviewer of Journal of Systems and Software (2022), Journal of Logical and Algebraic Methods in Programming (2020,2019)

Paper/artifact reviewer for CONCUR'22, OOPSLA-AEC'22, LICS'21, TACAS'21, LICS'19, CAV'19, CONCUR'19, FM'19, FoSSaCS'19, FSCD'18, AiML'18, FSCD'17, RV'17, CALCO'17, HSCC'17, NFM'17, FSCD'16, RV'16, CALCO'16, HSCC'16, NFM'16, FM'16, SEFM'16, TASE'16, APSEC'15, MEDI'15, WWV'15.

References

Prof. Grigore Roşu
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Prof. José Meseguer
University of Illinois Urbana-Champaign
Contact: Salome Liebenberg `salomel@illinois.edu`

Dr. Margus Veanes
Microsoft Research
Contact: `margus@microsoft.com`