

Jan Hoffmann

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Research Interests

My research areas are programming languages and verification. My mission is to discover beautiful mathematical ideas that have a real-world impact, shape the way programmers think, and help to create software that is more reliable, efficient, and secure. Currently, I am working on static and statistical resource analysis, type systems, and probabilistic programming.

Education

- 2008–2011 Ph.D. in Computer Science**
Ludwig-Maximilians-Universität, Munich
Advisor: Prof. Martin Hofmann.
Topic: Types with Potential: Polynomial Resource Bounds via Automatic Amortized Analysis.
- 2001–2007 Master with Honors in Computer Science (Diplom mit Auszeichnung)**
Ludwig-Maximilians-Universität, Munich

Employment

- since 2023 Associate Professor with Indefinite Tenure**
Carnegie Mellon University, Pittsburgh
In the Computer Science Department of the School of Computer Science
- 2020–2023 Tenure-Track Associate Professor**
Carnegie Mellon University, Pittsburgh
In the Computer Science Department of the School of Computer Science
- 2015–2020 Tenure-Track Assistant Professor**
Carnegie Mellon University, Pittsburgh
In the Computer Science Department of the School of Computer Science
- 2012–2015 Associate Research Scientist**
Yale University, New Haven
Topic: Quantitative Verification
- 2011–2012 Postdoctoral Associate**
Yale University, New Haven
In the group of Prof. Zhong Shao. Topic: Verification of Lock-Free Data Structures

Awards and Honors

- 2021** Amazon Research Award
- 2019** NSF CAREER Award
- 2016** Google Research Award

- 2008–2011** Ph.D. Scholarship
DFG Research Training Group (Graduiertenkolleg) PUMA
- 2005–2007** Student Scholarship
German National Academic Foundation (Studienstiftung des deutschen Volkes)

Publications

Refereed Journal Papers

- [1] S. Muller and J. Hoffmann.
Modeling and Analyzing Evaluation Cost of CUDA Kernels.
ACM Transactions on Parallel Computing, 2024. Originally included in 48th Symposium on Principles of Programming Languages (POPL'21).
- [2] J. Hoffmann and S. Jost.
Two Decades of Automatic Amortized Resource Analysis.
Math. Struct. Comput. Sci., 2022.
- [3] J. Hoffmann and Z. Shao.
Type-Based Amortized Resource Analysis with Integers and Arrays.
J. Funct. Program., 2015. Originally included in 12th International Symposium on Functional and Logic Programming (FLOPS'14).
- [4] D. Baumeister, F. Brandt, F. A. Fischer, J. Hoffmann, and J. Rothe.
The Complexity of Computing Minimal Unidirectional Covering Sets.
Theory of Computing Systems, 2013. Originally included in Algorithms and Complexity, 7th International Conference (CIAC'10).
- [5] J. Hoffmann, K. Aehlig, and M. Hofmann.
Multivariate Amortized Resource Analysis.
ACM Trans. Program. Lang. Syst., 2012. Originally included in 38th Symposium on Principles of Programming Languages (POPL'11).
- [6] F. Brandt, M. Brill, F. A. Fischer, and J. Hoffmann.
The Computational Complexity of Weak Saddles.
Theory of Computing Systems, 2010. Originally included in Algorithmic Game Theory, Second International Symposium (SAGT'09).
- [7] F. Brandt, M. Brill, F. Fischer, P. Harrenstein, and J. Hoffmann.
Computing Shapley's Saddles.
ACM SIGecom Exchanges, 8, 2009.
- [8] J. Hoffmann.
Finding a Tree Structure in a Resolution Proof is NP-Complete.
Theoretical Computer Science, 410(21-23), 2009.
- [9] S. R. Buss, J. Hoffmann, and J. Johannsen.
Resolution Trees with Lemmas: Resolution Refinements that Characterize DLL Algorithms with Clause Learning.
Logical Methods in Computer Science, 4(4), 2008.
- [10] S. R. Buss and J. Hoffmann.
The NP-hardness of Finding a Directed Acyclic Graph for Regular Resolution.
Theoretical Computer Science, 396(1-3), 2008.

Refereed Conference/Workshop Papers

- [11] L. Pham, F. A. Saad, and J. Hoffmann.
Robust resource bounds with static analysis and bayesian inference.
In *45th Conference on Programming Language Design and Implementation (PLDI'24)*, 2024.

- [12] L. Pham, D. Wang, F. Saad, and J. Hoffmann.
Programmable MCMC with Soundly Composed Guide Programs.
In *Conference on Object-Oriented Programming Systems, Languages, and Applications (OOPSLA'24)*, 2024.
- [13] J. Grosen, D. Kahn, , and J. Hoffmann.
Automatic Amortized Resource Analysis with Regular Recursive Types.
In *38th ACM/IEEE Symposium on Logic in Computer Science (LICS' 23)*, 2023.
- [14] A. Das, D. Wang, and J. Hoffmann.
Probabilistic Resource-Aware Session Types.
In *50th Symposium on Principles of Programming Languages (POPL '23)*, 2023.
- [15] D. Kahn and J. Hoffmann.
Automatic Resource Analysis with the Quantum Physicist's Method.
In *26th International Conference on Functional Programming (ICFP'21)*, 2021.
- [16] D. Wang, J. Hoffmann, and T. Reps.
Sound Probabilistic Inference via Guide Types.
In *42th Conference on Programming Language Design and Implementation (PLDI'21)*, 2021.
- [17] D. Wang, J. Hoffmann, and T. Reps.
Central Moment Analysis for Cost Accumulators in Probabilistic Programs.
In *42th Conference on Programming Language Design and Implementation (PLDI'21)*, 2021.
- [18] V. Rajani, M. Gaboardi, D. Garg, and J. Hoffmann.
A Unifying Type-Theory for Higher-Order (Amortized) Cost Analysis.
In *48th Symposium on Principles of Programming Languages (POPL'21)*, 2021.
- [19] S. Muller and J. Hoffmann.
Modeling and Analyzing Evaluation Cost of CUDA Kernels.
In *48th Symposium on Principles of Programming Languages (POPL'21)*, 2021.
- [20] L. Pham and J. Hoffmann.
Typable Fragments of Polynomial Automatic Amortized Resource Analysis.
In *29th EACSL Annual Conference on Computer Science Logic (CSL'21)*, 2021.
- [21] A. Das, S. Balzer, J. Hoffmann, F. Pfenning, and I. Santurkar.
Resource-aware session types for digital contracts.
In *2021 IEEE Computer Security Foundations Symposium (CSF'21)*, 2021.
- [22] D. Wang, D. M. Kahn, and J. Hoffmann.
Raising Expectations: Automating Expected Cost Analysis with Types.
In *25th International Conference on Functional Programming (ICFP'20)*, 2020.
- [23] T. Knuth, D. Wang, A. Reynolds, N. Polikarpova, and J. Hoffmann.
Liquid Resource Types.
In *25th International Conference on Functional Programming (ICFP'20)*, 2020.
- [24] D. Kahn and J. Hoffmann.
Exponential Automatic Amortized Resource Analysis.
In *23rd International Conference on Foundations of Software Science and Computation Structures (FoS-SaCS'20)*, 2020.
- [25] D. Wang, J. Hoffmann, and T. Reps.
A denotational semantics for low-level probabilistic programs with nondeterminism.
In *Mathematical Foundations of Programming Semantics XXXV (MFPS'19)*, 2019.
- [26] T. Knuth, D. Wang, J. Hoffmann, and N. Polikarpova.
Resource-guided program synthesis.
In *40th Conference on Programming Language Design and Implementation (PLDI'19)*, 2019.
- [27] D. Wang and J. Hoffmann.
Type-guided worst-case input generation.
In *46th Symposium on Principles of Programming Languages (POPL'19)*, 2019.

- [28] Y. Niu and J. Hoffmann.
Automatic space bound analysis for functional programs with garbage collection.
In *22nd International Conference on Logic for Programming Artificial Intelligence and Reasoning (LPAR'18)*, 2018.
- [29] A. Das, J. Hoffmann, and F. Pfenning.
Parallel complexity analysis with temporal session types.
In *23rd International Conference on Functional Programming (ICFP'18)*, 2018.
- [30] A. Das, J. Hoffmann, and F. Pfenning.
Work analysis with resource-aware session types.
In *33th ACM/IEEE Symposium on Logic in Computer Science (LICS'18)*, 2018.
- [31] D. Wang, J. Hoffmann, and T. Reps.
PMAF: An Algebraic Framework for Static Analysis of Probabilistic Programs.
In *39th Conference on Programming Language Design and Implementation (PLDI'18)*, 2018.
- [32] V. C. Ngo, Q. Carbonneaux, and J. Hoffmann.
Bounded Expectations: Resource Analysis for Probabilistic Programs.
In *39th Conference on Programming Language Design and Implementation (PLDI'18)*, 2018.
- [33] B. Lichtman and J. Hoffmann.
Arrays and References in Resource Aware ML.
In *2nd International Conference on Formal Structures for Computation and Deduction (FSCD'17)*, 2017.
- [34] Q. Carbonneaux, J. Hoffmann, T. Reps, and Z. Shao.
Automated Resource Analysis with Coq Proof Objects.
In *29th International Conference on Computer-Aided Verification (CAV'17)*, 2017.
- [35] V. C. Ngo, M. Dehesa-Azuara, M. Fredrikson, and J. Hoffmann.
Verifying and Synthesizing Constant-Resource Implementations with Types.
In *38th IEEE Symposium on Security and Privacy (S&P '17)*, 2017.
- [36] A. Das and J. Hoffmann.
ML for ML: Learning Cost Semantics by Experiment.
In *23rd International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS'17)*, 2017.
- [37] E. Çiçek, G. Barthe, M. Gaboardi, D. Garg, and J. Hoffmann.
Relational Cost Analysis.
In *44th Symposium on Principles of Programming Languages (POPL'17)*, 2017.
- [38] J. Hoffmann, A. Das, and S.-C. Weng.
Towards Automatic Resource Bound Analysis for OCaml.
In *44th Symposium on Principles of Programming Languages (POPL'17)*, 2017.
- [39] Q. Carbonneaux, J. Hoffmann, and Z. Shao.
Compositional Certified Resource Bounds.
In *36th Conference on Programming Language Design and Implementation (PLDI'15)*, 2015. Artifact submitted and approved.
- [40] J. Hoffmann and Z. Shao.
Automatic Static Cost Analysis for Parallel Programs.
In *24th European Symposium on Programming (ESOP'15)*, 2015.
- [41] Q. Carbonneaux, J. Hoffmann, T. Ramananandro, and Z. Shao.
End-to-End Verification of Stack-Space Bounds for C Programs.
In *35th Conference on Programming Language Design and Implementation (PLDI'14)*, 2014. Artifact submitted and approved.
- [42] G. Scherer and J. Hoffmann.
Tracking Data-Flow with Open Closure Types.
In *19th International Conference on Logic for Programming, Artificial Intelligence and Reasoning (LPAR'13)*, 2013.

- [43] H. Liang, J. Hoffmann, X. Feng, and Z. Shao.
Characterizing Progress Properties of Concurrent Objects via Contextual Refinements.
In *24th International Conference on Concurrency Theory (CONCUR'13)*, 2013.
- [44] J. Hoffmann, M. Marmar, and Z. Shao.
Quantitative Reasoning for Proving Lock-Freedom.
In *28th ACM/IEEE Symposium on Logic in Computer Science (LICS'13)*, 2013.
- [45] J. Hoffmann, K. Aehlig, and M. Hofmann.
Resource Aware ML.
In *24rd International Conference on Computer Aided Verification (CAV'12)*, 2012.
- [46] N. R. Krishnaswami, N. Benton, and J. Hoffmann.
Higher-Order Functional Reactive Programming in Bounded Space.
In *39th Symposium on Principles of Programming Languages (POPL'12)*, 2012.
- [47] J. Hoffmann and M. Hofmann.
Amortized Resource Analysis with Polymorphic Recursion and Partial Big-Step Operational Semantics.
In *8th Asian Symposium on Programming Languages (APLAS'10)*, 2010.
- [48] J. Hoffmann and M. Hofmann.
Amortized Resource Analysis with Polynomial Potential.
In *19th European Symposium on Programming (ESOP'10)*, 2010.

Other Publications

- [49] D. Kahn, J. Hoffmann, and T. Reps.
Efficient Cost Bounds with Linear Maps, 2024. Working paper.
- [50] S. Bakshi, A. Das, A. Miller, and J. Hoffmann.
Nomos-UC: A Programming Framework for Cryptography Based on Resource-Aware Session Types, 2023. Working paper.
- [51] L. Pham and J. Hoffmann.
Worst-Case Input Generation for Concurrent Processes, 2023. Working paper.
- [52] A. Das, J. Hoffmann, and F. Pfenning.
Nomos: A Protocol-Enforcing, Asset-Tracking, and Gas-Aware Language for Smart Contracts, 2022. Technical Report.
- [53] C. Yuan and J. Hoffmann.
BLT: Exact Bayesian Inference with Distribution Transformers, 2019. Technical Report.
- [54] S. Muller and J. Hoffmann.
Combining Source and Target Level Cost Analyses for OCaml Programs, 2020. Working paper.
- [55] J. Hoffmann.
Types with Potential: Polynomial Resource Bounds via Automatic Amortized Analysis. PhD thesis, Ludwig-Maximilians-Universität München, 2011.
- [56] J. Hoffmann.
Resolution Proofs and DLL-Algorithms with Clause Learning. Diploma Thesis, LMU München, 2007.

Software Artifacts

- **Nomos**
A resource-aware programming language for digital contracts that is session types
<http://nomos-lang.org>
2018–present

- **Resource Aware ML**
 A system for automatic derivation of resource bounds for OCaml programs
<http://raml.co>
 2009–present
- **C4B/Absynth**
 A compositional certified resource-bound analyzer for C programs
 Approved by the *PLDI'14 Artifact Evaluation Committee*
<http://www.cs.yale.edu/homes/qcar/aaa/>
 2013–present
- **ReSyn**
 A resource-guided and type-driven synthesis tool for functional programs 2018–2021
- **CertikOS**
 A formally-verified hypervisor kernel
<http://flint.cs.yale.edu/certikos>
 2012–2015
- **Quantitative CompCert**
 A formally-verified C compiler that preserves quantitative properties.
 Approved by the *PLDI'13 Artifact Evaluation Committee*
 2013–2014

Professional Activities

Talks

- Sound Probabilistic Inference with Guide Programs**
Invited talk at the Workshop on Verification of Probabilistic Programs (VeriProP 2024) July 2024
- Combining Automatic Amortized Resource Analysis with Bayesian Learning**
Seminar talk at McGill University July 2024
- Automatic Gas Bound Analysis for Smart Contracts**
 CMU Secure Blockchain Summit May 2023
- Probabilistic Resource-Aware Session Types**
Seminar talk SCOT: A Seminar on Semantic and Formal Approaches to Complexity April 2023
- Automatic Amortized Resource Bound Analysis**
Seminar talk at AWS Lambda May 2021
Invited talk at University of Massachusetts Lowell May 2023
- Raising Expectations: Automating Expected Cost Analysis with Types**
Seminar talk at University of Innsbruck, Austria January 2021
Seminar talk at IRIF/PPS, Paris, France October 2020
Seminar talk at Research Training Group UnRAVeL, RWTH Aachen, Germany September 2020
- Nomos: Resource-Aware Session Types for Programming Digital Contracts**
Seminar talk at Inria; Paris, France December 2019
Invited talk at the ETH Workshop on Dependable and Secure Software Systems; Zürich, Switzerland October 2019
Invited talk at the Workshop on Theory and Practice of Blockchains; Aarhus, Denmark May 2019
- Resource-Aware Session Types**
Invited talk at the 4th Workshop on Behavioral Types (BEAT '19); Lisbon, Portugal January 2019
- Programming Languages for Smart Contracts**
 CyLab Partners Conference; Pittsburgh, PA October 2018
- Resource Analysis for Probabilistic Programs**
Invited talk at the meeting of the IFIP working group 1.9/2.15 “Verified Software”; Oxford, UK July 2018

Resource Analysis for Probabilistic Programs	<i>Invited talk</i> at the 9th International Workshop on Developments in Implicit Computational Complexity (DICE '18); Thessaloniki, Greece	April 2018
Resource Analysis for Probabilistic Programs	ESOP 2018 Program Committee Workshop; Paris, France	December 2017
Resource Bound Analysis and Static Analysis	<i>Invited talk</i> at the 9th Working Conference on Verified Software: Theories, Tools, and Experiments (VSTTE '17); Heidelberg, Germany	July 2017
Towards Automatic Resource Bound Analysis for OCaml	Symposium on Principles of Programming Languages (POPL'17); Paris, France	January 2017
Resource Aware ML	University at Buffalo; Buffalo, NY	December 2017
<i>Invited talk</i> at the 5th South of England Regional Programming Language Seminar; Oxford; UK		January 2017
Max Planck Institute for Software Systems; Saarbrücken; Germany		June 2016
Automatic Resource Bound Analysis and Linear Optimization	<i>Invited talk</i> at the workshop <i>Beyond Worst-Case Analysis</i> at the Simons Institute; Berkeley; CA	November 2016
Static Analysis for Finding Space/Time Vulnerabilities	CyLab Partners Conference; Pittsburgh; PA	September 2016
Certified Resource Bounds in the CompCert Compiler	<i>Invited talk</i> at Mathematical Foundations of Programming Semantics (MFPS'16); Pittsburgh; PA	Mai 2016
Resource Aware Programming	Principles of Programming (PoP) Group Retreat; Seven Springs; PA	October 2015
Compositional Certified Resource Bounds	Conf. on Programming Language Design and Implementation (PLDI'15); Portland; OR	June 2015
Automatic Static Cost Analysis for Parallel Programs	European Symposium on Programming (ESOP'15); London; UK	April 2015
Formal Reasoning about Quantitative Properties of Software	University of Colorado Boulder; Boulder, CO	March 2015
Carnegie Mellon University; Pittsburgh, PA		February 2015
University of Illinois at Urbana-Champaign; Urbana-Champaign, IL		February 2015
University of Waterloo; Waterloo ON, Canada		January 2015
Heriot-Watt University; Edinburgh, UK		January 2015
TU Munich (Department of Computer Science); Munich, Germany		November 2014
Boston University; Boston MA		October 2014
Northeastern University; Boston MA		October 2014
MIT; Boston MA		April 2014
Harvard University; Boston MA		April 2014
Formal Verification of Quantitative Software Properties	TU Munich (Institute for Advanced Study); Munich, Germany	November 2014
End-to-End Verification of Stack-Space Bounds for C Programs	Workshop on Higher Order Computation: Types, Complexity, Applications; Paris, France	June 2014
Type-Based Amortized Resource Analysis with Integers and Arrays	Int. Symp. on Functional and Logic Programming (FLOPS'14); Kanazawa, Japan	June 2014
Tracking Data-Flow with Open Closure Types	Int. Conf. on Logic for Prog., Art. Intel. and Reasoning (LPAR'13); Stellenbosch, South Africa	December 2013
Characterizing Progress Properties of Concurrent Objects via Contextual Refinements	DARPA HACMS-CARS site visit; New Haven, CT	September 2013
Quantitative Reasoning for Proving Lock-Freedom	ACM/IEEE Symposium on Logic in Computer Science (LICS'13); New Orleans, LA	June 2013

University of Pennsylvania; Philadelphia, PA	February 2013
DARPA CRASH PI meeting; San Diego, CA	November 2012
DARPA CRASH-CertiKOS site visit; New Haven, CT	October 2012
Resource Aware ML	
Int. Conf. on Computer Aided Verification (CAV'12); Berkeley, CA	July 2012
Polynomial Amortized Resource Analysis	
DFG PUMA site visit; Munich, Germany	June 2012
Dissertation defense at LMU; Munich, Germany	October 2011
Higher-Order Functional Reactive Programming in Bounded Space	
PUMA Workshop; Traunkirchen, Austria	October 2011
Multivariate Amortized Resource Analysis	
Universite Paris 7 - Denis Diderot; Paris, France	September 2011
UPENN; Philadelphia, PA	June 2011
Yale University; New Haven, CT	June 2011
IST Austria; Vienna, Austria	June 2011
Microsoft Research; Cambridge, UK	March 2011
Symposium on Principles of Programming Languages (POPL'11); Austin, TX	January 2011
PUMA Workshop; Szentendre, Hungary	October 2010
Amortized Resource Analysis with Polymorphic Recursion and Partial Big-Step Op. Sem.	
Asian Symposium on Programming Languages (APLAS'10); Shanghai, China	November 2010
Analysing Sorting Algorithms in Resource Aware ML	
University of Kassel; Kassel, Germany	November 2010
Automatic Amortized Resource Analysis	
National DFG GK Workshop; Dagstuhl, Germany	June 2010
Amortized Resource Analysis with Polynomial Potential	
European Symposium on Programming (ESOP'10); Cyprus	March 2010
PUMA Workshop; Venice, Italy	October 2009
A Purely-Functional SAT Solver	
PUMA Kickoff Meeting; Spitzingsee, Germany	October 2008
DLL-Algorithms and Resolution Proofs	
Fall School: Logic and Complexity; Prague, Czech Republic	September 2008

Committee Work

2024–2025	Co-Chair 15th Workshop on Programming Language Approaches to Concurrency and Communication-centric Software (PLACES 2024) With Farzaneh Derakhshan
2024–2025	Program Committee Member Symposium on Principles of Programming Languages (POPL'25)
2023	Panel Member National Science Foundation (NSF)
2022–2023	Program Committee Member Conference on Programming Language Design and Implementation (PLDI'23)
2022–2023	Program Committee Member European Symposium on Programming (ESOP'23)
2022	Program Committee Member Symposium on Logic in Computer Science (LICS'22)
2019–pres.	Steering Committee Co-Chair Workshop on Logic and Computational Complexity

- 2021–2022** Program Committee Member
Symposium on Principles of Programming Languages (POPL'22)
- 2020–2021** Program Committee Member
Conference on Programming Language Design and Implementation (PLDI'21)
- 2019–2021** Workshop and Co-Located Events Co-Chair
Symposium on Principles of Programming Languages (POPL)
- 2018–2020** Steering Committee Member
Logic Mentoring Workshop
- 2020** Program Committee Member
Workshop on Semantic and Formal Approaches to Complexity (SCOT'20)
- 2019–2020** Program Committee Member
International Conference on Functional Programming (ICFP'20)
- 2019** Panel Member
National Science Foundation (NSF)
- 2019** Program Committee Member
European Symposium on Programming (ESOP'20)
- 2018–2019** Co-Organizer
Martin Hofmann Memorial Meeting
With Lennart Beringer, Steffen Jost, Ulrich Schöpp, and Don Sannella.
- 2019** Program Committee Member
6th Workshop on Rewriting Techniques for Program Transformations and Evaluation
- 2019** Program Committee Member
LOLA 2019 - Syntax and Semantics of Low-Level Languages
- 2018** Program Committee Member
Symposium on Principles of Programming Languages (POPL'19)
- 2018** Panel Member
National Science Foundation (NSF)
- 2018** Program Committee Member
Student Research Competition at the Conf. on Prog. Lang. Design and Impl. (PLDI'18 SRC)
- 2018** Program Committee Member
International Colloquium on Automata, Languages and Programming (ICALP'18)
- 2018** Co-Chair
3rd Logic Mentoring Workshop (LMW'18)
With Ugo Dal Lago, Sandra Kiefer, and Brigitte Pientka
- 2018** Co-Chair
19th Workshop on Logic and Computational Complexity (LCC'18)
With Erich Graedel
- 2017** Program Committee Member
European Symposium on Programming (ESOP'18)
- 2017** Program Committee Member
Joint Workshop on Developments in Implicit Computational Complexity
and Foundational and Practical Aspects of Resource Analysis (DICE-FOPARA'17)
- 2017** Program Committee Member
International Conference on Formal Structures for Computation and Deduction (FSCD'17)

- 2016–2017** Program Committee Member
Conference on Programming Language Design and Implementation (PLDI'17)
- 2016** Co-Chair
Workshop on Syntax and Semantics of Low-Level Languages (LOLA'16)
With Marco Gaboardi
- 2015–2017** Organizer
Dagstuhl Seminar *Resource Bound Analysis*.
With Marco Gaboardi, Reinhard Wilhelm, and Florian Zuleger.
- 2016** External Review Committee Member
Conference on Computer Aided Verification (CAV'16)
- 2015** Program Committee Member
Conference on Foundations of Software Science and Computational Structures (FOSSACS'16)
- 2015** Program Committee Member
Developments in Implicit Computational Complexity (DICE'15)
- 2014** External Review Committee Member
Symposium on Principles of Programming Languages (POPL'15)

Memberships

- 2022–pres.** Sigma Xi Member
- 2015–pres.** ACM SIGPLAN Member

Editorial Duties

- 2019–2023** Guest Editor, *Mathematical Structures in Computer Science* (special issue)
- 2015–2017** Guest Editor, *Journal of Automated Reasoning* (special issue)

Contract and Grant Support

Current

- 2023** Gift
Jane Street Group
PI: Jan Hoffmann (CMU)
(unrestricted gift)
- 2023–2027** Research Grant
National Science Foundation (NSF)
SHF: Medium: Language Support for Efficient and Sound Programmable Inference
PIs: Jan Hoffmann (CMU) and Feras Saad (CMU)
\$900,000
- 2020–2024** Research Grant
National Science Foundation (NSF)
SHF: Small: Automatic Qualitative and Quantitative Verification of CUDA Code
PIs: Jan Hoffmann (CMU) and Stefan Muller (IIT)
\$499,996
- 2019–2024** CAREER Award
National Science Foundation (NSF)
Title: *CAREER: Marlin: A Unified Framework for Automatic and Interactive Quantitative Program Analysis*
PI: Jan Hoffmann (CMU)
\$518,815

Past

- 2022–2023** Research Contract
Formally Reasoning about Gas Cost and Fairness in Smart Contracts
Algorand Foundation - CMU ACE
PI: Jan Hoffmann (CMU)
- 2018–2023** Research Grant
National Science Foundation (NSF)
SaTC: CORE: Medium: Automated Support for Writing High-Assurance Smart Contracts
PIs: Jan Hoffmann (CMU), Bryan Parno (CMU), and Andrew Miller (UIUC)
\$884,984 (CMU component), Award No. 1801369
- 2022** Gift
Jane Street Group
PIs: Jan Hoffmann (CMU) and Seth Goldstein (CMU)
(unrestricted gift)
- 2021–2022** Amazon Research Award
Automatic Static Resource Analysis for Serverless Computing
Amazon Web Services
PI: Jan Hoffmann (CMU)
(unrestricted gift)
- 2018–2022** Research Contract
DARPA Assured Autonomy
CMU PIs: J. Dolan, D. Held, J. Hoffmann, S. Mitch, F. Pfenning, A. Platzer
\$3,053,448 (CMU component)
- 2021** Gift
Jane Street Capital
PI: Jan Hoffmann (CMU)
(unrestricted gift)
- 2020–2021** Gift
Ripple Labs
PIs: Jan Hoffmann and Frank Pfenning (CMU)
(unrestricted gift)
- 2018–2021** Research Grant
National Science Foundation (NSF)
Title: *SHF: Small: Resource-Guided Program Synthesis*
PIs: Jan Hoffmann (CMU) and Nadia Polikarpova (UCSD)
\$250,000 (CMU component), Award No. 1812876
- 2020** Gift
Jane Street Capital
PI: Jan Hoffmann (CMU)
(unrestricted gift)
- 2019** Gift
Jane Street Capital
PI: Jan Hoffmann (CMU)
(unrestricted gift)
- 2018** Gift
Jane Street Capital
PIs: Jan Hoffmann (CMU) and Jean Yang (CMU)
(unrestricted gift)

- 2017–2018** Schmidt Sciences Grant
The Eric and Wendy Schmidt Fund for Strategic Innovation
Title: *An Automated Algorithm Designer*
PIs: Carl Kingsford (CMU), Nina Balcan (CMU), Guy Blelloch (CMU),
Anupam Gupta (CMU), and Jan Hoffmann (CMU)
(unrestricted gift)
- 2016–2017** Google Research Award
Google Inc.
Title: *Automated Static Resource Regression Analysis*
(unrestricted gift)
- 2015–2019** Research Contract
DARPA STAC – Space/Time Analysis for Cybersecurity
Title: *CURB: Calculating and Understanding Resource Bounds to Detect Space/Time Vulnerabilities*
\$6,230,090; Award FA8750-15-C-0082; PIs: A. Loginov (GrammaTech), T. Reps (U Wisconsin),
J. Hoffmann (CMU), and Z. Shao (Yale); CMU component: \$884,984
- 2013–2017** Research Grant
National Science Foundation (NSF)
Title: *VeriQ: Formal Quantitative Software Verification in Realistic Application Scenarios*
\$449,721, 3 years, Award CCF-1319671, PIs: Zhong Shao and Jan Hoffmann

Teaching

- Spring 2024** *15-411/15-611: Compiler Design*
15 units; undergraduate course (cross-listed as graduate course)
- Fall 2023** *15-814: Types and Programming Languages* (planned)
12 units; graduate course
- Spring 2023** *15-411/15-611: Compiler Design*
15 units; undergraduate course (cross-listed as graduate course); 82 students
- Fall 2022** *15-814: Types and Programming Languages*
12 units; graduate course
- Spring 2022** *15-312: Foundations of Programming Languages*
12 units; undergraduate course
- Fall 2021** None (on parental leave)
- Spring 2021** *15-312: Foundations of Programming Languages*
12 units; undergraduate course
- Fall 2020** *15-819: Resource Aware Programming Languages*
12 units; graduate course
- Spring 2020** *15-312: Foundations of Programming Languages*
12 units; undergraduate course
- Fall 2019** *15-819: Foundations of Quantitative Program Analysis*
12 units; graduate course
- Sum. 2019** *Type-Based Resource Analysis*
Oregon Programming Languages Summer School (OPLSS)
- Spring 2019** *15-312: Foundations of Programming Languages* (with Stephanie Balzer)
12 units; undergraduate course

- Fall 2018** *15-411/15-611: Compiler Design*
15 units; undergraduate course (cross-listed as graduate course)
- Sum. 2018** *Introduction to Types and Semantics*
Oregon Programming Languages Summer School (OPLSS)
- Spring 2018** *15-312: Foundations of Programming Languages*
12 units; undergraduate course
- Fall 2017** *15-411/15-611: Compiler Design*
15 units; undergraduate course (cross-listed as graduate course)
- Spring 2017** *15-312: Foundations of Programming Languages (with Bob Harper)*
12 units; undergraduate course
- Fall 2016** *15-411/15-611: Compiler Design*
15 units; undergraduate course (cross-listed as graduate course)
- Sum. 2016** *Type-Based Resource Analysis*
Oregon Programming Languages Summer School (OPLSS)
- Spring 2016** *15-819: Advanced Topics in Programming Languages: Resource Analysis*
12 units; graduate course

Contributions to Education

- **Graduate Course *Resource Aware Programming Languages***
Course design, development of lecture notes and exercises
Taught in 2016, 2019, and 2020
- **Workshop *Security Challenges with Cryptocurrencies and Smart Contracts***
Research@CMU Educator Professional Development Program
Taught in 2019 (with Bryan Parno)
- **Course Module *Writing Efficient Code***
Girls of Steel program, development of lecture notes and exercises
Taught in 2018

Graduate Student Advising

Current Ph.D. Students and Post-Docs

- 2020–pres.** John Grosen, Ph.D. Student
Research topic: Security and programming languages
- 2019–pres.** Long Pham, Ph.D. Student
Research topic: Statistical and statistical analysis
- 2018–pres.** David Kahn, Ph.D. Student
Research topic: Resource analysis

Current Master's Students

- 2023–pres.** Ethan Chu, M.Sc. Student
Defense date: December 11, 2023
Research topic: Resource Aware ML 2

Former Graduate Students and Post-Docs

- 2022–2023.** Yiyang Guo, M.Sc. Student
Research topic: Resource-aware session types
Defense date: August 18, 2023
Current position: Software Engineer at Apple
- 2017–2022** Di Wang, Ph.D. Student
Thesis title: Static Analysis of Probabilistic Programs: An Algebraic Approach
Defense date: May 4, 2022
Current position: Assistant Professor at Peking University, China
- 2015–2021** Ankush Das, Ph.D. Student
Thesis title: Resource-Aware Session Types for Digital Contracts
Defense date: April 22, 2021
Current position: Assistant Professor at Boston University
- 2018–2020** Stefan Muller, Post-Doc
Research topic: Resource-aware compilation, CUDA
Current position: Assistant Professor at Illinois Institute of Technology, Chicago
- 2016–2018** Chan Ngo, Post-Doc
Research topic: Preventing side channels; expected cost analysis
Next position: Senior Research Engineer at Aptiv
- 2013–2017** Quentin Carbonneaux, Ph.D. Student (at Yale, co-advised with Zhong Shao)
Thesis title: Modular and Certified Resource-Bound Analyses
Defense date: August 3, 2017
Current position: Research Scientist at Meta, Paris

Ph.D. Dissertation Committees

- 2024** Surya Bakshi
University of Illinois Urbana-Champaign
Advisor: Andrew Miller
- 2024** Jenny Lin
Carnegie Mellon University
Advisor: James McCann
- 2024** Yue Niu
Carnegie Mellon University
Advisor: Robert Harper
- 2023** Rishabh Iyer
École Polytechnique Fédérale de Lausanne
Advisors: Katerina Argyraki and George Candea
- 2022** Samuel Westrick
Carnegie Mellon University
Advisor: Umut Acar
- 2021** Alexis Ghyselen
ENS Lyon
Advisor: Patrick Baillot
- 2021** Maximilian Haslbeck
Technical University Munich
Advisor: Tobias Nipkow
- 2021** Ryan Kavanagh
Carnegie Mellon University
Advisor: Frank Pfenning and Stephen Brookes

- 2020** Mengqi Liu
Yale University
Advisor: Zhong Shao
- 2019** Armaël Guéneau
Inria Paris (Gallium Team)
Advisors: Arthur Charguéraud and François Pottier
- 2019** Rijnard van Tonder
Carnegie Mellon University
Advisor: Claire Le Goues
- 2019** Hannah Gommerstadt
Carnegie Mellon University
Advisor: Frank Pfenning
- 2018** Anthony Canino
Binghamton University, State University of New York
Advisor: David Liu
- 2018** Xiongnan (Newman) Wu
Yale University
Advisor: Zhong Shao

Student Service

Advised Undergraduate Students

- 2023–2024** Lauren Sands, B.Sc. Student
Research topic: Resource Bounds for Parallel Programs
- 2023-2024** Nathan Glover, B.Sc. Student
Research topic: Combining Manual and Automatic Resource Analysis
- 2023** Ziqi Liu, B.Sc. Student
Research topic: Resource Bounded Smart Contracts
- 2023** Zhongyi Cao, B.Sc. Student
Research topic: Sound Programmable Inference
- 2022** Runming Li, B.Sc. Student
Research topic: Resource Aware ML
- 2021** Vanshika Chowdhary, B.Sc. Student
Research topic: Probabilistic programming
- 2021** Mohamed Lotfi, B.Sc. Student
Research topic: Probabilistic inference
- 2020** Brandon Wu, B.Sc. Student
Research topic: Interactive RaML
- 2020** Stephen McIntosh, B.Sc. Student
Research topic: Compiling Nomos to a blockchain
- 2019–2020** Ishani Santurkar, B.Sc. Student
Research topic: Integrating functional programming in Nomos
- 2019–2020** Yinglan Chen, B.Sc. Student
Research topic: Error reporting in RaML
Next position: Site Reliability Engineer at Google

- 2018–2019** Charles Yuan, B.Sc. Student
Research topic: Bayesian inference
Next position: Ph.D. student at MIT
- 2018** Nicholas Roberts, B.Sc. Student
Research topic: Compiling OCaml to the EVM
Next position: Software Engineer at Jane Street Capital
- 2017–2018** Prachi Laud, B.Sc. Student
Research topic: Implementing arrays and references in RAML
Next position: Software Engineer at Facebook
- 2017–2018** Yue Niu, B.Sc. Student
CMU Summer Undergraduate Research Fellowship (SURF)
Research topic: Automatic Resource Bound Analysis for Programs with Garbage Collection
Next position: Ph.D. student at Carnegie Mellon
- 2016–2017** Benjamin Lichtman, B.Sc. Student
Research project: Resource Bounds for Functional Programs with Side-Effects
Senior thesis: Combining Liquid Types and Automatic Amortized Resource Analysis
Next position: Software Engineer at Microsoft

University Service

- 2020–pres.** Member of the Diversity, Equity and Inclusion (DEI) Committee, Computer Science Department, CMU
- 2018–pres.** Member of the Doctoral Review Committee (DRC), Computer Science Department, CMU
- 2015–pres.** Organizer of the weekly PLunch Meeting, CMU
- 2015–pres.** Organizer of the PoP Seminar, CMU
- 2023–2024** Member of the University Committee on Faculty Appointments without Indefinite Tenure, CMU
- 2022–2023** Member of the Hiring Committee, Computer Science Department, CMU
- 2020–2021** Member of the Hiring Committee, Computer Science Department, CMU
- 2017–2021** Member of the Committee for Selecting Fellowship Candidates, Computer Science Department, CMU
- 2020** Organizer of the Computer Science Department's Open House, CMU
- 2019–2020** Member of the Ph.D. Admissions Committee, Computer Science Department, CMU
- 2019** Organizer of the Computer Science Department's Open House, CMU
- 2018–2019** Member of the Ph.D. Admissions Committee, Computer Science Department, CMU
- 2015–2016** Master's Admissions Committee, Computer Science Department, CMU