

Abhiroop Sarkar

 abhiroop.sarkar@inf.ethz.ch
 <https://abhiroop.github.io/>

 <https://github.com/Abhiroop>

 sarkarabhiroop

 Google Scholar

Education

Jan 2019 – Mar 2024

- **Ph.D., Chalmers University, Sweden** (Defense date: 27.03.2024)
Thesis title: *Functional Programming for Securing Cloud and Embedded Environments.*

- Presented a Haskell-based domain-specific language for programming Trusted Execution Environments (such as Intel SGX), with robust confidentiality and integrity guarantees enforced through Information Flow Control Mechanisms.
- Presented a functional language runtime and a strongly typed, pure functional language with real-time capabilities, specifically designed for resource-constrained microcontrollers.

Jan 2019 – Apr 2022

- **Licentiate of Engineering, Chalmers University, Sweden**
Thesis title: *Functional Programming for Embedded Systems.*
The Swedish Licentiate Degree, conferred after a defense occurring halfway through the PhD program, is considered equivalent to a UK MPhil.

Aug 2017 – Sept 2018

- **M.Sc. Computer Science, University of Nottingham, UK**
Thesis title: *Superword Level Parallelism in the Glasgow Haskell Compiler.*
UK 1st Class, Distinction. Awarded Best CS Dissertation of 2017-18.

June 2010 – Dec 2014

- **M.Sc (Hons) Mathematics, BITS Pilani, India**
Thesis title: *A Bayesian Classifier-based Multi-Tenant Recommendation Engine.*

Research Interests

- **Programming Languages** Design and implementation of compilers, runtimes, type-systems, memory managers, code generators (LLVM), functional programming, Haskell, WebAssembly
- **Security** Language-based Information Flow Control, programming model and applications of Trusted Execution Environments (Intel SGX, ARM TrustZone), Attestation protocols
- **Formal Methods** Certified programming with proof assistants like Coq and EasyCrypt, Model checking tools like SPIN and TLA+, Lightweight formal methods like QuickCheck

Research Publications

- 1 A. Sarkar, D. Traytel, and D. Basin, “Monadic Inlined Reference Monitors,” Under submission to PLDI 2026.
- 2 A. Sarkar, *Functional Programming for Securing the Cloud and Embedded Environments*, PhD Thesis at Chalmers Tekniska Hogskola (Sweden), 2024.  URL: https://abhiroop.github.io/pubs/Abhiroop_PHD_Thesis.pdf, Accepted by the Grading Committee; Defense date - 27.03.2024.

- 3 A. Sarkar and A. Russo, "HasTEE+ : Confidential Cloud Computing and Analytics with Haskell," *CoRR*, vol. abs/2401.08901, 2024.  DOI: 10.48550/ARXIV.2401.08901. arXiv: 2401.08901, Under submission.
- 4 A. Sarkar, R. Krook, A. Russo, and K. Claessen, "HasTEE: Programming Trusted Execution Environments with Haskell," in *Proceedings of the 16th ACM SIGPLAN International Haskell Symposium, Haskell 2023, Seattle, WA, USA, September 8-9, 2023*, T. L. McDonell and N. Vazou, Eds., ACM, 2023, pp. 72–88.  DOI: 10.1145/3609026.3609731.
- 5 A. Sarkar, *Functional Programming for Embedded Systems*, Licentiate Thesis at Chalmers Tekniska Hogskola (Sweden), 2022.  URL: https://research.chalmers.se/publication/529325/file/529325_Fulltext.pdf, (accessed: 18.02.2024).
- 6 A. Sarkar, B. J. Svensson, and M. Sheeran, "Synchron - An API and Runtime for Embedded Systems," in *36th European Conference on Object-Oriented Programming, ECOOP 2022, June 6-10, 2022, Berlin, Germany*, K. Ali and J. Vitek, Eds., ser. LIPIcs, vol. 222, Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2022, 17:1–17:29.  DOI: 10.4230/LIPICS.ECOOP.2022.17.
- 7 A. Sarkar, R. Krook, B. J. Svensson, and M. Sheeran, "Higher-Order Concurrency for Microcontrollers," in *MPLR '21: 18th ACM SIGPLAN International Conference on Managed Programming Languages and Runtimes, Münster, Germany, September 29-30, 2021*, H. Kuchen and J. Singer, Eds., ACM, 2021, pp. 26–35.  DOI: 10.1145/3475738.3480716.
- 8 A. Sarkar and M. Sheeran, "Hailstorm: A Statically-Typed, Purely Functional Language for IoT Applications," in *PPDP '20: 22nd International Symposium on Principles and Practice of Declarative Programming, Bologna, Italy, 9-10 September, 2020*, ACM, 2020, 12:1–12:16.  DOI: 10.1145/3414080.3414092.
- 9 A. Sarkar, *Superword-level Parallelism in the Glasgow Haskell Compiler*, Masters Thesis at University of Nottingham (UK), 2018.  URL: https://abhiroop.github.io/pubs/Abhiroop_Masters_Thesis.pdf, (accessed: 18.02.2024).

Work Experience

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| Aug 2024 - Present |  ETH Zürich, Postdoctoral Researcher Part of the Information Security Group, working on runtime security monitoring and type-theoretic techniques like intrinsic typing to enforce compiler correctness. |
| Mar-July, 2018 |  Haskell.org, Contract Developer. Added support for SIMD instruction to the Glasgow Haskell Compiler code generator and runtime. |
| Mar-June, 2017 |  TypeLead Inc, Senior Software Engineer. Involved in the design and implementation of Eta, a Haskell dialect that runs on top of the JVM. |
| May 2016 - Feb 2017 |  Quintype, Software Engineer. Design and implementation of the OLAP analytics platform of Quintype, written in Clojure, a Lisp dialect on the JVM. |
| Nov 2015 - Apr 2016 |  Trestor Inc, Software Engineer. Design and implementation of the Trestor cryptocurrency protocol. |
| Dec 2014 - Nov 2015 |  Capillary Technologies, Software Engineer. Design and implementation of an Apache Mahout based Recommendation Engine. |

Miscellaneous Experience

Awards and Achievements

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| Nov 2022 |  Chalmerska Forskningsfonden 2022 scholarship winner |
| Aug 2018 |  Best CS Dissertation 2018 Prize Announcement |

Miscellaneous Experience (continued)

- July 2018 ■ **MaRIONet Manycore Summer School 2018** Best Poster Winner
- Mar - July 2018 ■ **Google Summer of Code 2018** Selected candidate for working with Haskell.org
- Mar - July 2013 ■ **Google Summer of Code 2013** Selected candidate for working with Reactome

Seminars/Training schools

- Oct - Nov 2022 ■ PhD Seminar on Differential Privacy - Theory and Verification, Gothenburg.
- July 2022 ■ Scottish Summer School on Programming Languages and Verification, Edinburgh.
- July 2019 ■ Summer School on Advanced Computer Architecture and Compilation for High-performance Embedded Systems, Fiuggi.
- July 2018 ■ MaRIONet Manycore Summer School, Glasgow.
- Apr 2018 ■ Midland Graduate School, Nottingham.

Research Visits

- Dec 2023 ■ **ETH Zurich** Invited visit for 2 weeks hosted by Professor David Basin
- Jul 2023 ■ **University of Cambridge** Invited visit for 2 days hosted by Alexandre Joannou
- Mar - June 2023 ■ **University of Glasgow** Summer Research visit hosted by Jeremy Singer

Invited Presentations

- Mar 2024 ■ Presenting remotely at the LSD Seminar University of California, Santa Cruz
- Dec 2023 ■ Presented at the Information Security Group seminar at ETH Zurich
- Mar 2023 ■ Invited talk at CHERI Technical Workshop 2023, Glasgow
- Feb 2023 ■ Guest Lecture at the Advanced Functional Programming course at Chalmers
- Jan 2023 ■ Invited poster for the Cybernode Cybersecurity Conference, Stockholm

Teaching Experience

- 2025 ■ Teaching Assistant, Formal Methods and Functional Programming
Teaching Assistant, Applied Security Lab
- 2019 - 2023 ■ Teaching Assistant, Introduction to Functional Programming
- 2019 - 2022 ■ Teaching Assistant, Principles of Concurrent Programming
- 2019 - 2021 ■ Teaching Assistant, Data Structures and Algorithms
- 2022 - 2023 ■ Teaching Assistant, Computer Scientist in the Society
- 2019 ■ Teaching Assistant, Domain Specific Languages of Mathematics

References

- Professor Mary Sheeran Available on request
- Professor Alejandro Russo Available on request