Yannick Forster

CV

yannick@yforster.de
yforster.de
∗ 13.06.1993
https://orcid.org/0000-0002-8676-9819

Academic Positions

since 01.12.2023 — **Inria**, *Permanent researcher (chargé de recherche) in the Cambium team, Paris*

01.12.2021 – 30.11.2023 — **Inria**, *Postdoctoral Marie Skłodowska-Curie fellow in the Gallinette team in Nantes*
hosted by Nicolas Tabareau

Education

01.07.2016 – 30.11.2021 — **Saarland University**, *Dr. rer. nat., summa cum laude*
supervised by Gert Smolka

01.10.2015– 30.06.2016 — **University of Cambridge, Robinson College**, *M. Phil. Advanced Computer Science, distinction*
Focus on Category Theory and Denotational Semantics of Programming Languages and Type Theory

01.10.2012– 13.02.2015 — **Saarland University**, *B.Sc. Computer Science*, Saarbrücken, *Grade* 1.2
Minor in Mathematics. Focus on Logic, Theorem Proving, Verification and Programming Languages

Publications

Conferences — 23 papers at POPL '20, CPP '19, '20, '23, LFCS '20, '22, FSCD '19, '21, CSL '21, '23, '24, APLAS '18, '23, ITP '17, '18, '19, '21, '22, ICFP '17.

Journals — 3 papers in JAR and JFP. 1 paper in LMCS. 1 paper in LOGCOM. (3 in PACMPL.)

Awards — Best student paper award (Rosser prize) at LFCS '22

BEStE Price for student initiatives and extraordinary commitment at Saarland University

Workshops — 2 invited talks: Unsound '22, TYPES '23. 17 contributed talks: TYPES '20, '22, '23, ML family workshop '22, WITS '22, CoqPL '20, Coq WS '16, '19, '20, '22 LOLA '17, '18, MLA '19, Facets of Realizability '19.

Academic Service

Workshop Co-Chair — 29th ACM SIGPLAN International Conference on Functional Programmingon (ICFP 2024)
28th ACM SIGPLAN International Conference on Functional Programmingon (ICFP 2023)

Program Committee — 25th International Symposium on Trends in Functional Programming (TFP 2024)
Computability in Europe 2024 (CiE 2024)
13th ACM SIGPLAN International Conference on Certified Programs and Proofs (CPP 2023)
16th Logical and Semantic Frameworks with Applications (LSFA 2022)
11th ACM SIGPLAN International Conference on Certified Programs and Proofs (CPP 2021)

External Reviewer — Logical Methods in Computer Science (LMCS 2023)
38th Annual ACM/IEEE Symposium on Logic in Computer Science (LICS 2023)
31st European Symposium on Programming (ESOP 2022)
36th Annual ACM/IEEE Symposium on Logic in Computer Science (LICS 2021)
Fundamentae Informaticae (2021)
6th International Conference on Formal Structures for Computation and Deduction (FSCD 2021)
10th ACM SIGPLAN International Conference on Certified Programs and Proofs (CPP 2020)
9th Coq Workshop (2019)

10th Internation Conference on Interactive Theorem Proving (ITP 2019)
21st International Symposium on Principles and Practice of Declarative Programming (PPDP 2019)
4th International Conference on Formal Structures for Computation and Deduction (FSCD 2019)
25th Workshop on Logic, Language, Information and Computation (WoLLIC 2018)
10th ACM SIGPLAN International Conference on Certified Programs and Proofs (CPP 2018)

Committee ACM SIGPLAN Long-Term Mentoring Committee (SIGPLAN-M): Operations Team

Teaching Experience

Supervised Bachelor's theses at Saarland University

2023 Haoyi Zeng: "Post's problem and the priority method in the calculus of inductive constructions", co-supervised with Dominik Kirst.

2022 Niklas Mück: "The Arithmetical Hierarchy, Oracle Computability, and Post's Theorem in Synthetic Computability", co-supervised with Dominik Kirst. Lead to TYPES '22 abstract [W16] and APLAS '23 paper [22].

2020 Felix Jahn: "Synthetic one-one, many-one, and truth-table reductions in Coq". Lead to TYPES '22 abstract [W15], CSL '23 paper [20], and CPP '23 paper [21].

2019 Marcel Ullrich: "Generating induction principles in MetaCoq". Lead to CoqWS '20 presentation [W9].

2018 Dominik Wehr: "A Constructive Analysis of First-Order Completeness Theorems in Coq", co-supervised with Dominik Kirst. Lead to LFCS '20 paper [10] and LOGCOM journal paper [J5].

2018 Simon Spies: "Undecidability of Higher-Order Unification in Coq". Lead to CPP '20 paper [13].

2017 Maximilian Wuttke: "Verified Programming of Turing Machines in Coq". Lead to CPP '20 paper [14] and ITP '21 paper [14].

2017 Edith Heiter: "Undecidability of PCP in Coq", co-supervised w/ Gert Smolka. Lead to ITP '18 paper [3].

Supervised Master's theses at Saarland University

2022 Roberto Álvarez Castro: "Mechanized undecidability of subtyping in System F".

Course Organisation and Teaching

For the Parisian Master of Research in Computer Science (MPRI)

Winter 2023 **Assistants de preuves (2-7-2)**, *Lecturer*, with Théo Winterhalter

Winter 2022 **Assistants de preuves (2-7-2)**, *Lecturer*, with Matthieu Sozeau and Théo Winterhalter

At Saarland University

Winter 2020 **Advanced Coq Programming**, *Lead Organiser and Lecturer*, Programming Systems Lab

Winter 2018 **Programming 1**, *Course management*, Programming Systems Lab

Summer 2017 **Mathematics Preparatory Course for CS students**, *Lead Organiser*, CS department

Summer 2018 **Advanced Coq Programming**, *Organiser and Lecturer*, Programming Systems Lab

Summer 2017 **Didactic Seminar for Student TAs in Programming 1**, *Organiser*, Reactive Systems Group

Summer 2016 **Mathematics Preparatory Course for CS students**, *Lead Organiser and Lecturer*, CS department

Summer 2015 **Mathematics Preparatory Course for CS students**, *Organisation team*, CS department

Winter 2014 **Didactic Seminar for Re-exam TAs in Programming 1**, *Organiser*, Reactive Systems Group

Teaching Assistance and Advised Seminars

At Saarland University

Summer 2020 **Seminar Functional Programming**, *Adviser*, Programming Systems Lab

Winter 2017 **Category Theory Seminar**, *Adviser*, Programming Systems Lab

Summer 2017 **Category Theory Seminar**, *Adviser*, Programming Systems Lab

Summer 2017 **Introduction to Computational Logic**, *TA*, Programming Systems Lab

Winter 2016 **Seminar Functional Programming**, *Adviser*, Programming Systems Lab

Winter 2014 **Programming 1**, *Supervision Student TA*, Reactive Systems Group

Summer 2014 **Introduction to Computational Logic**, *Student TA*, Programming Systems Lab

Winter 2013 **Programming 1**, *Student TA*, Dependable Systems and Software Group

Summer 2013 **Mathematics Preparatory Course for Computer Scientists**, *Student TA*, CS department

Science Outreach and Mentoring

since 2022 SIGPLAN-M Long term mentoring: Mentor and parts of the operation team

2018 Research Days Computer Science: 3 full-day courses on Coq for student winners of the German Federal Computer Science Competition

Scholarships, Awards, and Honors

2022 **Rosser Prize**, *Best Student Paper award at Symposium on Logical Foundations of Computer Science 2022.*

2021 **Marie Skłodowska-Curie Fellowship**, *EU Program HORIZON 2020*
total funding of 184 707.84 €

2017 **BeStE Preis for conception of math precourse**, *Saarland University*
Price for student initiatives and extraordinary commitment, awarded by the presidential board

2015–2016 **Kurt Hahn Trust**, *University of Cambridge*
Scholarship for graduate students of German nationality at the University of Cambridge

2015–2016 **German Academic Exchange Service**, *(Deutscher Akademischer Auslandsdienst, DAAD)*
Scholarship for graduate students pursuing a degree abroad, (approx. 15000 €)

2015–2016 **Scholarship by the Graduate School of Computer Science**, *Saarland University*
Scholarship awarded to students pursuing a PhD directly after completing their BSc degree (4800 €)

2013–2016 **German National Academic Foundation**, *(Studienstiftung des deutschen Volkes)*
Financial and academic scholarship, awarded to less than 0.5% of students in Germany (15000 €)

2015 **FdSI Bachelor Award**, *Saarland University*
awarded to the best Bachelor graduates in CS

2013–2015 **Member of the Bachelor's Honors Program**, *Saarland University*
special support program for talented and ambitious Bachelor students in CS

2012 **Award for outstanding extracurricular commitment in school**
awarded by the Minister of Education, Rhineland-Palatinate

Invited lectures

2023 "Coq, MetaCoq, and (verified) extraction". Invited lecture series at the international autumn school "Proof and Computation" in Herrsching, 10th to 16th September 2023,

Invited talks

2023 "Synthetic Computability in Constructive Type Theory." Invited talk in the special session on proof assistants at the 39th Conference on Mathematical Foundations of Programming Semantics – MFPS XXXIX (MFPS 2023) – in Bloomington, Indiana.

2023 "Verified Extraction from Coq to OCaml". Invited talk at the 29th International Conference on Types for Proofs and Programs (TYPES 2023). June 12th 2023, Valencia, Spain. Presenting joint work with Matthieu Sozeau, Nicolas Tabareau, and Pierre-Marie Pédrot.

2022 "MetaCoq as a tool to prevent future unsoundness in Coq". Invited talk at the workshop on Sources of Unsoundness in Verification (Unsound 2022), co-located with SPLASH '22, December 6th, Auckland, New Zealand (online). Joint work with the MetaCoq team.

2022 "Synthetic Computability in Constructive Type Theory". Talk at the Chocola meeting. June 2nd 2022, Lyon. Joint work with Dominik Kirst, Gert Smolka, Felix Jahn, Niklas Mück, Nils Lauermann, Fabian Kunze, and the contributors of the Coq Library of Undecidability Proofs.

2022 "Verified Extraction to OCaml from Coq, in Coq." Invited Talk at the Conference on Algorithmic Law Design and Implementation. April 28th 2022, Barcelona, Spain. Joint work with Matthieu Sozeau, Pierre Giraud, Pierre-Marie Pédrot, and Nicolas Tabareau.

Theses

PhD thesis: *Computability in Constructive Type Theory* (2021)

Supervisor: Gert Smolka. Grade: summa cum laude.

Master's thesis: *On the expressiveness of effect handlers and monadic reflection* (2016)

Supervisors: Ohad Kammar, Marcelo Fiore. Grade: 83 / 100 (UK: first class, US: A, GER: 1.0)

Bachelor's thesis: *A Formal and Constructive Theory of Computation* (2015)

Supervisor: Gert Smolka, Grade 1.0 (UK: first class, US: A)

Full List of Publications

Peer-reviewed Conferences

[23] Yannick Forster, Dominik Kirst, Niklas Mück. "The Kleene-Post and Post's Theorem in the Calculus of Inductive Constructions", *32nd Conference for Computer Science Logic*, CSL 2024.

[22] Yannick Forster, Dominik Kirst, Niklas Mück. "Oracle Computability and Turing Reducibility in the Calculus of Inductive Constructions", *The 21st Asian Symposium on Programming Languages and Systems*. APLAS 2023

[21] Yannick Forster, Felix Jahn, Gert Smolka. "A Computational Cantor-Bernstein and Myhill's Isomorphism Theorem in Constructive Type Theory", *12th ACM SIGPLAN International Conference on Certified Programs and Proofs*, CPP 2023.

[20] Yannick Forster, Felix Jahn. "Constructive and Synthetic Reducibility Degrees: Post's Problem for Many-one and Truth-table Reducibility in Coq", *31st Conference for Computer Science Logic*, CSL 2023.

[19] Yannick Forster, Nils Lauermann, Fabian Kunze. "Synthetic Kolmogorov Complexity in Coq", *International Conference on Interactive Theorem Proving*, ITP 2022.

[18] Yannick Forster. "Parametric Church's Thesis: Synthetic Computability Without Choice", *Symposium on Logical Foundations of Computer Science*, LFCS 2022.

[17] Yannick Forster, Fabian Kunze, Gert Smolka, Maximilian Wuttke. "A Mechanised Proof of the Time Invariance Thesis for the Weak Call-By-Value λ-Calculus". *International Conference on Interactive Theorem Proving*, ITP 2021.

[16] Yannick Forster. "Church's thesis and related axioms in Coq's type theory" *29th Conference for Computer Science Logic*, CSL 2021.

[15] Matthieu Sozeau, Simon Boulier, Yannick Forster, Nicolas Tabareau, Théo Winterhalter. "Coq Coq correct! verification of type checking and erasure for Coq, in Coq" *PACMPL 4(POPL)*: 8:1-8:28 (2020).

[14] Yannick Forster, Fabian Kunze, Maximilian Wuttke. "Verified programming of Turing machines in Coq". *Proceedings of the 10th ACM SIGPLAN International Conference on Certified Programs and Proofs*, CPP 2020.

[13] Simon Spies, Yannick Forster. "Undecidability of higher-order unification formalised in Coq". *Proceedings of the 10th ACM SIGPLAN International Conference on Certified Programs and Proofs*, CPP 2020.

[12] Yannick Forster, Kathrin Stark. "Coq à la carte: a practical approach to modular syntax with binders". *Proceedings of the 10th ACM SIGPLAN International Conference on Certified Programs and Proofs*, CPP 2020.

[11] Yannick Forster, Fabian Kunze, Marc Roth. "The weak call-by-value λ-calculus is reasonable for both time and space". *PACMPL 4 (POPL)*: 27:1-27:23 (2020).

[10] Yannick Forster, Dominik Kirst, Dominik Wehr. "Completeness Theorems for First-Order Logic Analysed in Constructive Type Theory". *Symposium on Logical Foundations of Computer Science*, LFCS 2020.

[9] Yannick Forster and Fabian Kunze. "A certifying extraction with time bounds from Coq to call-by-value λ-calculus". *International Conference on Interactive Theorem Proving*, ITP 2019.

[8] Dominique Larchey-Wendling and Yannick Forster. "Hilbert's Tenth Problem in Coq". *4th International Conference on Formal Structures for Computation and Deduction*, FCSD 2019.

[7] Yannick Forster, Steven Schäfer, Simon Spies, Kathrin Stark. "Call-By-Push-Value in Coq: Operational, Equational and Denotational Theory". *Proceedings of the 9th ACM SIGPLAN International Conference on Certified Programs and Proofs*, CPP 2019.

[6] Yannick Forster, Dominik Kirst, Gert Smolka. "On Synthetic Undecidability in Coq, with an Application to the Entscheidungsproblem". *Proceedings of the 9th ACM SIGPLAN International Conference on Certified Programs and Proofs*, CPP 2019.

[5] Yannick Forster and Dominique Larchey-Wendling. "Certified Undecidability of Intuitionistic Linear Logic via Binary Stack Machines and Minsky Machines". *Proceedings of the 9th ACM SIGPLAN International Conference on Certified Programs and Proofs*, CPP 2019.

[4] Fabian Kunze, Gert Smolka, Yannick Forster. "Formal Small-step Verification of a Call-by-value Lambda Calculus Machine". *Asian Symposium on Programming Languages and Systems*, APLAS 2018.

[3] Yannick Forster, Edith Heiter, Gert Smolka. "Verification of PCP-Related Computational Reductions in Coq". *International Conference on Interactive Theorem Proving*, ITP 2018.

[2] Yannick Forster, Ohad Kammar, Sam Lindley, Matija Pretnar. "On the expressive power of user-defined effects: Effect handlers, monadic reflection, delimited control." *Proceedings of the ACM on Programming Languages 1*. ICFP 2017.

[1] Yannick Forster and Gert Smolka. "Weak Call-by-Value Lambda Calculus as a Model of Computation in Coq". *International Conference on Interactive Theorem Proving*, ITP 2017.

Peer-reviewed Journals

[J5] Yannick Forster, Dominik Kirst, Dominik Wehr. "Completeness Theorems for First-Order Logic Analysed in Constructive Type Theory (extended version)". Journal of Logic and Computation.

[J4] Dominique Larchey-Wendling and Yannick Forster. "Hilbert's Tenth Problem in Coq (extended version)". Logical Methods in Computer Science (LMCS).

[J3] Sozeau, Matthieu, Abhishek Anand, Simon Boulier, Cyril Cohen, Yannick Forster, Fabian Kunze, Gregory Malecha, Nicolas Tabareau, and Théo Winterhalter. "The MetaCoq Project." *Journal of Automated Reasoning*, JAR 2020.

[J2] Yannick Forster, Ohad Kammar, Sam Lindley, Matija Pretnar. "On the expressive power of user-defined effects: effect handlers, monadic reflection, delimited control". *Journal of Functional Programming*, JFP 2019.

[J1] Yannick Forster and Gert Smolka. "Call-by-Value Lambda Calculus as a Model of Computation in Coq". *Journal of Automated Reasoning*, JAR 2018.

Peer-reviewed Workshops

[W18] Yannick Forster, Dominik Kirst, Bruno da Rocha Paiva, Vincent Rahli. "Markov's Principles in Constructive Type Theory, *29th International Conference on Types for Proofs and Programs*, TYPES 2023.

[W17] Yannick Forster, Dominik Kirst. "Synthetic Turing Reducibility in CIC", *28th International Conference on Types for Proofs and Programs*, TYPES 2022.

[W16] Dominik Kirst, Niklas Mück, Yannick Forster. "Synthetic Versions of the Kleene-Post and Post's Theorem", *28th International Conference on Types for Proofs and Programs*, TYPES 2022.

[W15] Yannick Forster, Felix Jahn, Gert Smolka. "Myhill Isomorphism Theorem and a Computational Cantor-Bernstein Theorem in Constructive Type Theory", *28th International Conference on Types for Proofs and Programs*, TYPES 2022.

[W14] Tiago Cogumbreiro, Yannick Forster. "Towards a Mechanized Theory of Computation for Education" *28th International Conference on Types for Proofs and Programs*, TYPES 2022.

[W13] Yannick Forster, Matthieu Sozeau. "Aspects of a machine-checked intermediate language for extraction from Coq, in MetaCoq" *28th International Conference on Types for Proofs and Programs*, TYPES 2022.

[W12] Dominik Kirst, Johannes Hostert, Andrej Dudenhefner, Yannick Forster, Marc Hermes, Mark Koch, Dominique Larchey-Wendling, Niklas Mück, Benjamin Peters, Gert Smolka, Dominik Wehr, "A Coq Library for Mechanised First-Order Logic". *Coq Workshop 2022*, Haifa, Israel.

[W11] Yannick Forster, Matthieu Sozeau, Pierre Giraud, Pierre-Marie Pédrot, Nicolas Tabareau. "Extraction to OCaml from Coq: Operational Correctness Verified in Coq". *ML family workshop 2022*, Ljubljana, Slovenia.

[W10] Matthieu Sozeau, Meven Lennon-Bertrand, Yannick Forster. "The Curious Case of Case: correct and efficient case representation in Coq and MetaCoq". *The first Workshop on the Implementation of Type Systems (WITS 2022)*, online, 2022.

[W9] Bohdan Liesnikov, Marcel Ullrich, Yannick Forster. "Generating induction principles and subterm relations for inductive types using MetaCoq". *Coq Workshop 2020*, online.

[W8] Yannick Forster, Dominik Kirst, Florian Steinberg. "Towards Extraction of Continuity Moduli in Coq" *26th International Conference on Types for Proofs and Programs*, TYPES 2020.

[W7] Yannick Forster, Dominique Larchey-Wendling, Andrej Dudenhefner, Edith Heiter, Dominik Kirst, Fabian Kunze, Gert Smolka, Simon Spies, Dominik Wehr, Maximilian Wuttke. "A Coq Library of Undecidable Problems". *The Sixth International Workshop on Coq for Programming Languages (CoqPL 2020)*, New Orleans, USA 2020.

[W6] Matthieu Sozeau, Yannick Forster, Simon Boulier, Nicolas Tabareau and Théo Winterhalter. "Coq Coq Codet! - Towards a Verified Toolchain for Coq in MetaCoq". Coq Workshop 2019, Portland, USA.

[W5] Yannick Forster and Matthieu Sozeau. "Mechanically verified type and proof erasure for Coq ". Facets of Realizability workshop 2019, Paris, France.

[W4] Yannick Forster and Dominique Larchey-Wendling. "A constructive Coq-library for the mechanisation of undecidability". MLA workshop 2019, Nancy, France.

[W3] Yannick Forster and Dominique Larchey-Wendling. "Towards a library of formalised undecidable problems in Coq: The undecidability of intuitionistic linear logic". *Syntax and Semantics of Low-Level Languages workshop*, LOLA 2018, Oxford, UK.

[W2] Yannick Forster, Fabian Kunze, Marc Roth. "The strong invariance thesis for a lambda-calculus". *Syntax and Semantics of Low-Level Languages workshop*, LOLA 2017, Reykjavik, Iceland.

[W1] Yannick Forster and Fabian Kunze. "Verified Extraction from Coq to a Lambda-Calculus". *Coq Workshop 2016*, Nancy, France.