Richard Hladík

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A second-semester student of the Computer science MSc programme at ETH Zürich. Theoretical computer scientist at heart, but currently also trying to gain experience in more practical fields, such as ML, bioinformatics, operation research or software engineering. Open source enthusiast. I love pushing the boundaries of human knowledge and creating new and meaningful things, especially in a group of similarly passionate people.

Education

SEPT. 2021–NOW	MSc in Computer science, **ETH Zürich** *(expected graduation: March 2024)*
	GPA of 5.56 (out of 6.00) after the second semester
SEPT. 2017–JUNE 2021	Bc. in Computer science, **Charles University**, Prague
	perfect grades (GPA of 1.00) throughout the studies and 224 ECTS credits

Experience

Student Researcher (MAR. 2020–JUN. 2021) – *Charles University, Prague.*
- Algorithm research in **networks flows** and **convex optimisation**. Basis for my bachelor's thesis.
- **Constructed** new **algorithms** and investigated properties of both them and their underlying combinatorial structure, in close collaboration with my supervisor. Also verified our intuitions practially (C++, Python).
- Proposed two **new combinatorial algorithms** for the multicommodity flow (MCF) problem.
- **Improved the state of the art** convergence for combinatorial MCF algorithms from polynomial to logarithmic for instances with small inflation rate.

Student Researcher (JUNE 2018–DEC. 2020) – *Czech Technical University, Prague.*
- Optimisation research in **scheduling**.
- **Proved NP-hardness** of a new periodic scheduling problem, proposed, discussed, **developed** (C++) and tested several **heuristics** for it. Wrote auxiliary tools (e.g. instance visualiser) in the process.
- **Decreased** the approximation error **10 times** compared to the base implementation.

Projects

Lab Project (MAR. 2022–NOW), *ETH Zürich* – an optimised implementation of belief propagation.
- A four-person team project focusing on **writing fast C code**.
- Achieved **100–500× speedup:** 80–250× due to optimisations in the underlying algorithm and 1.3–2× due to vectorisation, better cache locality, memory compaction etc.

Outotune (FEB. 2020–NOW) – a C++ harmoniser implementation.
- Lets you **sing harmonies** in real time by letting you play chords on your keyboard and **synthesising** them **using your voice.**
- Along the way, I **increased the performance** of an open-source DSP library **3 times** by optimising FFT usage and data reuse.

Machine Learning projects (MAR. 2018–DEC. 2022), *Charles University & ETH Zürich*
- Various ML projects written in Python (PyTorch and TensorFlow).
- Executed neural network **attacks**, **analysis** and **adversarial training** in a 3-person team.
- Toy ML projects including image segmentation, PoS tagging, speech recognition, 3D object recognition.

Písek (MAR.–MAY 2020) – a Python framework for the preparation of programming competitions.
- **Contributed** to the project during the initial phase (was one of the main contributors). I still occasionally help maintain it.
- **Added support** for the contest format used at the International Olympiad in Informatics.

Operating Systems project (SEPT. 2019–JAN. 2020) – a small MIPS OS in C; part of a university course.
- **Wrote an OS** including interrupt management, heap allocator, scheduler, VM etc. in a **two-person team.**

Skills

Programming languages: advanced: **Python**, **C++**, **C**, **sh**; intermediate: **SQL**; basic: C#, Haskell.

Technologies: Git, NumPy, PyTorch, TensorFlow, Pandas, GoogleTest, GDB, Make. Long-time (> 10 years) Linux user with sysadmin and **systems programming** experience.

I also try to broaden my scope by taking **courses in related areas**. So far, I have taken: Computer Linguistics, Deep Learning, Computer Graphics, Data Compression Algorithms, Reliable and Trustworthy AI, Information Theory. Currently I am taking Principles of Distributed Computing and Machine Perception.

Languages: Czech (native), English (C2 – CAE Grade A), German (B2–C1), French (basics)

Extracurricular Activities

2018–Now *Czech Olympiad in Informatics*, *Czech IOI Selection Camp* – I implement, test and write up algorithmic tasks; in the latter, I **reimplemented** and **simplified** a big part of the technical infrastructure.

2017–2020 *KSP* – an algorithmisation correspondence seminar for Czech highschoolers; **led the main category** in 2018–2019, managing 10–20 people. Co-organised several **educational camps** with lectures and informatics-related (and -unrelated) activities.

2019–2020 **Programming I/II** for advanced students, *Charles University* (Spring 2020, Autumn 2019, Spring 2019) – co-taught the exercises with Martin Mareš. Set, discussed and solved algorithmic questions during class and prepared C++ programming tasks for the students to solve.

Achievements & Awards

2021 ETH-D scholarship for excellent Master's students (≈ 90 out of 2500 students awarded each year)

2019 ACM-ICPC Central European Regional Contest – 5th place, advanced to World Finals 2020

2018 ACM-ICPC World Finals – 56th place out of 140 teams

2017 International Olympiad in Informatics (IOI) – Silver medal, 69th place out of 304 participants

2016 ACM-ICPC Central European Regional Contest – 12th place (unofficial high school participation)

2016 International Olympiad in Informatics (IOI) – Bronze medal, 154th place out of 308 participants

Publications

[1] Richard Hladík, Anna Minaeva, and Zdeněk Hanzálek. On the complexity of a periodic scheduling problem with precedence relations. In *International Conference on Combinatorial Optimization and Applications*, page 107–124. Springer, 2020.