STEPHEN NICHOLAS SWATMAN

PERSONAL DETAILS

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PROFILE

I am a computer scientist and programmer with an interest in high-performance computing and a passion for engaging and instructing others. I enjoy working on the edge between computer science and high energy physics. I am committed to sharing knowledge and ensuring people have free and open access to information and I am an advocate of intellectual freedom and free software.

SELECTED PUBLICATIONS

ICPE 2024

Swatman, S. N., Varbanescu, A. L., Pimentel, A., Salzburger, A., & Krasznahorkay, A. (2024, May). Using Evolutionary Algorithms to Find Cache-Friendly Generalized Morton Layouts for Arrays. In *Proceedings of the 2024 ACM/SPEC International Conference on Performance Engineering*.

ICPE 2023

Swatman, S. N., Varbanescu, A. L., Pimentel, A., Salzburger, A., & Krasznahorkay, A. (2023, April). Systematically Exploring High-Performance Representations of Vector Fields Through Compile-Time Composition. In *Proceedings of the 2023 ACM/SPEC International Conference on Performance Engineering* (pp. 55-66). ⋆ Nominated as Candidate to the Best Paper Award, awarded with ACM Artifacts Available and ACM Artifacts Evaluated badges.

MASCOTS 2022

Swatman, S. N., Varbanescu, A. L., Krasznahorkay, A., & Pimentel, A. (2022, October). Modelling Performance Loss due to Thread Imbalance in Stochastic Variable-Length SIMT Workloads. In *Proceedings of the 30th International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS)* (pp. 137-144). IEEE. ⋆ Best Presentation award at CompSys 2022 (talk based on aforementioned paper).

ACAT 2021

Swatman, S. N., Krasznahorkay, A., & Gessinger, P. (2023, February). Managing Heterogeneous Device Memory Using C++17 Memory Resources. In *Journal of Physics: Conference Series* (Vol. 2438, No. 1, p. 012050). IOP Publishing.

EDUCATION

2020 – Current CERN & University of Amsterdam

PhD

I worked at the European Organization for Nuclear Research (CERN) as a doctoral student associated with the University of Amsterdam. I developed high-performance heterogeneous algorithms for track reconstruction problems in high-energy physics experiments and I produced a fully heterogeneous algorithm chain to convert raw data to useful physics results. I was also engaged in education, training, and I worked to make HPC more accessible to domain scientists.

2016 – 2019 Vrije Universiteit Amsterdam

Master

I completed a master's degree in computer science specialised in big data engineering. My degree is a joint degree between the Vrije Universiteit Amsterdam and the University of Amsterdam. I conducted research on high-performance computing at the National Institute for Subatomic Physics (Nikhef), and I worked on the CERN ATLAS experiment software in the group of dr. Wouter Verkerke (Nikhef), under the supervision of dr. Ana Varbanescu (UvA) and dr. Peter Kluit (Nikhef). I graduated with a grade point average of 8.5 (US GPA equivalent 4.0).

2013 – 2016 University of Amsterdam

Bachelor

I completed a bachelor's degree in computer science with a minor in the intelligence studies and economics. I conducted research on combinatorial timetable optimisation problems under the supervision of dr. Leen Torenvliet (UvA). I graduated with honours (*cum laude*) and a grade point average of 8.6 (US GPA equivalent 4.0).

2007 – 2013 Cygnus Gymnasium

High School

I followed a gymnasium education with a double profile in natural sciences, health, and technology, with Latin as ancient language as well as German and computer science.

RELEVANT WORKING EXPERIENCE

2024 – Current Experienced Graduate Researcher, CERN

I worked an expert scientific software developer in the CERN QUEST programme for experienced graduates. In this capacity, I developed high-performance algorithms for GPGPU-based track reconstruction. I also worked extensively on analytical and statistical models of application performance in order to guide optimisation.

2020 – 2020 Software Developer, CERN

I worked to improve the computational performance of software for the ATLAS high energy physics experiment at CERN, developing high performance particle track fitting software to meet the requirements of planned high luminosity Large Hadron Collider upgrades. I also work on the thread safety and performance of very large code bases in multi-threaded environments.

2020 – 2020 Researcher, University of Amsterdam

I wrote software for *TeamPlay*, a Horizons 2020 project aiming to simplify the development of real-time systems based on non-functional properties. I co-developed the *methane* metaprogramming toolchain which generates efficient cross-platform high-level code for assembling real-time applications from components arranged in data flow graphs.

2014 – 2023 TA and Tutor, University of Amsterdam

I assisted students in computer science courses at both a bachelor's and master's levels. I taught current programming styles and methodologies, as well as theoretical aspects in both a personal and a group setting. I was a personal coach and tutor of a small to medium-sized group of first and second year bachelor's students. I taught students academical competencies such as writing, working in teams and technical skills such as LaTeX.

2014 – 2014 Programmer, Sponiza IT

I developed extensions for the OpenCart webshop system in the context of a large, non-conventional web store project. I programmed in the MVC model and processed monetary transactions and data, including automatic generation of invoices both internally and using external invoice services.

FURTHER ACTIVITIES

2023 – Current **Tour Guide & Science Show Presenter, CERN**

I am a certified and active tour guide for the *Synchrocyclotron* (SC), *ATLAS Visitor Center* (AVC), *Linac2*, *Data Center*, and *Antiproton Decelerator* (AD) visit points at CERN. I am also a certified presenter for (popular science) *Science Shows* aimed at large audiences aged 6–19.

AREAS OF INTEREST

High performance computing Scientific computing
Programming languages Compiler design Functional programming
Theoretical foundations Category theory Code quality assurance

COMPETENCIES

Languages C, C++, Python, Haskell, Rust, Bash, Zsh, Java, SQL, LaTeX, Markdown, Piet, Agda

HPC CUDA, SYCL

System Operation Linux, nginx, PostgreSQL, supervisord, Docker, Slurm

Tooling git, GNU make, CMake, gdb, Intel VTune, perf, NVIDIA Nsight

Web Django

OTHER

Awards
2022 · Best presentation award at CompSys 2022
2023 · Candidate to the best paper award at ICPE 2023
2024 · Second place in the PASC 2024 ACM Student Research Competition

Schools
2021 · ACM Europe Summer School on HPC Computer Architectures for AI and Dedicated Applications
2022 · University of Western Ontario HoTTEST Summer School on Homotopy Type Theory
2024 · ASCI A30 – Rings and Finite Fields in Modern Cryptography

Certifications
LFS101x · Introduction to Linux
SIG · Building Maintainable Software

Memberships
2014 – Current · Linux Foundation
2016 – Current · Free Software Foundation
2016 – Current · Free Software Foundation Europe
2021 – Current · Association for Computing Machinery (ACM)
2021 – Current · Institute of Electrical and Electronics Engineers (IEEE)

Driving Licenses November 2015 · Dutch *Rijbewijs* B (cars) and AM (scooters)

Languages
Dutch · Native (C2)
English · Native (C2)
German · Intermediate (B2)
French · Intermediate (B1)
Finnish · Basic (A1)

Notable Talks
Doctoral Showcase poster & talk at SC 2023
ACM Student Research Competition poster & talk at PASC 2024

Service Student volunteer at *International Conference for High Performance Computing, Networking, Storage and Analysis* (SC) 2021, 2022, and 2023

Reviewer for *Simulation Modelling Practice and Theory* (SIMPAT)
Reviewer for *Performance, Portability & Productivity in HPC* (P3HPC) 2022
Reviewer for *International Conference on Supercomputing* (ICS) 2022
Reviewer for *International Conference on Parallel Processing* (ICPP) 2023
Reviewer for *Symposium on New Ideas in Programming and Reflections on Software* (Onward!) 2023
Reviewer for *International Symposium on the Modeling, Analysis, and Simulation of Computer and Telecommunication Systems* (MASCOTS) 2023
Program Committee member for *Symposium On Applied Computing: Machine Learning and Its Applications* (SAC MLA) 2024
Artifact Evaluation Committee member for *International Symposium on Code Generation and Optimization* (CGO) 2024
Artifact Evaluation Committee member for *International Conference on Performance Engineering* (ICPE) 2024
Technical Program Reproducibility Committee member for *International Conference for High Performance Computing, Networking, Storage and Analysis* (SC) 2024
Program Committee member for *International Conference on Supercomputing* (ICS) 2024
Artifact Evaluation Committee member for *International Conference on Parallel Processing* (ICPP) 2024
Artifact Evaluation Committee member for *International Symposium on Code Generation and Optimization* (CGO) 2025

August 23, 2024