Nian-Ze Lee

Curriculum Vitae

2025-07-21

Coordinates

Affiliation:	National Taiwan University Department of Electrical Engineering Graduate Institute of Electronics Engineering LMU Munich Department of Computer Science	ORCID:	0000-0002-8096-5595
		DBLP:	dblp.org/pid/154/3010.html
		Google Scholar:	8OD03gAAAAJ
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Research Interests

My research focuses on applying formal methods to facilitate the construction of correct and secure systems. My goal is to invent new analysis approaches for real-world applications involving heterogeneous components, such as software, hardware, or emerging technology. Currently, I am active in the following directions (tools which I have developed or contributed to are given in parentheses):

- Cross-application of hardware and software verification techniques (BTOR2C, BTOR2-CERT, and CPV)
- Development of new algorithms for software verification (CPACHECKER)
- Unification and transformation for formal methods (MOXICHECKER and HARNESSFORGE)
- Artificial intelligence and machine learning for formal verification (BTOR2-SELECT)

The theoretical foundation of my work is algorithms and data structures, formal methods, mathematical logic, and system modeling. I also emphasize software engineering for tool implementation and reproducible evaluation.

Education

2015 – 2021 **Ph.D., Graduate Institute of Electronics Engineering**
National Taiwan University, Taipei, Taiwan
Advisor: Prof. Jie-Hong R. Jiang

Lam Research Thesis Award

Dissertation: *Stochastic Boolean Satisfiability: Decision Procedures, Generalization, and Applications*

2009 – 2014 **B.Sc. in Eng., Department of Electrical Engineering**
Minor in Economics
National Taiwan University, Taipei, Taiwan

Academic Employment

2025 – **Assistant Professor** (Tenure Track)
Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan

2021 – 2024 **Postdoctoral Researcher**, Host: Prof. Dirk Beyer
Department of Computer Science, LMU Munich, Munich, Germany

Visiting and Honorary Appointments

2025 – 2028 **Garmin Scholar Fellowship**
National Taiwan University, Taipei, Taiwan

2025 – 2030 **Gastprofessor** (Visiting Professor), Host: Prof. Dirk Beyer
Department of Computer Science, LMU Munich, Munich, Germany

2019 – 2020 **DAAD Scholarship Student**, Host: Prof. Dirk Beyer
Department of Computer Science, LMU Munich, Munich, Germany

2018 – 2019 **Internship Student at ERATO MMSD Project**, Host: Prof. Ichiro Hasuo
National Institute of Informatics, Tokyo, Japan

Industrial Employment

2016 **Research Intern**, Mentor: Dr. Victor N. Kravets
IBM Thomas J. Watson Research Center, Yorktown Heights, NY, U.S.A.

Shortlisting

2024 Call for Tenure-Track Assistant Professorship for "Reliable Software and Distributed Systems", School of Electrical, Information, and Media Engineering, University of Wuppertal (offer rejected)

Grants

2024-2027 **German Research Foundation (DFG)**
Research funding, € 363.6 K
Topic: *Bridging Hardware and Software Analysis* (1 Ph.D. position)

2024-2025 **Intel University Research & Collaboration**
Research funding, $ 30 K
Topic: *Configurable Program Analysis for Automated Firmware Verification*

2025-2026 **NTU New Faculty Grant**
Initiation and research funding, NT$ 2,100 K

2023-2024 **LMUexcellent PostDoc Support Fund**
Travel funding, € 13.3 K

2019-2020 **German Academic Exchange Service (DAAD)**
Joint scholarship with National Science and Technology Council, Taiwan, € 15 K

Awards and Recognitions

2024 **ACM SIGSOFT Distinguished Paper Award** at the 32nd ACM International Conference on the Foundations of Software Engineering
A Transferability Study of Interpolation-Based Hardware Model Checking for Software Verification

2024 **ACM SIGSOFT Best Artifact Award** at the 32nd ACM International Conference on the Foundations of Software Engineering
A Transferability Study of Interpolation-Based Hardware Model Checking for Software Verification

2024 **Best Paper Award** at the 30th International Symposium on Model Checking Software
Augmenting Interpolation-Based Model Checking with Auxiliary Invariants

2024 **Distinguished Artifact Award** at the 30th International Conference on Tools and Algorithms for the Construction and Analysis of Systems
Btor2-Cert: A Certifying Hardware-Verification Framework Using Software Analyzers

2022 **Best Master Lecture**
Methods in Software Engineering, instructor: Prof. Gidon Ernst

2021 **Lam Research Thesis Award**
Stochastic Boolean Satisfiability: Decision Procedures, Generalization, and Applications

2021 **Honorary Member of the Phi Tau Phi Scholastic Honor Society**
Achievement of academic excellence upon graduation

Important Publications

Statistics: h-index 11; 5 journal papers and 24 peer-reviewed conference papers in prestigious venues, including the **Proceedings of the ACM on Software Engineering** and **IEEE Transactions on Computers**.

The complete list of my peer-reviewed publications can be found via

- My personal website: https://nianzelee.github.io/files/Nian-Ze.Lee.Publications.pdf
- DBLP: https://dblp.org/pid/154/3010.html
- Google Scholar: https://scholar.google.com/citations?user=_8OD03gAAAAJ
- ORCID: https://orcid.org/0000-0002-8096-5595

Below are my five recent and most important publications.

1. Dirk Beyer, Nian-Ze Lee, and Philipp Wendler. Interpolation and SAT-Based Model Checking Revisited: Adoption to Software Verification. *Journal of Automated Reasoning*, 69(1):5, 2025. doi: 10.1007/s10817-024-09702-9.
2. Dirk Beyer, Po-Chun Chien, Marek Jankola, and Nian-Ze Lee. A transferability study of interpolation-based hardware model checking for software verification. *Proceedings of the ACM on Software Engineering*, 1(FSE):90:1–90:23, 2024. doi: 10.1145/3660797.
3. Zsófia Ádám, Dirk Beyer, Po-Chun Chien, Nian-Ze Lee, and Nils Sirrenberg. Btor2-Cert: A certifying hardware-verification framework using software analyzers. In *Proceedings of the International Conference on Tools and Algorithms for the Construction and Analysis of Systems*, LNCS 14572, pages 129–149. Springer, 2024. doi: 10.1007/978-3-031-57256-2_7.
4. Dirk Beyer, Po-Chun Chien, and Nian-Ze Lee. Augmenting interpolation-based model checking with auxiliary invariants. In *Proceedings of the International Symposium on Model Checking Software*, LNCS 14624, pages 227–247. Springer, 2024. doi: 10.1007/978-3-031-66149-5_13.
5. Nian-Ze Lee and Jie-Hong R. Jiang. Dependency stochastic Boolean satisfiability: A logical formalism for NEXPTIME decision problems with uncertainty. In *Proceedings of the AAAI Conference on Artificial Intelligence*, pages 3877–3885. AAAI Press, 2021. doi: 10.1609/aaai.v35i5.16506.

Talks

Invited Speech

"*Publish or Perish? A Rookie Scholar's Guide to Graduate School*", Institute Seminar, Graduate Institute of Electronics Engineering, National Taiwan University, May 2025

"*Why Do I Choose an Academic Career?*", Bachelor's Seminar, Department of Electrical Engineering, National Taiwan University, May 2025

"*Formal Methods and Analysis for Computing and Engineering*", EDA Group Seminar, Graduate Institute of Electronics Engineering, National Taiwan University, February 2025

"*Exploring the Interplay of Hardware and Software Verification for Emerging Computing Paradigms*", Keynote Speech at Software-Engineering Alumni Seminar, LMU Munich, September 2024

"*Bridging Hardware and Software Formal Verification for Reliable Computing Systems*", Interview of Tenure-Track Assistant Professorship for "Reliable Software and Distributed Systems", School of Electrical, Information, and Media Engineering, University of Wuppertal, January 2024

"*Bridging Hardware and Software Analysis*", EDA Group Seminar, Graduate Institute of Electronics Engineering, National Taiwan University, November 2023

Workshop Presentation

"*Verifying Firmware Modules for Confidential Computing with CPAchecker*", 9th International Workshop on CPAchecker, September 2024

"*Bridging Hardware and Software Formal Verification for Reliable Computing Systems*", 5th Workshop on Cooperative Software Verification, April 2024

"*Bridging Hardware and Software Verification Witnesses*", 1st Workshop on Verification Witnesses and Their Validation, July 2023

"*Enriching Software Verification with Analyses and Applications from Hardware*", 7th International Workshop on CPAchecker, October 2022

Software

ABC: Sequential logic synthesis and formal verification
Contributor

BENCHEXEC: Reliable benchmarking and resource measurement
Contributor

BTOR2C: Translation from word-level circuits to C programs
Principal designer, implementer, and maintainer

BTOR2-CERT: Certifying hardware verification using software analysis
Principal designer and maintainer

BTOR2-SELECT: Algorithm selection for hardware model checking
Contributor

CPACHECKER: Configurable software verification
Contributor, conceptual extensions, and implementation of interpolation-based analyses

CPV: Circuit-based program verification
Principal designer and maintainer

HARNESSFORGE: Creation of Verification Tasks from Source-Code Repositories
Principal designer and maintainer

MOXICHECKER: Extensible model checking for the MoXI verification language
Principal designer and maintainer

RESSATand ERSSAT: Stochastic satisfiability solvers
Principal designer, implementer, and maintainer

TLCOLLAPSEVERIFY: Optimization and verification of threshold logic circuits
Principal designer, implementer, and maintainer

Thesis Committees

Ph.D. Dissertation

2025	Jan Onderka Faculty of Information Technology, Czech Technical University in Prague Dissertation title: *Abstraction-Based Machine-Code Program Verification*
2025	I-Ching Tseng, Ph.D. proposal Department of Computer Science and Information Engineering, National Taiwan University Dissertation title: *Enhancing Robustness of Cyber-Physical Systems through Contract-Based Design*

Master's Thesis

2025	Long-Hin Fung Department of Computer Science and Information Engineering, National Taiwan University Thesis title: *Solving and Counting Skolem Functions for 2-DQBF via Symbolic Reachability Analysis*
2025	Zih-Ming Li Department of Computer Science and Information Engineering, National Taiwan University Thesis title: *A Hybrid-Automata-Based Verification Framework for Compatibility of Autonomous Multi-Vehicle Systems*

Student Mentoring

2021-	Po-Chun Chien, **DFG Research Training Group ConVeY** and **Grant Bridge** Ph.D. student, LMU Munich Topic: Bridging hardware and software verification
2024-2025	Zhengyang Lu, **Google Summer of Code** Ph.D. student, University of Waterloo Topic: Algorithm selection for hardware model checking
2023-2024	Marek Jankola, **DFG Research Training Group ConVeY** Ph.D. student, LMU Munich Topic: Transferring interpolation-based hardware verification to software

2023-2024	Ádám Zófia, **Erasmus Program** Ph.D. student, Budapest University of Technology and Economics Topic: Witness validation for programs translated from hardware models
2023	Bastiaan Laarakker, **Google Summer of Code** Master student, University of Amsterdam Topic: Backward bounded model checking in CPACHECKER

Teaching Activities

Statistics: I have instructed or assisted 7 graduate courses, 3 graduate seminars, 2 undergraduate courses, and 1 undergraduate seminar, and supervised 3 Bachelor's theses/projects at LMU Munich and NTU since 2016. My teaching skills are well received by students at LMU Munich and have contributed to the success of the graduate course *Methods in Software Engineering*, which was awarded the **Best Master Lecture** in Summer 2022 at the Institute of Informatics. Below are my recent courses. The complete list of my teaching experiences can be found on my personal website.

Graduate Course

Formal Methods, Spring 2025

Software Verification, Summer 2024, with Marek Jankola, instructor: Prof. Dirk Beyer

Software Verification, Summer 2023, instructor: Prof. Dirk Beyer

Graduate Seminar

Algorithms for Model Checking, Summer 2024, with Po-Chun Chien

Reproducibility of Software Engineering Research, Winter 2022, with Dr. Stefan Winter

Undergraduate Course

Formal Languages and Complexity, Summer 2020, instructor: Prof. Dirk Beyer

Undergraduate Seminar

Tools for Software Verification, Winter 2021, with Dr. Stefan Winter and Sudeep Kanav

Bachelor's Thesis or Project

Salih Ates, *Improving Array Encoding in Hardware-to-Software Translation*, 2023

Siang-Yun Lee, *Threshold Logic Synthesis and Canonicalization*, 2018-2019

Yen-Shi Wang, *Random-Exist and Exist-Random Stochastic Satisfiability Solving*, 2017-2018

Professional Activities

Conference/Workshop Organization

Artifact-Evaluation Committee Chair, 31st International Symposium on Model Checking Software, 2025 (co-chair: Prof. Julie Cailler)

Organizer, 8th International Workshop on CPAchecker (co-organizer: Prof. Marie-Christine Jakobs)

Journal Referee

Integration, The VLSI Journal, Elsevier, 2025

IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, 2024

IEEE Transactions on Computers, 2023

International Journal on Software Tools for Technology Transfer, Springer, 2023

ACM Transactions on Design Automation of Electronic Systems, 2023

Formal Methods in System Design, Springer, 2022

IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, 2022

IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, 2021

IEEE Transactions on Very Large Scale Integration (VLSI) Systems, 2021

IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, 2020

IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, 2019

IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, 2018

Conference Referee

Int. Conference on Computer Aided Verification (CAV), 2025

ACM Int. Conference on the Foundations of Software Engineering (FSE), 2025

Int. Symposium on Automated Technology for Verification and Analysis (ATVA), Artifact Evaluation, 2024

Int. Conference on Computer Design (ICCD), 2023

Int. Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS), 2023

AAAI Conference on Artificial Intelligence (AAAI), 2022

Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE), 2022

Annual NASA Formal Methods Symposium (NFM), 2022

Design Automation Conference (DAC), 2022

Int. Conference on Automated Software Engineering (ASE), 2022

AAAI Conference on Artificial Intelligence (AAAI), 2021

Design Automation Conference (DAC), 2021

Int. Conference on Computer-Aided Design (ICCAD), 2021

Int. Conference on Software Engineering and Formal Methods (SEFM), 2020

Administrative Services

Admission Exams

Committee Member, oral exams for enrolling Ph.D. students at the EDA group, GIEE, NTU, 2025

Committee Member, oral exams for enrolling Master's students at the EDA group, GIEE, NTU, 2025

References

1. Dirk Beyer, Professor, LMU Munich, Munich, Germany, https://www.sosy-lab.org/people/beyer
2. Jie-Hong R. Jiang, Professor, NTU, Taipei, Taiwan, http://cc.ee.ntu.edu.tw/∼jhjiang
3. Victor N. Kravets, Full Researcher, IBM Thomas J. Watson Research Center, NY, U.S.A.

Additional references are available on request.