

CLAUDIA CAULI, PhD

Automated Reasoning | Formal Methods Lead | Huawei Cloud Reliability Lab

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PERSONAL SUMMARY

Scientist specializing in **software correctness**, systems reliability, and provable assurance. I integrate **automated reasoning** and formal methods into software systems—including AI and agentic pipelines—to build software that is provably correct and trustworthy, particularly where bugs are costly or carry regulatory or criminal liabilities. 9+ years spanning research, engineering, and technical leadership. I lead the Formal Methods team in Huawei's Cloud Reliability Lab, where our work has shipped to production and prevented critical bugs in core cloud services. Published at CAV, KR, IJCAR, and EuroSys. PC member of CAV & TACAS. Co-organizing a Dagstuhl seminar on neurosymbolic reasoning. Recipient of Huawei's Individual Gold Medal 2025, awarded to the **top 1%** of employees globally.

PROFESSIONAL EXPERIENCE

06/2024 - *current* **Formal Methods Lead (Expert B)** Huawei Cloud Reliability Lab

- Built a Formal Methods team in Dublin (3 scientists) and **led a cross-region team of 6** (incl. 3 matrixed engineers in China HQ); set verification methodology and strategic direction for critical cloud infrastructure reliability; drove adoption with product-line stakeholders.
- Unblocked the launch of Huawei Cloud's IAM bounded privilege-escalation analysis by designing and co-developing the Rust preprocessing engine that prunes unreachable policy statements and partitions the state space into permissiveness-keyed equivalence classes. With SMT optimizations, took analysis from timeouts to sub-second at scale, a **50–2700x** speed-up, making it commercially viable. Identified and fixed 7 soundness bugs. Proved reduction soundness in Lean 4. Shipped to two China regions.
- Led TLA⁺, P, and Gobra verification of Huawei Cloud KVS's transaction and replication protocols and GSLB's P2P and sharder logic; prevented **4 critical atomicity bugs** from reaching production and surfaced one major **load-imbalance bug** in the sharder.
- Found **15 bugs** (4 high-severity) in DPDK's data-plane eBPF validator via fuzzing, bounded model checking (CBMC/ESBMC), and deductive verification (Frama-C/WP), driven by AI-assisted agentic workflows.
- **Envisioned** a multi-modal Cloud reasoning agent unifying natural language, configuration, and code. Drove four AI+FM prototypes pairing code agents with AR tools; built two hands-on (*Billing Rules Red-teaming*; *Code2Model Extraction*, run on TiKV and Redis); scoped two as team OKRs (*C Verification Agent*, autonomously reproducing the eBPF-validator bugs above; *NL2Code Conformance*).
- Hired and **developed** across seniority levels, growing two members into project leads. Team won Ireland Research Center's Outstanding Contribution Team Award.

10/2021 - 06/2024 **Applied Scientist** AWS Automated Reasoning Group

- Built a domain-specific language, with a compiler and automated-reasoning backends (**Tamarin** and **Boogie**), to model AWS service designs and detect privilege-escalation vulnerabilities; partnered with AppSec and product teams to capture security requirements as verifiable properties.
- Diagnosed a subtle distributed-systems bug surfaced by **P** and identified its root cause.
- Mentored 5 junior team members. Interviewed 19 candidates.

07/2019 - 09/2019 **SDE Intern** AWS AppSec & ARG

Automated the pre-deployment static analysis of IaC templates for detecting security misconfigurations.

04/2018 - 06/2018 **SDE Intern** AWS AppSec & ARG

Worked on knowledge representation, reasoning, and ontologies for machine-readable threat models.

EDUCATION

- 10/2016 - 09/2021 **CS PhD** Chalmers University & University of Gothenburg (Sweden)
- 09/2015 - 09/2016 **MSc in Advanced Computational Methods**, University of Leicester (UK)
- 10/2013 - 07/2015 **BSc in Computer Science**, Università di Cagliari (Sardinia, Italy)

SKILLS & TECHNOLOGIES

Solvers & Automated Reasoning: Z3, CVC5, Tamarin

Proof Assistants & Deductive Verification: Lean 4, Dafny, Frama-C/WP, Boogie, Viper, Gobra

Model Checking: CBMC, ESBMC, Kani

Model-based Specification: TLA⁺, P

AI for Reasoning: LLM-guided proof search & autoformalization, Claude Code / agentic workflows

Programming: Rust, Go, Python, Java, C++, Bash, Git

Domains: Automated Reasoning, Cloud Infrastructure & Security, IAM, Distributed Systems, Network Protocols

EVENTS & SERVICE

PC Member [CAV 2025](#), [TACAS 2024](#), [CAV 2023](#)

Co-organizer Dagstuhl “Neurosymbolic Reasoning About Policies and Legal Texts” 2026

Participant Dagstuhl “Resilient Software Configuration and Infrastructure Code Analysis” 2023

PATENTS & PUBLICATIONS

1. Cauli C, et al. *Lessons Learned from Incorporating Formal Methods in Huawei Cloud Reliability*. EuroSys 2026 [🔗](#)
2. Cauli C, Ortiz M, Piterman N. *Actions over Core-closed Knowledge Bases*. IJCAR 2022 [🔗](#)
3. Cauli C, Ortiz M, Piterman N. *Closed- and Open-world Reasoning in DL-Lite for Cloud Infrastructure Security*. KR 2021 [🔗](#)
4. Cauli C, Li M, Piterman N, Tkachuk O. *Pre-Deployment Security Assessment for Cloud Services through Semantic Reasoning*. CAV 2021 [🔗](#)
5. Cauli C, Piterman N. *Equivalence of μ^p -Calculus and p -Automata*. CIAA 2017 [🔗](#)
6. Cauli C. *Pre-deployment Description Logic-based Reasoning for Cloud Infrastructure Security*. PhD Thesis, 2022 [🔗](#)
7. Tkachuk O, Cauli C, Rungta N, Bolignano P V, Hortala J R, Maher S. *Automatically generating a machine-readable threat model using a template associated with an application or service*. US Patent 11,128,653. Assignee: Amazon Technologies Inc [🔗](#)