

Jan Onderka

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 [jan-onderka](#) |  [onderjan](#)

Prague, Czech Republic

RESEARCH INTEREST

I am interested in formal verification of electronic systems for increased safety, security, and reliability. I specialise in machine-code verification, which seems to be under-researched despite its potential for improving the security, safety and reliability of critical systems by verifying properties such as avoidance of stack overflow and illegal memory access or ensuring the correct use of peripherals. I have researched and published novel techniques that enable feasible verification of properties of machine-code systems and integrated them in my formal verification tool **machine-check**. I intend to continue the research, incorporating techniques from source-code and hardware verification, so that bugs in critical systems can be detected and avoided.



EDUCATION

- **Doctoral Student / Candidate (Informatics)** 2020 – ongoing
Czech Technical University in Prague, Faculty of Information Technology
 - Dissertation thesis submitted in August 2024
 - Defence expected in Q4 2024 / Q1 2025
- **Bachelor (Electrical Engineering)** 2019 – 2022
Czech Technical University in Prague, Faculty of Electrical Engineering
 - With honours
 - Thesis: [Analog Modular Music Synthesizer with Digital Control](#)
- **Master (Informatics)** 2018 – 2020
Czech Technical University in Prague, Faculty of Information Technology
 - With honours
 - Thesis: [Deadline Verification Using Model Checking](#)
- **Bachelor (Informatics)** 2015 – 2018
Czech Technical University in Prague, Faculty of Information Technology
 - Thesis: [Pitch Shifting of Audio Signals in Real Time Using STFT on a Digital Signal Processor](#)

EXPERIENCE

- **Instructor** 2019 – 2021
Czech Technical University in Prague, Faculty of Information Technology
 - Digital and Analog Systems (bachelor course)
 - Computer Structures and Architectures (bachelor course)
 - Combinatorial Optimization (master course)
- **Java Developer** 2012 – 2019
TriInfo Solutions s.r.o.
 - Mainly Private Branch Exchange (PBX) Java backend development
 - Some C and C++ embedded system development

PROJECTS

- **machine-check (Creator)** 2024
Formal verification tool for digital systems, especially machine-code systems (written in Rust) 
 - Publicly available, open-source, MIT / Apache 2.0 licence
- **CPAchecker (Developer)** 2023
Formal verification tool for source-code systems 
 - Participated in development during a month-long study stay at LMU Munich
 - Implemented the support for C functions memset, memcpy, and memmove
 - Improved the support of quantifiers

PUBLICATIONS

[C.1] J. Onderka. **Formal Verification of Machine-Code Systems by Translation of Simulable Descriptions.** *Proceedings of the 13th Mediterranean Conference on Embedded Computing (MECO 2024)*, Institute of Electrical and Electronic Engineers, Budva, Montenegro, 2024. DOI: [10.1109/MECO62516.2024.10577942](https://doi.org/10.1109/MECO62516.2024.10577942).

[C.2] J. Onderka, S. Ratschan. **Fast Three-Valued Abstract Bit-Vector Arithmetic.** *Proceedings of the 23rd International Conference on Verification, Model Checking, and Abstract Interpretation (VMCAI 2022)*, pp. 242-262, 2022. Springer Nature Switzerland, Cham, 2022. ISBN: 978-3-030-94583-1. DOI: [10.1007/978-3-030-94583-1_12](https://doi.org/10.1007/978-3-030-94583-1_12).

PREPRINTS

[X.1] J. Onderka. **Input-based Framework for Three-valued Abstraction Refinement** (preprint). arXiv:2408.12668 [cs.LO]. <https://arxiv.org/abs/2408.12668>.

SKILLS

- **Programming Languages:** Rust, C, C++, Java, JavaScript
- **Hardware Description Languages:** VHDL, Verilog (a bit)
- **Web Technologies:** HTTP, HTML, CSS, WebSockets, WebRTC
- **Embedded Systems:** PIC, AVR, ARM (Cortex-M), ESP32, RISC-V, AD Blackfin, TI C6000
- **Database Systems:** SQL, Lotus Notes
- **Version Control:** Git, SVN
- **Mathematical & Statistical Tools:** Matlab, Mathematica
- **Voice Over IP (VoIP):** SIP, SDP, RTP, RTCP, Asterisk

AWARDS

- **The Best Paper in Software and Algorithms** 2024
The 13th Mediterranean Conference on Embedded Computing (MECO 2024) 
 - For the paper “Formal Verification of Machine-Code Systems by Translation of Simulable Descriptions”

ADDITIONAL INFORMATION

Languages: Czech (native), English (fluent), German (basic)
Interests: Playing guitar & bass guitar, hobby electronics (especially audio signal processing using embedded systems)