

## Work Experience

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- 12/2024 **Research Associate, RPTU-Kaiserslautern, Automated Reasoning Group**  
 present
- applying verification techniques to improve reliability of neural networks such as *Transformers* and *RNNs* [12].
  - combining symbolic methods with *language models* (LLMs, SLMs) to synthesise loop invariants for automated software verification [13].
  - applying Agentic AI to software engineering and verification tasks.
- Funded through ERC project [LASD](#).
- 1/2024 **Research Associate, University of Innsbruck, TCS and CL**  
 10/2024
- Worked on compositional well-founded relations for automated termination analysis.
  - Program synthesis methods using tree-structured neural networks.
  - Computability of fragments of second-order unification [10].
- Funded through the projects [AUTOSARD](#) and [FormalWeb3](#) focusing on
- 9/2022 **Research Associate, University of Edinburgh, ICSA and LFCS**  
 12/2023
- *Applied Monte Carlo Tree Search* (MCTS), *reinforcement learning* [2], and *large language models* (LLMs) [1] to problems in Syntax-Guided Synthesis (SyGuS).
  - Infinite model synthesis in satisfiability modulo theories (SMT) [3].
- 9/2019 **DPhil (PhD) Student, University of Oxford, Department of Computer Science**  
 5/2024
- Thesis titled “Machine Learning for Function Synthesis” describing:
- application of MCTS and reinforcement learning to SyGuS [2],
  - using SyGuS for ranking function synthesis, and
  - a framework called *Neural Termination Analysis* [4] that uses neural networks for ranking function synthesis.
- My DPhil (PhD) studies were funded by the Oxford-Deepmind Graduate Scholarship as well as the EPSRC Doctoral Training Partnership Scholarship.
- 1/2019 **Research Assistant, University of Innsbruck, Computational Logic**  
 7/2019
- As part of the ERC project [SMART](#), I worked on machine learning embeddings for first-order Logic formulas [5, 11].
- 7/2017 **Research Assistant, University of Innsbruck, Computational Logic**  
 9/2018
- I worked on three projects ([SMART](#), [Interactive Proof](#), [Certification Redux](#)) led by [Cezary Kaliszyk](#) and [Christian Sternagel](#). The research involved formalising
- game and utility theory as well as economic models and algorithms [6, 8], and
  - an algorithm for solving Homogeneous Linear Diophantine Equations [7]
- in the proof assistant [Isabelle/HOL](#). Apart from formal mathematics, I also worked on machine learning embeddings first-order logic [5].
- 7/2016 **Research Assistant, University of Innsbruck, Department of Strategic Management,**  
 9/2016 **Marketing and Tourism**
- I worked on the [FairCare](#) project as a software engineer for the Java back-end.
- 10/2015 **Student Assistant, University of Innsbruck, Databases and Information Systems.**  
 2/2016
- Worked on a Python tool for scraping, and evaluating the quality of Wikipedia articles.

# Education

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- 10/2019 **DPhil (Doctor of Philosophy) in Computer Science**, University of Oxford, UK  
5/2024 Advisors: [Daniel Kröning](#) and [Tom Melham](#)  
Thesis Title: *Machine Learning for Function Synthesis*
- 9/2017 **M.Sc. degree Computer Science**, University of Innsbruck, Austria,  
9/2019 Including Erasmus exchange at [University of Helsinki](#) in 2018
- 9/2016 **B.Sc. Management and Economics**  
2/2019 [University of Innsbruck](#), Austria, (*not completed*)
- 9/2014 **B.Sc. Computer Science**  
7/2017 [University of Innsbruck](#), Austria

## Skills

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- **Spoken Languages:**  
German: native, English: proficient, French: basic
- **Operating Systems and Environments:**  
*Linux* (workstation & server), *AWS* (Amazon Linux), *Docker*  
Extensive experience setting up and managing Linux environments for research and development, conducting experiments, and ensuring reproducibility.
- **Programming Languages:**  
Extensive experience with: *Python*, *C++*, *JAVA*  
Limited experience with: *OCaml*, *Haskell*, *Rust*
- **Libraries, Frameworks, and Other Systems:**  
**Artificial Intelligence:** *PyTorch/Torch*, *Tensorflow*, *Ollama*, *XGBoost*, *scikit-learn*, ...  
**Formal Methods:** *SMT/SyGuS (Z3, CVC5)*, *Isabelle/HOL*, *SymbolicAutomata*, *CBMC*, *ESBMC*, ...  
I used these open source libraries and systems in my research and also contributed bug fixes and functionality.

## Other Experience:

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- The PGT-System described in [9] won the “Best System” award at CISM 2018.
- Awarded Oxford-Deepmind Graduate scholarship as well as the EPSRC Doctoral Training Partnership scholarship to fund my PhD research.
- **Teaching:**  
*Automated Reasoning*, graduate degree lecture at RPTU Kaiserslautern  
*Logic and Verification Seminar*, graduate degree seminar at RPTU Kaiserslautern  
*Logic and Semantics of Programming Languages*, undergraduate degree lecture at RPTU
- **Summer Schools Participated:**  
[Verified Trustworthy Software Systems \(VeTSS\) Summer School 2023](#),  
[International School on Rewriting 2017 \(ISR\)](#)
- **Workshops Participated:**  
[Proof Systems for Mathematics and Verification \(2024\)](#),  
[Alpine Verification Meeting: \(AVM'23\) and \(AVM'24\)](#)  
[Workshop on Synthesis \(SYNT\) 2023](#),  
[Conference on Artificial Intelligence and Theorem Proving \(AITP\) 2019 and 2022](#),  
[Workshops on Practical Aspects of Machine Learning in Theorem Proving and Dataset Generation for Data-Deficient Domains \(PAMLTP/DG3D<sup>4</sup>\)](#),  
[Viennese inter-reasoning workshop 2017 \(VINO\)](#),

# Academic Service

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- **Program Committee Member:**

- 2027: [AAAI Conference on Artificial Intelligence \(AAAI\)](#)

2026:

- [International Conference on Computer-Aided Verification \(CAV\)](#)
- [Formal Methods in Computer-Aided Design 2026 \(FMCAD\)](#)

2025: [European Conference on Artificial Intelligence \(ECAI\)](#)

2023: [Deep Learning-aided Verification \(DAV\)](#)

- **Sub-Reviewer:**

Computer Aided Verification (CAV), International Conference on Machine Learning (ICML), International Conference on Interactive Theorem Proving (ITP), International Symposium on Frontiers of Combining Systems (FRODOS), Formal Methods in Computer-Aided Design (FMCAD), Certified Programs and Proofs (CPP)

- **Journal Reviewer:**

Journal of Automated Reasoning (JAR)

# Publications

## Reviewed and Published Conference Papers

- [1] Yixuan Li, Julian Parsert, Elizabeth Polgreen. Guiding Enumerative Program Synthesis with Large Language Models. accepted at: 36th International Conference on Computer Aided Verification (CAV). [preprint](#). 2024.
- [2] Julian Parsert and Elizabeth Polgreen. Reinforcement Learning and Data-Generation for Syntax-Guided Synthesis. Thirty-Eighth AAAI Conference on Artificial Intelligence (AAAI). 2024. [doi:10.1609/AAAI.V38I9.28938](#).
- [3] Julian Parsert, Chad Brown, Mikolas Janota, and Cezary Kaliszyk. Experiments on Infinite Model Finding in SMT Solving. Proceedings of 24th International Conference on Logic for Programming, Artificial Intelligence and Reasoning (LPAR 2023). 2023. [doi:10.29007/slrm](#)
- [4] Mirco Giacobbe, Daniel Kröning and Julian Parsert. Neural Termination Analysis. Proceedings of the 30th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE). 2022. [doi:10.1145/3540250.3549120](#)
- [5] Julian Parsert, Stephanie Autherith, and Cezary Kaliszyk. Property Preserving Embedding of First-order Logic. 6th Global Conference on Artificial Intelligence (GCAI). 2020. [doi:978-3-319-94821-8\\_29](#).
- [6] Julian Parsert and Cezary Kaliszyk. Towards Formal Foundations for Game Theory. 9th International Conference on Interactive Theorem Proving (ITP), pp. 495–503. 2018. [doi:978-3-319-94821-8\\_29](#).
- [7] Florian Meßner, Julian Parsert, Schöpf Jonas, and Christian Sternagel. A Formally Verified Solver for Homogeneous Linear Diophantine Equations. 9th International Conference on Interactive Theorem Proving (ITP), pp. 441–458. 2018. [doi:10.1007/978-3-319-94821-8\\_26](#).
- [8] Julian Parsert and Cezary Kaliszyk. Formal Microeconomic Foundations and the First Welfare Theorem. 7th ACM Conference on Certified Programs and Proofs (CPP), ACM, pp. 91-101, 2018. [doi:10.1145/3167100](#).
- [9] Yutaka Nagashima and Julian Parsert. System Description: Goal-Oriented Conjecturing for Isabelle/HOL. Intelligent Computer Mathematics - 11th International Conference (CICM), volume 11006 of LNCS, pp. 225-231, 2018 [doi:10.1007/978-3-319-96812-4\\_19](#).

## Reviewed and Published Journal Articles

- [10] David M. Cerna and Julian Parsert. One is all you need: Second-order Unification without First-order Variables. Logical Methods in Computer Science, Volume 22, Issue 2, April 2026 [doi:10.46298/LMCS-22\(2:3\)2026](#).
- [11] Stanisław Purgał, Julian Parsert, Cezary Kaliszyk. A study of continuous vector representations for theorem proving. Journal of Logic and Computation, Volume 31, Issue 8, December 2021, Pages 2057–2083 [doi:10.1093/logcom/exab006](#).

## Pre-prints or Articles Under Submission

- [12] Chih-Duo Hong, Hongjian Jiang, Anthony W. Lin, Oliver Markgraf, Julian Parsert, Tony Tan. Extracting Robust Register Automata from Neural Networks over Data Sequences. [doi:10.48550/ARXIV.2511.19100](#)

- [13] Muhammad A. A. Pirzada, Julian Parsert, Weiqi Wang, Konstantin Korovin, Lucas C. Cordeiro  
Neuro-Symbolic Software Verification: Hyper-charging Local Language Models with Symbolic Reasoning at Scale. [doi:https://doi.org/10.48550/arXiv.2606.16886](https://doi.org/10.48550/arXiv.2606.16886)
- [14] Julian Parsert. Linear Programming in Isabelle/HOL. [preprint](#). 2024.

## Refereed Workshop Papers and Presentations

- [15] Julian Parsert, Stephanie Autherith and Cezary Kaliszyk. Teaching the Structure of First-order Formulas to Neural Networks. 4th Conference on Artificial Intelligence and Theorem Proving, (2019).
- [16] Julian Parsert and Elizabeth Polgreen. Reinforcement Learning for Syntax-Guided Synthesis. 12th Workshop on Synthesis, (2023).
- [17] David M. Cerna and Julian Parsert. One is all you need: Second-order Unification without First-order Variables. The 38th International Workshop on Unification, (2024).

## Formalization Journals

- [18] Julian Parsert and Cezary Kaliszyk. [Microeconomics and the First Welfare Theorem](#). *Archive of Formal Proofs*, 2017.
- [19] Florian Meßner, Julian Parsert, Jonas Schöpf, and Christian Sternagel. [Homogeneous Linear Diophantine Equations](#). *Archive of Formal Proofs*, 2017.
- [20] Julian Parsert and Cezary Kaliszyk. [Von-Neumann-Morgenstern Utility Theorem](#). *Archive of Formal Proofs*, 2018.
- [21] Julian Parsert and Cezary Kaliszyk. [Linear Programming](#). *Archive of Formal Proofs*, 2019.

## Theses

- [22] Machine Learning for Function Synthesis. Thesis for the degree of Doctor of Philosophy at the University of Oxford, (2024)
- [23] Formal Foundations for Game Theory. Master's thesis at the University of Innsbruck, (2019)
- [24] Formalization of the First Fundamental Theorem of Welfare Economics. Bachelor's thesis at the University of Innsbruck, (2017)