Curriculum Vitae

Julian Parsert

Citizenship: Austrian
Current Residence: Tyrol, Austria

Date of Birth: 15th January 1995
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Education:

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

Work Experience:

1/2024 – present	**Research Associate, University of Innsbruck, Chair for Theoretical Computer Science** Research in compositional well-founded relations for termination analysis. During this time I also collaborated with David Cerna on research in second-order unification [1].
9/2022 – 12/2023	**Research Associate, University of Edinburgh,** **Institute for Computing Systems Architecture (ICSA), and** **Laboratory for Foundations of Computer Science (LFCS)** Research in applying *Monte-Carlo tree search* (MCTS) and *reinforcement learning* [3] as well as *large language models (LLMs)* [2] to Syntax-Guided Synthesis (SyGuS). I also collaborated on work applying SyGuS to infinite model finding in satisfiability modulo theories (SMT) [4].
9/2019 – 2024	**DPhil (PhD) Student, University of Oxford, Department of Computer Science** Thesis titled "Machine Learning for Function Synthesis" describing: • application of MCTS and reinforcement learning to SyGuS [3], • using SyGuS for ranking function synthesis, and • a framework called *Neural Termination Analysis* [5] that uses neural networks for ranking function synthesis.

1/2019 – 7/2019	**Research Assistant, University of Innsbruck, Computational Logic** Following my stay abroad, during which I could not be employed: As part of the ERC project SMART I worked on embedding methods for First-order Logic [6, 11].
7/2017 – 9/2018	**Research Assistant, University of Innsbruck, Computational Logic** During this employment I was part of two research projects: • ERC project SMART: My work focused on formalisation of Game and Utility Theory as well as related mathematical concepts [7, 9]. I also worked on deep embeddings first order logic [6]. • FWF project Interactive Proof: My work revolved around the formalisation of economic theories in Isabelle/HOL [7, 9]. . Both projects were led by Cezary Kaliszyk.
7/2017 – 10/2017	**Research Assistant, University of Innsbruck, Computational Logic** I worked on the FWF project Certification Redux led by Christian Sternagel formalising Homogeneous Linear Diophantine Equations in Isabelle/HOL. This includes a formally verified algorithm for solving HLDEs which can be extracted from Isabelle using its code generation mechanism [8].
7/2016 – 9/2016	**Research Assistant, University of Innsbruck, Department of Strategic Management, Marketing and Tourism** I was employed on the FairCare project, and mostly worked on the Java back-end.
10/2015 – 2/2016	**Student Assistant, University of Innsbruck, Databases and Information Systems** My work involved the development of a python tool for scraping, and evaluating the quality of Wikipedia articles.

Miscellaneous:

- My DPhil (PhD) studies were funded by the Oxford-Deepmind Graduate Scholarship as well as the EPSRC Doctoral Training Partnership Scholarship.
- The PGT-System described in [10] won the "Best System" award at CICM 2018.
- **Program Committee:**
  2023: Deep Learning-aided Verification (DAV)
- **Attended Workshops and Summer Schools:**
  Verified Trustworthy Software Systems (VeTSS) Summer School 2023, International School on Rewriting 2017 (ISR), Workshop on Synthesis (SYNT) 2023, Viennese inter-reasoning workshop 2017 (VINO), Conference on Artificial Intelligence and Theorem Proving (AITP), Workshops on Practical Aspects of Machine Learning in Theorem Proving and Dataset Generation for Data-Deficient Domains (PAMLTP/DG3D[4])
- **I reviewed submissions to the following journals and conferences:**
  Computer Aided Verification (CAV), Journal of Automated Reasoning (JAR), International Conference on Machine Learning (ICML), Interactive Theorem Proving (ITP), International Symposium on Frontiers of Combining Systems (FROCOS), Formal Methods in Computer-Aided Design (FMCAD)

Publications

Reviewed and Accepted Conference Papers

[1] David M. Cerna and Julian Parsert. One is all you need: Second-order Unification without First-order Variables. under submission. preprint. 2024.

[2] 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.

[3] 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.

[4] 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

[5] Mirco Giacobbe and Daniel Kroening 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

[6] 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.

[7] 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.

[8] 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.

[9] 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.

[10] 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.

Journal Articles

[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.

Formalization Journals

[12] Julian Parsert and Cezary Kaliszyk. Microeconomics and the First Welfare Theorem. ***Archive of Formal Proofs***, 2017.

[13] Florian Meßner, Julian Parsert, Jonas Schöpf, and Christian Sternagel. Homogeneous Linear Diophantine Equations. ***Archive of Formal Proofs***, 2017.

[14] Julian Parsert and Cezary Kaliszyk. Von-Neumann-Morgenstern Utility Theorem. ***Archive of Formal Proofs***, 2018.

[15] Julian Parsert and Cezary Kaliszyk. Linear Programming. ***Archive of Formal Proofs***, 2019.

Theses

[16] Machine Learning for Function Synthesis. Thesis for the degree of Doctor of Philosophy at the University of Oxford, (2024)

[17] Formal Foundations for Game Theory. Master's thesis at the University of Innsbruck, (2019)

[18] Formalization of the First Fundamental Theorem of Welfare Economics. Bachelor's thesis at the University of Innsbruck, (2017)