Adam Šmelko

📞 +420 777 631 137   📞 +421 902 714 534

✉ adamsmelko1@gmail.com   in linkedin.com/in/adam-smelko   ⭘ github.com/asmelko
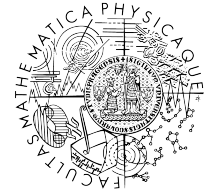
Education

PhD. in Computer Science   Expected Sep 2024

Charles University   *Prague, Czech Rep.*

- General-purpose computing on GPUs, High-performance computing, Memory performance optimizations

Master of Computer Science   2020

Charles University   *Prague, Czech Rep.*

- Software Engineering

Bachelor of Computer Science   2018

Charles University   *Prague, Czech Rep.*

- Software Engineering

Work Experience

Pure Storage   Dec 2020 – Jan 2023, Sep 2023 - *present*

Member of Technical Stuff   *Prague, Czech Rep.*

- **Technologies and Skills**: C++, Java, Python, SMB, TCP/IP, File Systems, Optimizations, Parallel programming
- Designed and developed scalable implementation of SMB operations handling thousands of concurrent users with low latency. Led efforts to automate performance benchmarking and coverage tests.

Broadcom   Feb 2019 – Nov 2020

R&D Developer   *Prague, Czech Rep.*

- **Technologies and Skills**: C++, CMake, HLASM, ANTLR, LSP
- Part of a university software project team in collaboration with Broadcom developing VSCode extension for modern development in High Level Assembler by IBM (semantic highlighting, visual debugger, …).

Academic Internships

Barcelona Supercomputing Center (BSC)   May 2023 – Aug 2023

Junior Technician in Computational Biology   *Barcelona, Spain*

- **Technologies and Skills**: C++, CMake, OpenMP, OpenCL, CUDA
- Led the development of highly optimized CPU/GPU implementation of a physics-based simulator.

Institut Curie   Feb 2023 – Apr 2023

Study Engineer   *Paris, France*

- **Technologies and Skills**: C++, CMake, cuSPARSE, cuSOLVER, NVRTC, NVJITLINK
- Ported tools for analysis of Boolean networks to GPUs employing sparse linear algebra and Monte Carlo-based simulations.

Projects

`MaBoSSG` - **The GPU implementation of MaBoSS tool**   *Associated with Institut Curie*

- Designed and developed CUDA implementation of MaBoSS tool, using runtime compilation to store and process Boolean formulae efficiently.
- Achieved speedup of over $300\times$ compared to parallel CPU version, allowed to analyze models with a higher number of nodes and trajectories, and made mutants analysis more feasible.
- **GitHub Link:** ⭘ github.com/asmelko/MaBoSSG

`paraPhysiCell` - **The optimized parallel implementation of PhysiCell core features**   *Associated with BSC*

- Analyzed, researched, and developed highly efficient *serial* implementation of diffusive transport solver BioFVM, promoting memory access optimizations and vectorization. Further, employed OpenMP for trivial parallelism and incorporated it in also optimized 3D agent-based simulator Physicell.
- Optimizing for memory accesses brought speedup of over $30\times$ compared to the prior state-of-the-art.
- **GitHub Link:** ⭘ github.com/asmelko/paraPhysiCell

Technical Skills

Languages: C, C++, C#, Java, Python, R, CSS, JavaScript, PHP
Technologies: CUDA, OpenCL, OpenMP, ANTLR, ER, UML, SQL, noSQL, XPath, XSLT, XQuery
Concepts: Compilers, Optimizations, HPC, GPGPU, Software Engineering, Agile Methodology

Social Engagements

Teaching: Practical courses of *Introduction to C++* and *Computer Systems*
Volunteer: at Microsoft ESPC'19
Organization: committer at Eclipse Foundation
Sports: Trail running, mountain biking, chess

Publications

[1]   Adam Šmelko, Miroslav Kratochvíl et al. "GPU-Accelerated Mahalanobis-Average Hierarchical Clustering Analysis". In: *European Conference on Parallel Processing*. Springer. 2021, s. 580–595.

[2]   Adam Šmelko, Martin Kruliš et al. "Astute Approach to Handling Memory Layouts of Regular Data Structures". In: *International Conference on Algorithms and Architectures for Parallel Processing*. Springer. 2022, s. 507–528.

[3]   Jiří Klepl, Adam Šmelko et al. "Pure C++ Approach to Optimized Parallel Traversal of Regular Data Structures". In: *Proceedings of the 15th International Workshop on Programming Models and Applications for Multicores and Manycores*. 2024, s. 42–51.

[4]   Adam Šmelko, Miroslav Kratochvíl et al. "Maboss for HPC environments: implementations of the continuous time Boolean model simulator for large CPU clusters and GPU accelerators". In: *BMC bioinformatics* 25 (2024).

[5]   Adam Šmelko, Martin Kruliš a Jiří Klepl. "GPU-acceleration of neighborhood-based dimensionality reduction algorithm EmbedSOM". In: *16th Workshop on General Purpose Processing Using GPU*. Association for Computing Machinery, 2024, s. 13–18.

Ongoing Work

[1]   Adam Šmelko, Soňa Molnárová et al. "Scalable semi-supervised dimensionality reduction with GPU-accelerated EmbedSOM". In: *arXiv preprint arXiv:2201.00701* (2022).

[2]   Jiří Klepl, Adam Šmelko et al. "Abstractions for C++ Code Optimizations in Parallel High-performance Applications". In: *The first review round in Parallel Computing* (*).

[3]   Karel Maďera, Adam Šmelko a Martin Kruliš. "Efficient GPU-accelerated Parallel Cross-correlation". In: *The second review round in Journal of Parallel and Distributed Computing* (*).