Jean-Baptiste Jeannin
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Education

PhD, 08/2013, Computer Science, Cornell University, Ithaca, NY, United States of America
Title of Dissertation: Capsules and Non-Well-Founded Computation, 01/2009 - 08/2013

Advisor: Dexter Kozen

MS, 08/2012, Computer Science, Cornell University, Ithaca, NY, United States of America
Title of Dissertation: N/A, 01/2009 - 08/2012

Advisor: Dexter Kozen

MEng, 05/2008, Computer Science, Cornell University, Ithaca, NY, United States of America
Title of Dissertation: N/A, 08/2007 - 05/2008

Advisor: Dexter Kozen

BSE, 07/2007, Mathematics and Computer Science, École polytechnique, Palaiseau, France
Title of Dissertation: N/A, 08/2004 - 07/2007

Associates Degree, 07/2004, Mathematics and Physics, Collège Stanislas, Classes Préparatoires aux Grandes Écoles, MPSI MP*, Paris, France
Title of Dissertation: N/A, 09/2002 - 07/2004

Appointments

Positions at U of M

1. Associate Professor, Aerospace Engineering, University of Michigan - Ann Arbor, 08/2024 - Present

2. Associate Professor (courtesy appointment), Electrical Engineering and Computer Science (Computer Science and Engineering Division), University of Michigan - Ann Arbor, 08/2024 - Present

3. Assistant Professor (courtesy appointment), Electrical Engineering and Computer Science (Computer Science and Engineering DIvision), University of Michigan - Ann Arbor, 04/2018 - 07/2024

4. Assistant Professor, Aerospace Engineering, University of Michigan - Ann Arbor, 09/2017 - 07/2024

Positions at other institutions or organizations

1. Invited Professor, Computer Science, École Normale Supérieure, Paris, France, 09/2024 - 06/2025

2. Senior Researcher, Programming Languages Group, Samsung Research America, Mountain View, CA, United States of America, 09/2015 - 08/2017

3. Postdoctoral Scholar, Computer Science Department, Carnegie Mellon University, Pittsburgh, PA, United States of America, 09/2013 - 08/2015

4. Research Intern, F* group, Microsoft Research India, Bangalore, India, 09/2012 - 12/2012

5. Research Intern, F* group, Microsoft Research, Redwond, WA, United States of America, 06/2011 - 08/2011

6. Software Engineering Intern, Compiler group, Facebook, Inc., Palo Alto, CA, United States of America, 06/2010 - 08/2010

7. Graduate Student Researcher, Computer Science, Cornell University, Ithaca, NY, United States of America, 01/2009 - 08/2013

8. Engineering Intern, Hispano-Suiza, Safran Group, Réau, France, 06/2008 - 12/2008

9. Graduate Student, Computer Science, Cornell University, Ithaca, NY, United States of America, 08/2007 - 05/2008

10. Research Intern, National Institute of Aerospace, NASA Langley Research Center, Hampton, VA, United States of America, 04/2007 - 06/2007

11. Undergraduate Student, Computer Science, École polytechnique, Palaiseau, France, 08/2004 - 07/2007

12. Undergraduate Student, Mathematics and Physics, Collège Stanislas, Classes Préparatoires aux Grandes Écoles, MPSI MP*, Paris, France, 09/2002 - 07/2004

Honors and Awards

International

1. Distinguished paper award for the CCS 2023 paper "Security Verification of Low-Trust Architectures", 11/2023

2. Amazon Research Award, $60,000, 04/2022

3. TACAS 2015 Selection for appearance in the International Journal of Software Tools for Technology Transfer (STTT) "A Formally Verified Hybrid System for Safe Advisories in the Next-Generation Airborne Collision Avoidance System", 04/2015

Institutional

1. Acheson Award: merit-based full-tuition scholarship for Master program at Cornell University, 08/2007

Student Awards

1. Mohit Tekriwal, Chateaubriand fellowship covering a 6-month visit to a French research institute. Used to visit the team of Yves Bertot at INRIA Sophia-Antipolis from 09/2022 to 02/2023., 09/2022

2. Siyuan He, Ke Du and Joshua Wilhelm. DASC 2020: Best of Session (Formal Verification) Award. Top 10 Finalist for Best Student Paper Award. For paper "Verification of an Airport Taxiway Path-Finding Algorithm", 10/2020

3. Shayan Jalili, NASA Fellowship, Tuition and stipend for 3 years of graduate studies (valued at $165,000), 09/2020

Teaching

New courses introduced at U of M

1. AERO 350 (formerly AERO 495), Fundamentals of Aerospace Computing
   Description: The class is a junior-level undergraduate class, which has become a required class for all Aerospace Engineering majors. Its first six weeks focus on fundamentals: programming and logic, data structures, introduction to complexity theory and algorithms. The next four weeks use those tools to introduce students to computational science, showing them how to simulate differential equation solutions using finite different schemes. The last four weeks focus on embedded systems for aerospace, including sensor interfaces, signal processing and embedded control.

Courses taught at U of M

Course #	Course Title	Teaching Role	Term	Enrollment/ Response
AEROSP 552	Aerospace Information Systems	Instructor	Fall 2025	NA
EECS 590	Advanced Programming Languages	Instructor	Winter 2024	36 / 40
AEROSP 552	Aerospace Information Systems	Instructor	Fall 2023	16 / 16
AEROSP 350	Fundamentals of Aerospace Computing	Co-Instructor	Winter 2023	54 / 23
AEROSP 350	Fundamentals of Aerospace Computing	Co-Instructor	Fall 2022	51 / 36
EECS 590	Advanced Programming Languages	Instructor	Fall 2022	31 / 29
AEROSP 552	Aerospace Information Systems	Instructor	Winter 2022	20 / 18
AEROSP 350	Fundamentals of Aerospace Computing	Instructor	Fall 2021	27 / 8
AEROSP 552	Aerospace Information Systems	Instructor	Winter 2021	35 / 27
AEROSP 495	Special Topics Aerospace Engineering: Fundamentals of Aerospace Computing	Instructor	Fall 2020	24 / 18
EECS 590	Advanced Programming Languages	Instructor	Winter 2020	34 / 32
AEROSP 495	Special Topics Aerospace Engineering: Fundamentals of Aerospace Computing	Instructor	Fall 2019	27 / 13
AEROSP 552	Aerospace Information Systems	Instructor	Winter 2019	34 / 11
AEROSP 495	Special Topics Aerospace Engineering: Fundamentals of Aerospace Computing	Instructor	Fall 2018	7 / 3
AEROSP 552	Aerospace Information Systems	Instructor	Fall 2017	26 / 21

Course #	Term	Enrollment/ Response	Q1	Q1631	Q1632	Q1633	Course Quality Avg. (Q1631, Q1632, Q1633)	Q2	Q199	Q217	Q230	Instructor Quality Avg. (Q199, Q217, Q230)	Q4	Q891
AEROSP 552	Fall 2025	NA												
EECS 590	Winter 2024	36 / 40	4.7	4.7	4.5	4.3	4.50	4.8	4.8	4.9	4.8	4.83	4.6	2.8
AEROSP 552	Fall 2023	16 / 16	4.7	4.8	4.6	4.6	4.67	4.8	4.8	4.9	4.9	4.87	4.3	2.9
AEROSP 350	Winter 2023	54 / 23	3.85	4.68	3.89	4.54	4.37	4.54	4.45	4.78	4.65	4.63	3.14	1.75
AEROSP 350	Fall 2022	51 / 36	3.18	4.29	3.77	3.46	3.84	4.14	4.12	4.60	4.64	4.45	3.13	1.64
EECS 590	Fall 2022	31 / 29	4.76	4.90	4.81	4.53	4.75	4.92	4.86	4.96	4.89	4.90	4.74	2.73
AEROSP 552	Winter 2022	20 / 18	4.13	4.40	3.83	4.17	4.13	4.60	4.81	4.97	4.39	4.72	4.23	3.21
AEROSP 350	Fall 2021	27 / 8	3.75	4.33	4.00	3.88	4.07	4.25	4.00	4.80	4.63	4.48	3.75	1.38
AEROSP 552	Winter 2021	35 / 27	3.71	4.23	3.95	4.00	4.06	4.11	4.31	4.83	4.25	4.46	3.94	2.93
AEROSP 495	Fall 2020	24 / 18	4.20	4.38	4.21	4.00	4.20	4.36	4.17	4.68	4.60	4.48	3.75	2.61
EECS 590	Winter 2020	34 / 32	4.4	4.8	4.4	4.2	4.47	4.8	4.7	4.9	4.7	4.77	4.3	2.6
AEROSP 495	Fall 2019	27 / 13	3.94	4.57	4.00	3.80	4.12	4.69	4.69	4.91	4.78	4.79	4.57	2.43
AEROSP 552	Winter 2019	34 / 11	3.86	4.25	4.06	3.58	3.96	4.00	4.58	4.81	4.25	4.55	4.30	2.92
AEROSP 495	Fall 2018	7 / 3	4.75	4.75	4.25	4.00	4.33	4.75	4.75	5.00	4.75	4.83	4.00	2.00
AEROSP 552	Fall 2017	26 / 21	4.36	4.55	4.69	4.15	4.46	4.33	4.55	4.80	4.80	4.72	4.38	2.57

Evaluations are on a 5 point scale where 5 is Strongly Agree and 1 is Strongly Disagree.
Q1. This was an excellent course.
Q1631. This course advanced my understanding of the subject matter.
Q1632. My interest in the subject has increased because of this course.
Q1633. I knew what was expected of me in this course.
Q2. The instructor was an excellent teacher.
Q199. The instructor explained material clearly.
Q217. The instructor treated students with respect.
Q230. The instructor seemed well prepared for class meetings.
Q4. I had a strong desire to take this course.
Q891. As compared with other courses of equal credit, the workload for this course was (5 = Much Lighter, 4 = Lighter, 3 = Typical, 2 = Heavier, 1 = Much Heavier).

Ph.D. committee activity (chair)

1. Yichen Tao, 2028, Verification of Numerical Programs

2. Nishant Ketherpal, 2025, Geometric Formal Verification via Active Corners (Robotics)

3. Jiawei Chen, 2025, Synchronous Programming with Refinement Types and Differential Equations (Robotics)

4. Mohit Tekriwal, 2023, A mechanized error analysis framework for an end-to-end verification of numerical programs (Graduated June 2023, Aerospace Engineering).
   Student Current Position: Postdoctoral Researcher, Place of Employment: Livermore National Laboratories, Livermore, CA, United States of America

5. Shayan Jalili, 2021, Graduated with a Masters in 2021.
   Student Current Position: Engineer, Place of Employment: Ford Motor Company, Dearborn, MI, United States of America

Ph.D. committee activity (co-chair)

1. Steven Schaefer, 2027, Computer Science and Engineering, Co-Chair/s: Max New

2. Yonathan Fisseha, 2025, Formal Verification of Hardware (Computer Science and Engineering), Co-Chair/s: Todd Austin

3. Hammad Ahmad, 2024, Program Repair in Formal Verification (Computer Science and Engineering), Co-Chair/s: Westley Weimer

Ph.D. committee activity (member)

1. Shibo Chen, 2024

2. Andrew Wintenberg, 2023

3. Lauren Biernacki, 2023

4. Andrew Loveless, 2023

5. Tanvir Ahmed Khan, 2023

6. Sung Kim, 2023

7. Yan Long, 2023

8. Andrew Kwong, 2023

9. Prashin Santosh Sharma, 2023

10. Haojun Ma, 2022

11. Claire Wincott, 2021

12. Andrew Quinn, 2021

13. Mark Gallagher, 2021

14. Akshithra Sriraman, 2021

15. James Usevitch, 2021

16. Kevin Angstadt, 2020

17. Romulo Meira Goes, 2020

18. Yiding Ji, 2019

19. Xianzheng Dou, 2019

20. Ofir Weisse, 2019

21. Misiker Tadesse Aga, 2019

22. Zelalem Birhanu Aweke, 2018

M.S. students advised

1. Elanor Tang, 2021 - 2023, Automatic Geometric Formal Proofs, Thesis Completed: No

2. Hang Zhang, 2020 - 2022, Comparison of forward and backward reachability for zonotopes and Hamilton-Jacobi-Bellman equations, Thesis Completed: No

3. Ke Du, 2020, Formal Verification of a Taxiway Path-Finding Algorithm, Thesis Completed: No

4. Siyuan He, 2020, Formal Verification of a Taxiway Path-Finding Algorithm, Thesis Completed: No

5. Jiahong Xu, 2020, Falsification of Vision-based Automatic Landing, Thesis Completed: No

6. Joshua Whilhelm, 2019 - 2020, Verification of Self-Taxiing, Thesis Completed: No

7. Yuhao Zhang, 2018 - 2020, Formal verification of aircraft taxiing, Thesis Completed: No

8. Aakash Abhishek, 2018 - 2019, Verification of Swerving and Braking Maneuvers, Thesis Completed: No

9. Huaiyuan Teng, 2018 - 2019, Formal verification of aircraft taxiing, Thesis Completed: No

10. Guillaume Poupart-Lafarge, 2018 - 2018, Taxiing path planning, Thesis Completed: No

11. Enoch Lee, 2018 - 2018, Verification of aircraft trajectories, Thesis Completed: No

Undergraduate students advised

1. Gemechis Urgessa (AURA student from Ethiopia), 2023 - 2023, MARVeLus compiler

2. Pranjal Sharma, 2022 - 2023, MARVeLus robotics

3. Bereket Ayele (AURA student from Ethiopia), 2022 - 2023, MARVeLus compiler

4. Yicheng Zhang, 2022 - 2023, MARVeLus compiler

5. Nicholas Wohlfeil, 2022 - 2023, MARVeLus robotics

6. Bereket Ngussie (AURA student from Ethiopia), 2021 - 2023, MARVeLUS compiler

7. Tigist Shiferaw (AURA student from Ethiopia), 2021 - 2023, MARVeLus compiler

8. Elanor Tang, 2021 - 2022, Geometric safety proofs

9. Avi Tachna-Fram, 2021 - 2022, Undergraduate Honors Thesis – Formal Verification of MSR Algorithm

10. Elliot Dubuque, 2021 - 2021, MARVeLus robotics

11. Saima Jamal, 2021 - 2021, MARVeLus robotics

12. José Luiz Vargas de Mendonca, 2020 - 2022, Verification of Synchronous Hybrid Systems

13. Harsh Jhaveri, 2020, Runtime Verification on UAVs

14. Bethel Hall (AURA student from Ethiopia), 2020, Correct-by-construction Neural Networks (AURA program)

15. Isabelle Gallagher, 2020, Falsification of Vision-based Automatic Landing

16. Joshua Miller, 2020, Verification of Numerical Schemes

17. Eytan Adler, 2019 - 2019, Formal Verification of Aicraft Turning Maneuvers

18. Harry Sood (SURE student), 2018 - 2020, Formal Verification of Car Emergency Maneuvers

19. Shivam Sharma (SURE student), 2018 - 2020, Formal Verification of Neural-Network-based Aircraft Collision Avoidance

20. Nathan Vollbrecht (SURE student), 2018 - 2018, Verification of Control Algorithms

21. Nathan Koskas de Diego (Exchange student from France), 2018 - 2018, Verification of Control Algorithms

Research

Research programs underway

1. **Verification of Cyber-Physical Systems**
   My group and I are working on understanding how to integrate reasoning based on formal logic with techniques traditionally used in controls. To address proof automation, we have proposed an active corner technique, which formalizes some geometric intuition to automate some proofs of collision avoidance (FMCAD 2022, FTSCS 2022). We have also developed methods to improve backward reachability using Minkowski difference and zonotopes (EMSOFT 2022), in an automated way. To address temporal expressivity in program logics, we have developed formal program logics integrating Linear Temporal Logic (IJCAR 2014), then Signal Temporal Logic, with Dynamic Logic, in a unified logic enabling temporal guarantees on hybrid (discrete and continuous) computer programs (HSCC 2021). To bridge the gap between modeling and implementation of cyber-physical systems, we have recently started developing a new synchronous language with differential equations and verification features, (FTSCS 2022).

2. **Formal Verification of Numerical Methods**
   My group and I have developed a research program on formally verifying and getting guarantees on traditional computational schemes, a feature of the numerical methods community. Computational schemes are traditionally used to model the behavior of differential equations to make important engineering decisions. Because computational schemes are software, they could contain software bugs that could lead to wrong engineering decisions. We proved the Lax equivalence scheme for finite difference schemes, which relates consistency, stability and convergence, in an interactive theorem prover (NFM 2021). The usage of an interactive theorem prover ensures that all proofs are checked step-by-step by a computer. We then formally verified iterative methods that are commonly used to solve finite difference equations, by proving the correctness all the way down to the C implementation, and taking into account C program semantics and floating-point arithmetic (CICM 2023).

3. **Formal Verification of Distributed Systems**

   One of the most challenging parts of verifying distributed sytems is to find an inductive invariant. We developed a new approach, Incremental Inference of Inductive Invariants (I4), to automatically generate inductive invariants for distributed protocols (HotOS 2019, SOSP 2019). The essence of our idea is simple: the inductive invariant of a finite instance of the protocol can be used to infer a general inductive invariant for the infinite distributed protocol. In I4, we use a model checking tool to automatically derive the inductive invariant for a finite instance of the protocol; and generalize this invariant to an inductive invariant for the infinite protocol. Our experiments show that I4 can prove the correctness of several distributed protocols like Chord, 2PC and Transaction Chains with little to no human effort. We extended this effort in Sift, to handle more complicated protocols requiring several refined layers, and prove refinements between layers automatically (ATC 2022).

Past grants and contracts

1. *Collins Aerospace*, "Formal verification for autonomous aerospace systems," 01/2020 - 12/2020, Total: $129,974, Jean-Baptiste Jeannin (PI), Necmiye Ozay (Co-PI). Candidate's Share: $64,607.
2. *Collins Aerospace*, "Formal verification for autonomous aerospace systems," 03/2019 - 12/2019, Total: $59,827, Jean-Baptiste Jeannin (Co-PI), Necmiye Ozay (PI). Candidate's Share: $29,914.
3. *Toyota Research Institute*, "Formally Verified Guardians to Avoid Moving Obstacles," 01/2019 - 12/2020, Total: $228,613, Jean-Baptiste Jeannin (PI). Candidate's Share: $228,613.
4. *Collins Aerospace*, "Formal Verification for Autonomous Aerospace Systems," 08/2018 - 12/2018, Total: $24,784, Jean-Baptiste Jeannin (Co-PI), Necmiye Ozay (PI). Candidate's Share: $12,392.
5. *Toyota Research Institute*, "Formally Verified Guardians for Enhanced Driving: Emergency Braking, Swerving, and Combined Maneuvers," 01/2018 - 12/2018, Total: $170,712, Jean-Baptiste Jeannin (PI). Candidate's Share: $170,712.

Current grants and contracts

1. *National Science Foundation*, "Conference: Midwest Programming Languages Summits 2023, 2024, 2025," 09/2023 - 08/2025, Total: $15,000, Jean-Baptiste jeannin (PI), Cyrus Omar (Co-PI). Candidate's Share: $15,000.
2. *University of Michigan START*, "Interactively Deriving Formal Proofs," 06/2023 - 05/2024, Total: $30,000, Jean-Baptiste Jeannin (PI), Cyrus Omar (Co-PI). Candidate's Share: $15,000.
3. *National Science Foundation*, "FMitF: Track I: Foundational Approaches for End-to-end Formal Verification of Computational Physics," 10/2022 - 09/2026, Total: $750,000, Jean-Baptiste Jeannin (PI), Karthik Duraisamy (Co-PI). Candidate's Share: $375,000.
4. *Amazon Research*, "Automatic Verification of Distributed Systems Implementations," 04/2022 - 10/2023, Total: $60,000, Jean-Baptiste Jeannin (PI). Candidate's Share: $60,000.
5. *National Aeronautics and Space Administration*, "Compositional Reasoning and Parallelism in Cyber-Physical Systems – Student: Shayan Jalili (later transferred to Nishant Kheterpal)," 09/2020 - 08/2023, Total: $165,000, Jean-Baptiste Jeannin (PI). Candidate's Share: $165,000.

New research directions

1. **Hybrid Synchronous Programming with Refinement Types**

   Modern cyber-physical systems (CPSs) such as cars and aircraft are responsible for expensive equipment and human lives. Today, tools for verification and execution of CPSs are largely disconnected. In this project, we aim to bring together verification and execution by adding refinement types to a well-studied executable synchronous programming language similar to Lustre, in a new tool called MARVeLus. We have started to develop our language in the purely discrete case (FTSCS 2023), and are currently developing its metatheory. In the long run, we are planning to add support for ordinary differential equations to create an executable language capable of verifying both discrete and continuous dynamics.

2. **Cyber-Physical Systems with Neural Networks in the loop**

   There has been much recent excitement on formal verification techniques for neural networks. With an undergraduate, we worked on applying existing techniques to guarantee strong safety properties on cyber-physical systems, and we show how to use the Marabou tool to guarantee absence of collision for a neural-network-based aircraft collision avoidance system (VNN 2019). The general absence-of-collision properties we prove are stronger than previous work, which focused on sound behavior in select cases. But to ensure safety by design rather than a posteriori, we have most recently investigated how to train correct-by-construction neural networks with respect to their safety properties, rather than verify networks after training (FoMLAS 2023, DASC 2023). In contrast, the majority of the current state-of-the-art has focused on verifying neural networks (and usually finding counterexamples) after training, or repairing neural networks after training.

3. **Formal Verification of Hardware**

   With Todd Austin of CSE and his students, we designed the Twine language for heterogeous design (DATE 2022), which standardizes the interface between different hardware components, so that heterogenous hardware components can interact in a seamless manner. Most recently and along with Sharad Malik from Princeton, we have showed how to formally prove security properties about a low-trust computer architecture using sequestered encryption, which protects confidentiality of sensitive data against direct data disclosures and digital side channels (CCS 2023). We are continuing this work to establish more general formal security guarantees on secure hardware. In these projects, I have brought my expertise in formal modeling, language semantics and verification.

Pending grants and contracts

1. *Amazon Automated Reasoning*, "Verification of Distributed Systems: from Model to Implementation," 11/2023, Total: $100,000, Jean-Baptiste Jeannin (PI). Candidate's Share: $100,000.

2. *Federal Aviation Administration, Fueling Aviation's Sustainable Transition via Low-Emission Aviation Technologies (FAST-Tech)* , "Fleet-wide and NAS-wide Dynamic Rerouting with SmartRoutes for Minimized Fuel Consumption during Flight Operations," 11/2023, Total: $1,800,000, Max Li (PI), Jean-Baptiste Jeannin (Co-PI), George Hunter (Co-PI). Candidate's Share: $300,000.
3. *National Science Foundation and Agence Nationale pour la Recherche (France)* , "CAFEE: Control Algorithms Formal End-to-End Verification," 10/2023, Total: $920,000, Jean-Baptiste Jeannin (PI), Pierre-Loïc Garoche (PI). Candidate's Share: $600,000.
4. *National Science Foundation*, "SHF: Small: A Hybrid Synchronous Language for Verifiable Execution of Cyber-Physical Systems," 06/2023, Total: $600,000, Jean-Baptiste Jeannin (PI). Candidate's Share: $600,000.

Publications and Scholarly Presentations

Full articles in refereed journals, transactions, or archives

1. Jiawei Chen, José Luiz Vargas de Mendonça*, Bereket Ayele*, Bereket Ngussie Bekele*, Shayan Jalili, Pranjal Sharma*, Nicholas Wohlfeil*, Yicheng Zhang*, Jean-Baptiste Jeannin "Synchronous Programming with Refinement Types". *Proc. ACM Program. Lang. 8(ICFP)*. 04/2024; 8: 938-972

2. Liren Yang, Hang Zhang, **Jean-Baptiste Jeannin**, Necmiye Ozay "Efficient Backward Reachability Using the Minkowski Difference of Constrained Zonotopes". *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (EMSOFT). Acceptance rate: 25% (30/118)* . 05/2022; 41(11): 3969-3980

3. Kevin Angstadt, Tommy Tracy, Kevin Skadron, **Jean-Baptiste Jeannin**, Westley Weimer "Synthesizing Legacy String Code for FPGAs Using Bounded Automata Learning". *IEEE Micro*. 2022; 42(5): 70-77

4. **Jean-Baptiste Jeannin**, Dexter Kozen, Alexandra Silva "Well-Founded Coalgebras, Revisited". *Mathematical Structures in Computer Science (MSCS)*. 2017; 27(7): 1111-1131

5. **Jean-Baptiste Jeannin**, Khalil Ghorbal, Yanni Kouskoulas, Ryan Gardner, Aurora Schmidt, Stefan Mitsch, André Platzer "A Formally Verified Hybrid System for Safe Advisories in the Next-Generation Airborne Collision Avoidance System". *International Journal on Software Tools for Technology Transfer (STTT)*. 2017; 19: 717-741

6. **Jean-Baptiste Jeannin**, Dexter Kozen, Alexandra Silva "Cocaml: Functional programming with regular coinductive types". *Fundamenta Informaticae (FI)*. 2017; 150(3-4): 347-377

7. Carolyn Jane Anderson, Nate Foster, Arjun Guha, **Jean-Baptiste Jeannin**, Dexter Kozen, Cole Schlesinger, David Walker "NetKAT: Semantic Foundations for Networks". *ACM SIGPLAN notices (POPL). Acceptance rate: 23% (51/220)* . 01/2014; 49(1): 113-126

8. Khalil Ghorbal, **Jean-Baptiste Jeannin**, Erik Zawadzki, André Platzer, Geoffrey J. Gordon, Peter Capell "Hybrid Theorem Proving of Aerospace Systems: Applications and Challenges". *Journal of Aerospace Information Systems (JAIS)* . 2014; 11(10): 702-713

9. **Jean-Baptiste Jeannin**, Dexter Kozen "Computing with Capsules". *Journal of Automata, Languages and Combinatorics (JALC)* . 2012; 17(2-4): 185–204

Refereed conference or symposium proceedings papers

1. Mohit Tekriwal, Joshua Miller*, **Jean-Baptiste Jeannin** "Formalization of Asymptotic Convergence for Stationary Iterative Methods". *NASA Formal Methods (NFM), 20 pages*, Moffett Field, CA, United States of America, 06/2024, Accepted, in press

2. Mohit Tekriwal, Avi Tachna-Fram*, **Jean-Baptiste Jeannin**, Manos Kapritsos, Dimitra Panagou "Formally Verified Asymptotic Consensus in Robust Networks". *Tools an dAlgorithms for the Constructions and Analysis of Systems (TACAS), 20 pages* , Luxembourg, Luxembourg, 04/2024, (Journal Quality), Accepted, in press

3. Qinhan Tan, Yonathan Fisseha, Shibo Chen, Lauren Biernacki, **Jean-Baptiste Jeannin**, Sharad Malik, Todd Austin "Security Verification of Low-Trust Architectures". *ACM Conference on Computer and Communications Security (CCS), 15 pages* , Copenhagen, Denmark, 11/2023, (Journal Quality)

4. Hossein Rastgoftar, Xun Liu, **Jean-Baptiste Jeannin** "A Concurrent Switching Model for Traffic Congestion Control". *Modeling, Estimation and Control Conference (MECC), 6 pages, acceptance rate 87% (142/163)*, Lake Tahoe, NV, United States of America, 10/2023

5. Mohit Tekriwal, Andrew W. Appel, Ariel E. Kellison, David Bindel, Jean-Baptiste Jeannin "Verified Correctness, Accuracy, and Convergence of a Stationary Iterative Linear Solver: Jacobi Method". *16th Conference on Intelligent Computer Mathematics (CICM), 16 pages, acceptance rate 74% (23/31)*, Cambridge, United Kingdom, 09/2023, (Journal Quality)

6. Nishant Kheterpal, **Jean-Baptiste Jeannin** "Towards a Study of Performance for Safe Neural Network Training". *6th Workshop on Formal Methods for ML-Enabled Autonomous Systems (FoMLAS), 6 pages*, Paris, France, 07/2023

7. Hammad Ahmad, Zachary Karas, Kimberly Diaz, Amir Kamil, **Jean-Baptiste Jeannin**, Westley Weimer "How Do We Read Formal Claims? Eye-Tracking and the Cognition of Proofs about Algorithms". *International Conference on Software Engineering (ICSE), 13 pages, acceptance rate 26% (208/798)*, Melbourne, Australia, 05/2023, (Journal Quality)

8. Jiawei Chen, José Luiz Vargas de Mendonça*, Shayan Jalili, Bereket Shimels Ayele*, Bereket Ngussie Bekele*, Zhemin Qu*, Pranjal Sharma*, Tigist Shiferaw*, Yicheng Zhang*, **Jean-Baptiste Jeannin** "Synchronous Programming and Refinement Types in Robotics: From Verification to Implementation". *Formal Techniques for Safety-Critical Systems (FTSCS), pages 68-79* , Auckland, New Zealand, 12/2022

9. Nishant Kheterpal, **Jean-Baptiste Jeannin** "Towards a Formalization of the Active Corner Method for Collision Avoidance in PVS". *Formal Techniques for Safety-Critical Systems (FTSCS), 6 pages*, Auckland, New Zealand, 12/2022

10. Ariel Kellison, Mohit Tekriwal, **Jean-Baptiste Jeannin**, Geoffrey Hulette "Towards Verified Rounding Error Analysis for Stationary Iterative Methods". *Workshop on Software Correctness for HPC Applications (Correctness in Supercomputing), pages 10-17*, Dallas, TX, United States of America, 11/2022

11. Nishant Kheterpal, Elanor Tang*, **Jean-Baptiste Jeannin** "Automating Geometric Proofs of Collision Avoidance with Active Corners". *Formal Methods in Computer-Aided Design (FMCAD), pages 1-10, acceptance rate: 45% (40/88)*, Trento, Italy, 10/2022, (Journal Quality)

12. **Jean-Baptiste Jeannin**, Jiawei Chen, José Luiz Vargas de Mendonça*, Konstantinos Mamouras "Work-in-Progress: Towards a Theory of Robust Quantitative Semantics for Signal Temporal Logic". *International Conference on Embedded Software (EMSOFT), Work-in-Progress track, pages 11-12, acceptance rate: 57% (8/14)*, Shanghai, China, 09/2022

13. Heiko Becker, Mohit Tekriwal, Eva Darulova, Anastasia Volkova, **Jean-Baptiste Jeannin** "Dandelion: Certified Approximations of Elementary Functions". *Interactive Theorem Proving (ITP), pages 6:1-6:19, acceptance rate: 47% (31/66)* , Haifa, Israel, 08/2022, (Journal Quality)

14. Haojun Ma, Hammad Ahmad, Aman Goel, Eli Goldweber, **Jean-Baptiste Jeannin**, Manos Kapritsos, Baris Kasikci "Sift: Using Refinement-guided Automation to Verify Complex Distributed Systems". *Usenix Annual Technical Conference (ATC), pages 151-166, acceptance rate: 16% (64/394)* , Carlsbad, CA, United States of America, 07/2022, (Journal Quality)

15. Shibo Chen, Yonathan Fisseha, **Jean-Baptiste Jeannin**, Todd Austin "Twine: A Hardware Design Language for Component-Level Heterogeneous Design". *Design, Automation and Test in Europe Conference (DATE), pages 466-471, acceptance rate: 29% (518/1,794)* , Antwerp, Belgium, 03/2022, (Journal Quality)

16. Hammad Ahmad, **Jean-Baptiste Jeannin** "A Program Logic to Verify Signal Temporal Logic Specifications of Hybrid Systems". *Hybrid Systems: Computation and Control (HSCC), pages 10:1-10:11, acceptance rate: 35% (27/77)*, Online, 05/2021, (Journal Quality)

17. Hossein Rastgoftar, **Jean-Baptiste Jeannin** "A Physics-Based Finite-State Abstraction for Traffic Congestion Control". *American Control Conference (ACC), pages 237-242*, Online, 05/2021

18. Mohit Tekriwal, Karthik Duraisamy, **Jean-Baptiste Jeannin** "A formal proof of the Lax equivalence theorem for finite difference schemes". *NASA Formal Methods (NFM), pages 322-339, acceptance rate: 36% (24/66)*, Online, 05/2021, (Journal Quality)

19. Yuhao Zhang, Sara Shoouri, Joshua Wilhelm, Shayan Jalili, Jiahong Xu, **Jean-Baptiste Jeannin**, Necmiye Ozay "Falsification of Vision-based Automatic Landing". *AIAA SciTech, pages 998-1015* , Online, 01/2021

20. Siyuan He, Ke Du*, Joshua Wilhelm, **Jean-Baptiste Jeannin** "Verification of an Airport Taxiway Path-Finding Algorithm". *Digital Avionics Systems Conference (DASC), pages 1-10*, Online, 10/2020

21. Hossein Rastgoftar, **Jean-Baptiste Jeannin**, Ella Atkins "An integrative behavioral-based physics-inspired approach to traffic congestion control". *Dynamics Systems and Control Conference (DSCC), pages 23-29* , Online, 10/2020

22. Aakash Abhishek, Harry Sood*, **Jean-Baptiste Jeannin** "Formal Verification of Swerving Maneuvers for Car Collision Avoidance". *American Control Conference (ACC), pages 4729-4736, acceptance rate: 67% (835/1,239)*, Online, 07/2020

23. Aakash Abhishek, Harry Sood*, **Jean-Baptiste Jeannin** "Formal Verification of Braking while Swerving in Automobiles". *Hybrid Systems: Computation and Control (HSCC), pages 27:1-27:11, acceptance rate: 39% (29/75)*, Online, 04/2020, (Journal Quality)

24. Kevin Angstadt, **Jean-Baptiste Jeannin**, Westley Weimer "Accelerating Legacy String Kernels via Bounded Automata Learning". *Architectural Support for Programming Languages and Operating Systems (ASPLOS), pages 235-249, acceptance rate: 18% (86/486)*, Lausanne, Switzerland, 03/2020, (Journal Quality)

25. Yuhao Zhang, Guillaume Poupart-Lafarge, Huaiyuan Teng, Joshua Wilhelm, **Jean-Baptiste Jeannin**, Necmiye Ozay, Eelco Scholte "A Software Architecture for Autonomous Taxiing of Aircraft". *AIAA SciTech, pages 139-157* , San Diego, CA, United States of America, 01/2020

26. Yanni Kouskoulas, Aurora Schmidt, **Jean-Baptiste Jeannin**, Daniel Genin, Jessica Lopez "Provably Safe Controller Synthesis Using Safety Proofs as Building Blocks". *International Conference on Software Engineering Research and Innovation (CONISOFT), pages 26-35* , Mexico City, Mexico, 10/2019

27. Haojun Ma, Aman Goel, **Jean-Baptiste Jeannin**, Manos Kapritsos, Baris Kasikci, Karem A. Sakallah "I4: Incremental Inference of Inductive Invariants for Verification of Distributed Protocols". *Symposium on Operating Systems Principles (SOSP), pages 370-384, acceptance rate: 14% (38/276)* , Huntsville, ON, United States of America, 10/2019, (Journal Quality)

28. Hossein Rastgoftar, **Jean-Baptiste Jeannin**, Ella M. Atkins "Formal Specification of Continuum Deformation Coordination". *American Control Conference (ACC), pages 3358-3363, acceptance rate: 64% (948/1,478)*, Philadelphia, PA, United States of America, 07/2019

29. Eytan Adler*, **Jean-Baptiste Jeannin** "Formal Verification of Collision Avoidance for Turning Maneuvers in UAVs". *AIAA Aviation, pages 2845-2852*, Dallas, TX, United States of America, 06/2019

30. Haojun Ma, Aman Goel, **Jean-Baptiste Jeannin**, Manos Kapritsos, Baris Kasikci, Karem A. Sakallah "Towards Automatic Inference of Inductive Invariants". *Workshop on Hot Topics in Operating Systems (HotOS), pages 30-36*, Bertinoro, Italy, 05/2019

31. Kyle D. Julian, Shivam Sharma*, **Jean-Baptiste Jeannin**, **Mykel J. Kochenderfer** "Verifying Aircraft Collision Avoidance Neural Networks Through Linear Approximations of Safe Regions". *Verification of Neural Networks (VNN), 8 pages*, Stanford, CA, United States of America, 03/2019

32. Julie L. Newcomb, Satish Chandra, **Jean-Baptiste Jeannin**, Cole Schlesinger, Manu Sridharan "IoTa: A Calculus for Internet of Things Automation". *Onward!, part of Systems, Programming, Languages and Applications: Software for Humanity (SPLASH), pages 119-133, acceptance rate: 50% (15/30)*, Vancouver, Canada, 10/2017

33. Yanni Kouskoulas, Daniel Genin, Aurora Schmidt, **Jean-Baptiste Jeannin** "Formally Verified Safe Vertical Maneuvers for Non-Deterministic, Accelerating Aircraft Dynamics". *Interactive Theorem Proving (ITP), pages 336-353, acceptance rate: 46% (30/65)*, Brasilia, Brazil, 09/2017, (Journal Quality)

34. Andrei Marian Dan, Manu Sridharan, Satish Chandra, **Jean-Baptiste Jeannin**, Martin T. Vechev "Finding Fix Locations for CFL-Reachability Analyses via Minimum Cuts". *Computer-Aided Verification (CAV), pages 521-541, acceptance rate: 30% (57/191)*, Heidelberg, Germany, 07/2017, (Journal Quality)

35. Arjun Guha, **Jean-Baptiste Jeannin**, Rachit Nigam, Rian Shambaugh, Jane Tangen "Fission: Dynamic Code Splitting for Javascript". *Summit on Advances in Programming Languages (SNAPL), pages 5:1-5:13, acceptance rate: 64% (18/28)*, Asilomarc, CA, United States of America, 05/2017

36. Leonid Ryzhyk, Nikolaj Bjørner, Marco Canini, **Jean-Baptiste Jeannin**, Cole Schlesinger, Douglas B. Terry, George Varghese "Correct by Construction Networks using Stepwise Refinement". *USENIX Symposium on Networked Systems Design and Implementation (NSDI), pages 683-698, acceptance rate: 18% (46/254)*, Boston, MA, United States of America, 03/2017, (Journal Quality)

37. Satish Chandra, Colin Gordon, **Jean-Baptiste Jeannin**, Cole Schlesinger, Manu Sridharan, Frank Tip, Young-il Choi "Type Inference for Static Compilation of JavaScript". *Object-Oriented Programming, Systems, Languages and Applications (OOPSLA), pages 410-429, acceptance rate: 26% (52/203)*, Amsterdam, Netherlands, 11/2016, (Journal Quality)

38. **Jean-Baptiste Jeannin**, Khalil Ghorbal, Yanni Kouskoulas, Ryan Gardner, Aurora Schmidt, Erik Zawadzki, André Platzer "Formal Verification of ACAS X, an Industrial Airborne Collision Avoidance System". *Embedded Software (EMSOFT), pages 127-136, invited paper*, Amsterdam, Netherlands, 10/2015, (Journal Quality)

39. **Jean-Baptiste Jeannin**, Khalil Ghorbal, Yanni Kouskoulas, Ryan Gardner, Aurora Schmidt, Erik Zawadzki, André Platzer "A Formally Verified Hybrid System for the Next-Generation Airborne Collision Avoidance System". *Tools and Algorithms for the Construction and Analysis of Systems (TACAS), pages 21-36, acceptance rate: 24% (36/147)*, London, United Kingdom, 04/2015, (Journal Quality)

40. **Jean-Baptiste Jeannin**, André Platzer "dTL2: Differential Temporal Dynamic Logic with Nested Modalities for Hybrid Systems". *International Conference on Automated Rea- soning (IJCAR), pages 292-306, acceptance rate: 45% (37/83)*, Vienna, Austria, 07/2014, (Journal Quality)

41. **Jean-Baptiste Jeannin**, Dexter Kozen, Alexandra Silva "Language Constructs for Non-Well-Founded Computation". *22nd European Symposium on Programming (ESOP), pages 61-80, acceptance rate: 26% (31/120)*, Rome, Italy, 03/2013

42. **Jean-Baptiste Jeannin**, Guido de Caso, Juan Chen, Yuri Gurevich, Prasad Naldurg, Nikhil Swamy "DKAL*: Constructing Executable Specifications of Authorization Protocols". *Engineering Secure Software and Systems (ESSoS), pages 139-154, acceptance rate: 24% (15/62)*, Paris, France, 02/2013

43. **Jean-Baptiste Jeannin**, Dexter Kozen "Computing with Capsules". *Descriptional Complexity of Formal Systems (DCFS), pages 1-19, invited paper*, Braga, Portugal, 07/2012

44. **Jean-Baptiste Jeannin**, Dexter Kozen "Capsules and Separation". *Logic in Computer Science (LICS), pages 425-430, acceptance rate: 35% (60/171)*, Dubrovnik, Croatia, 06/2012, (Journal Quality)

45. **Jean-Baptiste Jeannin** "Capsules and Closures: a Small-Step Approach". *Logic and Program Semantics: Essays dedicated to Dexter Kozen on the the occasion of his 60th birthday, pages 106-123*, Ithaca, NY, United States of America, 04/2012

46. **Jean-Baptiste Jeannin** "Capsules and Closures". *Mathematical Foundations of Programming Semantics (MFPS XXVII), pages 191-213, acceptance rate: 70% (14/20)*, Pittsburgh, PA, United States of America, 05/2011

47. Heber Herencia-Zapana, **Jean-Baptiste Jeannin**, César Muñoz "Formal Verification of Safety Buffers for State-Based Conflict Detection and Resolution". *27th International Congress of the Aeronautical Sciences (ICAS), pages 9213-9221*, Nice, France, 09/2010

Refereed conference summaries or abstracts

1. <u>Jiawei Chen</u>, <u>José Luiz Vargas de Mendonça</u>*, **Jean-Baptiste Jeannin**, "Bridging the Cyber and Physical with a Verifiable, Executable Language for Robotics", *Lab-to-Real Workshop, International Conference on Robotics and Automation, 3 pages* , London, United Kingdom, 05/2023

2. **Jean-Baptiste Jeannin**, "Programming with Rational Coinductive Streams", *Workshop on ML-family Programming Languages (ML), 3 pages*, Berlin, Germany, 08/2019

3. Leonid Ryzhyk, Nikolaj Bjorner, Marco Canini, **Jean-Baptiste Jeannin**, Nina Narodytska, Cole Schlesinger, Douglas B. Terry, George Varghese, "Towards Correct-by-Construction Software Defined Networks", *ACM SIGCOMM Workshop on Networking and Programming Languages (NetPL), 1 page*, Salvador, Brazil, 08/2016

Book reviews

1. **Jean-Baptiste Jeannin**, "Formal Verification of Control System Software", Pierre-Loic Garoche, 2018

Other submitted publications

1. <u>Mohit Tekriwal</u>, <u>Joshua Miller</u>*, **Jean-Baptiste Jeannin**, "Formalization of Asymptotic Convergence for Stationary Iterative Methods", *submitted to Certified Programs and Proofs (CPP) 2024*, 01/2024

2. <u>Mohit Tekriwal</u>, <u>Avi Tachna-Fram</u>*, **Jean-Baptiste Jeannin**, Manos Kapritsos, Dimitra Panagou, "Formally verified asymptotic consensus in robust networks", *submitted to Tools and Algorithms for the Construction and Analysis of Systems (TACAS) 2024* , 10/2023

Total number of invited presentations
21

Invited presentations (List the top 10 most important invited talks.)

1. "Formal Verification in Scientific Computing", Correctness in Scientific Computing, Orlando, FL, Keynote speaker, 06/2023

2. "Temporal reasoning and aircraft collision avoidance", United Technologies Research Center seminar, Berkeley, CA, 01/2020

3. "Temporal reasoning and aircraft collision avoidance", United Technologies Research Center seminar, Farmington, CT, 11/2019

4. "Programming with Rational Coinductive Types", MidWest Programming Languages Seminar, Purdue University, 09/2019

5. "Temporal reasoning and aircraft collision avoidance", JHU/APL seminar, Bethel, MD, 08/2019

6. "Temporal reasoning and aircraft collision avoidance", Cambridge University seminar, Cambridge, UK, 06/2019

7. "Temporal reasoning and aircraft collision avoidance", Dynamical Systems Workshop, Moorea, 06/2019

8. "Verifying Neural Networks forAircraft Collision Avoidance", CPS Verification and Validation workshop, Carnegie Mellon University, Pittsburgh, PA, 12/2018

9. "Formal Verification of ACAS X", NASA Langley seminar, Langley, VA, 11/2018

10. "Temporal reasoning and aircraft collision avoidance", INRIA Rennes seminar, Rennes, France, 08/2018

Technology Transfer and Entrepreneurship

Industry interactions

1. Collins Aerospace: interactions on formal verification for autonomous aerospace systems, in particular with Eelco Scholte and Darren Cofer, with several grants from Collins Aerospace from 2018 to 2020.

2. Toyota Research Institute: interactions on formal verification for automotive trajectories, in particular with Nikos Aréchiga, with grants from Collins Aerospace from 2018 to 2020.

3. NASA Langley: interactions with the formal methods group at NASA Langley Research Center (César Muñoz, Aaron Dutle, Tanner Slagel, Laura Titolo), with a NASA fellowship sponsored by this team from 2020 to 2023.

4. Amazon Web Services: interactions with the formal verification team of Dimitra Giannakopoulou and the Automated Reasoning group, leading to an Amazon Research Award in 2022.

5. Raytheon: ongoing interactions with Timothy Wang, with invited talks at two of their research centers in November 2019 and January 2020.

6. Applied Physics Laboratory (JHU APL): extensive interactions on the ACAS X work, with several co-authored papers over the years, especially with Yanni Kouskoulas, Ryan Gardner and Aurora Schmidt. Invited talk in August 2019.

7. Federal Aviation Administration (FAA): extensive interactions over the ACAS X work, whose design is led by the FAA, especially with Neal Suchy of the TCAS program office.

8. Boeing: discussions with Eric Muir and Dragos Margineantu, cut short after internal Boeing management changes.

9. Radiance Technologies: discussions on automating theorem proving, in particular with Andrew Gardner and Adam Hellmers, leading to a DARPA grant written together in June 2023.

10. Peraton Laboratories: discussions on automating theorem proving, in particular with Ray Chen, leading to a DARPA grant written together in June 2023.

11. Skyramp, Inc.: Interactions with Nithin Michael on testing infrastructure, and programming languages consulting.

Outreach directly related to research

1. African Undergraduate Research Adventure (AURA): I have hosted 5 undergraduates from Ethiopia for summer research internships as part of the AURA: one in 2020 (online), two in 2021 (online), one in 2022 (in person) and one in 2023 (in person).

Service

Significant service assignments

Department

1. member, Undergraduate Committee, 01/2021 - Present

2. member, DEI committee, 09/2019 - 2021

3. member, Graduate committee, 10/2018 - 2021

4. member, Aerospace Computing Curriculum Committee, 09/2017 - 2018

College

1. Member, Computing Curriculum Committee, 09/2021 - 2022

2. College of Engineering Representative, 23 times for Computer Science and Engineering: once in 2018, 3 times in 2019, 8 times in 2020, 3 times in 2021, 4 times in 2022, 4 times in 2023, 01/2018 - Present

Service to government or professional organizations, and service on review board/study panels

1. PC Member, PLDI 2026, 2026

2. Technical Program Chair, Software, SciTech 2024, 2024

3. Associate Editor, Journal of Aerospace Information Systems, 2023 - Present

4. PC Member, EMSOFT 2023, 2023

5. PC Member, FMICS 2023, 2023

6. Reviewer, Software and Hardware Foundations (SHF) Small, National Science Foundation, 2023

7. PC Member, CAV 2022, 2022

8. PC Member, HSCC 2022, 2022

9. Reviewer, Journal of Automated Reasoning, 2021 - Present

10. Reviewer, Journal of Functional Programming, 2021 - Present

11. PC Member, CSL 2021, 2021

12. PC Member, CAV 2021, 2021

13. PC Member, HSCC 2020, 2020

14. PC Member, RAMiCS 2020, 2020

15. PC Member, ICCPS 2020, 2020

16. PC Member, NFM 2020, 2020

17. PC Member, EMSOFT 2020, 2020

18. PC Member, FoMLAS 2020, 2020

19. Panel Member, Software and Hardware Foundations (SHF) Small, National Science Foundation, 2020

20. PC Member, HSCC 2019, 2019

21. PC Member, ITP 2019, 2019

22. PC Member, FoMLAS 2019, 2019

23. PC Member, EMSOFT 2019, 2019

24. PC Member, RAMiCS 2018, 2018

25. Reviewer, Software and Hardware Foundations (SHF) CISE Research Initiation Initiative (CRII), National Science Foundation, 2018

26. PC Member, RAMiCS 2017, 2017

27. PC Member, ICE 2015, 2015

28. Reviewer, Journal of Aerospace Information Systems, 2014 - Present