

# Nian-Ze Lee

## Curriculum Vitae

2024-05-15

### Coordinates

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Affiliation:	Ludwig-Maximilians-Universität München Software and Computational Systems Lab Oettingenstr. 67, Munich, Germany	ORCID:	<a href="https://orcid.org/0000-0002-8096-5595">0000-0002-8096-5595</a>
Email:	<a href="mailto:nian-ze.lee@sosy.ifi.lmu.de">nian-ze.lee@sosy.ifi.lmu.de</a>	DBLP:	<a href="https://dblp.org/pid/154/3010.html">dblp.org/pid/154/3010.html</a>
Phone:	+49-176-677-030-45	Google Scholar:	<a href="https://scholar.google.com/citations?user=8OD03gAAAAJ">8OD03gAAAAJ</a>
Citizenship:	Taiwan	Webpage:	<a href="https://nianzelee.github.io">nianzelee.github.io</a>
		Year of birth:	1991

### Research Interests

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My research focuses on the application of formal methods to the analysis and optimization of computational models, including software programs, VLSI circuits, and emerging technologies. Specifically, 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](#))
- Stochastic Boolean satisfiability and its application to probabilistic models ([RESSAT](#) and [ERSSAT](#))
- Optimization and verification of threshold logic circuits ([TLCOLLAPSEVERIFY](#))

The theoretical foundation of my work is algorithms and data structures, formal methods, mathematical logic, and system modeling. My goal is to invent new approaches for real-world applications with heterogeneous components. I also emphasize software engineering for tool implementation and reproducible evaluation.

### Education

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2015 – 2021	<b>Ph.D., Graduate Institute of Electronics Engineering</b> National Taiwan University, Taipei, Taiwan Advisor: Prof. Jie-Hong R. Jiang <b>Lam Research Thesis Award</b> Dissertation: <i>Stochastic Boolean Satisfiability: Decision Procedures, Generalization, and Applications</i>
2009 – 2014	<b>B.Sc. in Eng., Department of Electrical Engineering</b> Minor in Economics National Taiwan University, Taipei, Taiwan

### Academic Employment

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since 2021	<b>Postdoctoral Researcher</b> , Host: Prof. Dirk Beyer Ludwig-Maximilians-Universität München, Munich, Germany
2019 – 2020	<b>DAAD Scholarship Student</b> , Host: Prof. Dirk Beyer Ludwig-Maximilians-Universität München, Munich, Germany
2018 – 2019	<b>Internship Student at ERATO MMSD Project</b> , Host: Prof. Ichiro Hasuo National Institute of Informatics, Tokyo, Japan
2015 – 2021	<b>Research and Teaching Assistant</b> , Advisor: Prof. Jie-Hong R. Jiang National Taiwan University, Taipei, Taiwan

### Industrial Employment

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2016	<b>Research Intern</b> , Mentor: Dr. Victor N. Kravets IBM Thomas J. Watson Research Center, Yorktown Heights, NY, U.S.A.
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## Grants

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2024-	<b>Intel University Research &amp; Collaboration</b> Research funding, requested \$ 240 K Topic: <i>Configurable Program Analysis for Automated Firmware Verification</i>
2024-2027	<b>German Research Foundation (DFG)</b> Research funding, € 363.6 K Topic: <i>Bridging Hardware and Software Analysis</i> (1 Ph.D. position)
2023-2024	<b>LMUexcellent PostDoc Support Fund</b> Travel funding, € 10.6 K
2019-2020	<b>German Academic Exchange Service (DAAD)</b> Joint scholarship with National Science and Technology Council, Taiwan, € 15 K

## Awards and Recognitions

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2024	<b>Best Paper Award</b> at the 30th International Symposium on Model Checking Software <i>Augmenting Interpolation-Based Model Checking with Auxiliary Invariants</i>
2024	<b>Distinguished Artifact Award</b> at the 30th International Conference on Tools and Algorithms for the Construction and Analysis of Systems <i>Btor2-Cert: A Certifying Hardware-Verification Framework Using Software Analyzers</i>
2022	<b>Best Master Lecture</b> <i>Methods in Software Engineering</i> , instructor: Prof. Gidon Ernst
2021	<b>Lam Research Thesis Award</b> <i>Stochastic Boolean Satisfiability: Decision Procedures, Generalization, and Applications</i>
2021	<b>Honorary Member of the Phi Tau Phi Scholastic Honor Society</b> Achievement of academic excellence upon graduation

## Important Publications

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Statistics: h-index 9; 5 journal papers and 20 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>
- ORCID: <https://orcid.org/0000-0002-8096-5595>
- DBLP: <https://dblp.org/pid/154/3010.html>
- Google Scholar: <https://scholar.google.com/citations?user=.8OD03gAAAAJ>

Below are my five most important publications.

1. Dirk Beyer, Po-Chun Chien, Marek Jankola, and Nian-Ze Lee. A Transferability Study of Interpolation-Based Hardware Model Checking to Software Verification. *Proceedings of the ACM on Software Engineering*, Issue FSE, 2024. Accepted.
2. Dirk Beyer, Nian-Ze Lee, and Philipp Wendler. Interpolation and SAT-Based Model Checking Revisited: Adoption to Software Verification. *Journal of Automated Reasoning*, 2024. Accepted, preprint available via <https://doi.org/10.48550/arXiv.2208.05046>.
3. Dirk Beyer, Po-Chun Chien, and Nian-Ze Lee. Bridging hardware and software analysis with BTOR2C: A word-level-circuit-to-C translator. In *Proceedings of the International Conference on Tools and Algorithms for the Construction and Analysis of Systems*, LNCS 13994, pages 152–172. Springer, 2023. doi: [10.1007/978-3-031-30820-8\\_12](https://doi.org/10.1007/978-3-031-30820-8_12).
4. 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](https://doi.org/10.1609/aaai.v35i5.16506).
5. Nian-Ze Lee and Jie-Hong R. Jiang. Towards formal evaluation and verification of probabilistic design. *IEEE Transactions on Computers*, 67(8):1202–1216, 2018. doi: [10.1109/TC.2018.2807431](https://doi.org/10.1109/TC.2018.2807431).

## Talks

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### Invited Speech

“*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

“*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

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[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

[CPACHECKER](#): Configurable software verification  
Contributor, conceptual extensions, and implementation of interpolation-based analyses

[CPV](#): Circuit-based program verification  
Principal designer and maintainer

[RESSAT](#) and [ERSSAT](#): Stochastic satisfiability solvers  
Principal designer, implementer, and maintainer

[TLCOLLAPSEVERIFY](#): Optimization and verification of threshold logic circuits  
Principal designer, implementer, and maintainer

## Student Mentoring

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2021-	Po-Chun Chien, <b>DFG RTG ConVeY</b> Ph.D. student, LMU Munich Topic: Bridging hardware and software verification
2023-	Marek Jankola, <b>DFG RTG ConVeY</b> Ph.D. student, LMU Munich Topic: Replicating interpolation-based hardware verification for software
2023	Ádám Zófia, <b>Erasmus Program</b> Ph.D. student, Budapest University of Technology and Economics Topic: Witness validation for programs translated from hardware models
2023	Bastiaan Laarakker, <b>Google Summer of Code</b> Master student, University of Amsterdam Topic: Backward bounded model checking in CPAchecker

## University Activities

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Statistics: I have been a teaching assistant for 6 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.

## Graduate Course

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

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

*Methods in Software Engineering*, Summer 2022, instructor: Prof. Gidon Ernst  
(**Best Master Lecture** at Institute of Informatics)

*Software Verification*, Winter 2021, instructor: Prof. Dirk Beyer

*Logic Synthesis and Verification*, Fall 2020, instructor: Prof. Jie-Hong R. Jiang

*Logic Synthesis and Verification*, Fall 2018, instructor: Prof. Jie-Hong R. Jiang

## Graduate Seminar

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

*Algorithms for Model Checking*, Winter 2023, 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

*Introduction to Electronic Design Automation*, Spring 2016, instructor: Prof. Jie-Hong R. Jiang

## 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

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### Conference/Workshop Organizer

The 8th International Workshop on CPAchecker, 2023 (co-chair: Prof. Marie-Christine Jakobs)

### Journal Referee

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. Symposium on Automated Technology for Verification and Analysis (ATVA), 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

## References

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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.