



# Jianlin Li

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## EDUCATION

### UNIVERSITY OF WATERLOO

#### PH.D. IN COMPUTER SCIENCE

Supervisor: Yizhou Zhang and Ondřej Lhoták  
Cumulative GPA: 98.33  
Sep. 2021 - Expected Sep. 2025 Waterloo, Canada

### SAARLAND UNIVERSITY (EXCHANGE)

#### MASTER IN COMPUTER SCIENCE

Supervisor: Holger Hermanns  
Grade: 1.3 (Germany grading system)  
Sep. 2019 - Aug. 2020  
Saarbrücken, Germany

### INSTITUTE OF SOFTWARE, CHINESE ACADEMY OF SCIENCES

#### MASTER IN COMPUTER SCIENCE

Supervisor: Lijun Zhang | GPA: 3.88/4.0  
Sep. 2018 - Aug. 2021 | Beijing

### NANJING UNIVERSITY OF AERONAUTICS AND ASTRONAUTICS

#### BACHELOR OF COMPUTER SCIENCE

Supervisor: Zhe Chen  
GPA: 4.3/5.0 | Ranking: No.1 / 102  
Jun. 2018 | Nanjing, China

## COURSEWORK

### COURSE PROJECTS

- Variational inference reinforcement learning implemented in Pyro
- Generalized Minsky machine halting  $\preceq_m 2$  counter machine halting in Coq.
- C (resp. Java) interprocedural points-to analysis in LLVM (resp. Soot).
- xv6 programming projects for OS.
- 5 stage pipelined MIPS-32 processor.

## SKILLS

### PROGRAMMING SKILLS

Coq, Agda, Model Checkers, OCaml, Rust, Haskell, LLVM, Soot, Verilog, MIPS Assembly, Tensorflow, C++, Java,  $\text{\LaTeX}$ , Shell, Python, Objective-C, Swift

### LANGUAGES

Chinese native speaker

English TOEFL: Listening 27 • Speaking 27

## HIGHLIGHTS

- Self-motivated Phd student in computer science with strong research experience in probabilistic programming [1, 2], abstract interpretation [3–5], probabilistic model checking [6], linear temporal logic,  $\omega$ -regular languages, and software verification [7].
- Good academic writing and presentation skills. Served as a student volunteer at CONCUR'18, SSFM'18, SSFM'19, and LICS'20, as a sub-viewer at LICS'18, TASE'19, FM'19, FMAC'19, and TACAS'21.

## PUBLICATIONS

- [1] **Jianlin Li**, Eric Wang, and Yizhou Zhang.  
Compiling Probabilistic Programs for Variable Elimination with InformationFlow.  
*Proc. ACM Program. Lang.*, 8(PLDI 2024):1755–1780, 2024.
- [2] **Jianlin Li**, Leni Ven, Pengyuan Shi, and Yizhou Zhang.  
Type-Preserving, Dependence-Aware Guide Generation for Sound, Effective Amortized Probabilistic Inference.  
*Proc. ACM Program. Lang.*, 7(POPL 2023):1454–1482, 2023.
- [3] **Jianlin Li**, Jiangchao Liu, Pengfei Yang, Liqian Chen, Xiaowei Huang, and Lijun Zhang.  
Analyzing Deep Neural Networks with Symbolic Propagation: Towards Higher Precision and Faster Verification. In *26th Static Analysis Symposium, SAS 2019, Porto, Portugal, October 8–11, 2019*.
- [4] Renjue Li, **Jianlin Li**, Cheng-Chao Huang, Pengfei Yang, Xiaowei Huang, Lijun Zhang, Bai Xue, and Holger Hermanns.  
PRODeep: A Platform for Robustness Verification of Deep Neural Networks. In *ESEC/FSE 2020: 28th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering, USA, November 8–13, 2020*.
- [5] Pengfei Yang, Renjue Li, **Jianlin Li**, Cheng-Chao Huang, Jingyi Wang, Jun Sun, Bai Xue, and Lijun Zhang.  
Improving neural network verification through spurious region guided refinement. In *Tools and Algorithms for the Construction and Analysis of Systems - 27th International Conference, TACAS 2021, as Part of ETAPS 2021, Luxembourg City, Luxembourg, March 27 - April 1, 2021*.
- [6] Hongfei Fu, Yi Li, and **Jianlin Li**.  
Verifying Probabilistic Timed Automata Against Omega-Regular Dense-Time Properties. In *15th International Conference on Quantitative Evaluation of Systems QEST 2018, Beijing, China, September 4–7, 2018*.
- [7] Maria Christakis, Hasan Ferit Eniser, Holger Hermanns, Jörg Hoffmann, Yugesh Kothari, **Jianlin Li**, Jorge A. Navas, and Valentin Wüstholtz.  
Automated safety verification of programs invoking neural networks. In *Computer Aided Verification - 33rd International Conference, CAV 2021, July 20–23, 2021*.

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## SELECTED RESEARCH PROJECTS

### COMPILING PROBABILISTIC PROGRAMS FOR VARIABLE ELIMINATION WITH INFORMATION FLOW PLDI 2024

- We present an approach to variable elimination and marginal inference for probabilistic programs featuring bounded recursion, discrete distributions, and sometimes even continuous ones. A compiler eliminates probabilistic side effects, using a novel information-flow type system to factorize probabilistic computations and hoist independent subcomputations out of sums or integrals.
- Experiments show that the compiled programs subsume widely used PTIME algorithms for recursive models and that the compilation time scales with the size of the inference problems.
- As a separate contribution, we develop a denotational, logical-relations model of information-flow types in the novel measure-theoretic setting of probabilistic programming; we use it to prove noninterference and consequently the correctness of variable elimination.

### TYPE-PRESERVING, DEPENDENCE-AWARE GUIDE GENERATION FOR SOUND, EFFECTIVE AMORTIZED PROBABILISTIC INFERENCE POPL 2023

- Automatically generating *guide programs* for deep amortized inference in a universal PPL.
- *Guide programs* are generated using a type-directed translation while extracting and exploiting independence structures
- Introduce a novel behavioral type system, that supports out-of-order sampling, as a static guarantee of absolute continuity for automatically generated *guides*.
- Consistently improves training and inference over state-of-the-art baselines for a suite of benchmarks.

### ANALYZING DEEP NEURAL NETWORKS WITH SYMBOLIC PROPAGATION: TOWARDS HIGHER PRECISION AND FASTER VERIFICATION SAS 2019

- Improve on a recent proposal of analyzing DNNs through the abstract interpretation technique, by a novel symbolic propagation technique. Achieve significantly higher precision and thus can prove more properties than using only abstract domains.
- The bounds derived from our approach on the hidden neurons bring significant benefits to a state-of-the-art SMT based verification tool with an overall 549.43% speedup (9.16 hours v.s. 1.41 hours).

## INDUSTRY EXPERIENCE

### NUAAX.COM | Co-FOUNDER + IOS DEVELOPER

Apr. 2015 – Sep. 2017 | Nanjing, China

Apps available on Apple App Store (served 55,000+ users in the first three years):

- YanHuPan: The Missing NUAALecture Timetable Utility for iOS.
- NUAAX portal in Hand: One App for All Information You Need in NUAAX.

I co-founded this non-official student team and developed Apps to help students register for courses, get information (timetables, grades, etc.) and socialize online.

## AWARDS

2023	Type 1	David R. Cheriton Graduate Scholarship
2021	Entrance	University of Waterloo Entrance Scholarship
2020	National	China National Scholarship (Top 0.2%)
2020	First-Class	Academic Scholarships of Institute of Software Chinese Academy of Sciences (Top 10%)
2019	First-Class	Academic Scholarships of Institute of Software Chinese Academy of Sciences (Top 10%)
2015	<b>Silver Medal</b>	ACM-ICPC Shanghai Metropolitan Programming Contest
2014	<b>Silver Medal</b>	ACM-ICPC Asia Regional Contest AnShan Site
2014	National	China National Scholarship (Top 0.2%)
2014	Winning Prize	RoboCup China Open Soccer Simulation 2D