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Michal Šedý

PhD Fellow

Research Interests

Automata and their applications in formal verification: timed pattern matching, automata reduction, and automata-based string constraint solving.

Positions

- Mar 2025 – Present **PhD Fellow**, *Department of Computer Science*, Aalborg University
- Funded by the VILLUM Investigator project S4OS, led by Kim Guldstrand Larsen.
 - Section for Distributed, Embedded and Intelligent Systems; groups Automated System Verification and Validation, and Foundations for Interacting and Computing Systems.
 - Research on timed pattern matching: developing a deterministic approach and the timed pattern matching engine TimeRex (in development).
- Nov 2023 – 2025 **Research Assistant**, *VeriFIT and Automata@FIT groups*, Faculty of Information Technology, Brno University of Technology
- Research on automata reduction, leading to the NFM 2025 paper.
 - Implemented transducers and related operations in the automata library Mata for the string solver Z3-Noodler, leading to the CAV 2026 paper.
 - Integrated Mata with MONA, a tool for deciding WS1S formulae.
- Mar 2020 – Oct 2023 **Student Research Assistant**, *Automata@FIT group*, Faculty of Information Technology, Brno University of Technology
- Research on automata reduction; developed a tool for SAT-based reduction of nondeterministic automata.

Education

- 2025–Present **PhD**, *Aalborg University*, Department of Computer Science
- Thesis (working title): *Exploiting Structures for Succinct Representation and Efficient Analysis of Transition Systems*.
 - Supervisor Kim Guldstrand Larsen, co-supervisor Lukáš Holík. Expected completion February 2028.
- 2024–2025 **PhD studies (one semester)**, *Brno University of Technology*, Faculty of Information Technology
- 2021–2024 **Ing. (MSc), Information Technology and Artificial Intelligence**, *Brno University of Technology*, specialisation Mathematical Methods
- Graduated with honours.
 - Thesis: *Repetitive Substructures for Efficient Representation of Automata*, supervised by Lukáš Holík. Dean's Award; Excel@FIT 2024 Committee Award.
- 2018–2021 **Bc. (BSc), Information Technology**, *Brno University of Technology*
- Graduated with honours.
 - Thesis: *Reducing Size of Nondeterministic Automata with SAT Solvers*, supervised by Lukáš Holík. Excel@FIT 2021 Committee Award.

Publications

- 2026 David Chocholatý, Vojtěch Havlena, Lukáš Holík, Juraj Síč, **Michal Šedý**. *String Solving with Stabilization and Transducers*. In Computer Aided Verification (CAV 2026), LNCS 16683, pp. 50–74, Springer. doi:10.1007/978-3-032-32526-6_3
- 2025 **Michal Šedý**, Lukáš Holík. *Automata Size Reduction by Procedure Finding*. In NASA Formal Methods (NFM 2025), LNCS 15682, pp. 421–440, Springer. doi:10.1007/978-3-031-93706-4_24

Research Projects

- 2025–Present **S4OS**, VILLUM Investigator grant, Villum Foundation, led by Kim Guldstrand Larsen, Aalborg University
Scalable analysis and Synthesis of Safe, Small, Secure and Optimal Strategies for Cyber-Physical Systems. PhD fellow.
- 2023–2025 **GA23-07565S**, Czech Science Foundation (GAČR), led by Ondřej Lengál, Brno University of Technology
Representing Boolean Functions by a Self-Adaptable Data Structure. Team member.
- 2020–2024 **LL1908**, Ministry of Education, Youth and Sports (ERC CZ), led by Lukáš Holík, Brno University of Technology
Efficient Finite Automata for Automated Reasoning. Team member.
- 2019–2021 **GA19-24397S**, Czech Science Foundation (GAČR), led by Lukáš Holík, Brno University of Technology
Automata for Decision Procedures and Verification. Team member.

Software

- Mata Core developer. C++ automata library with Python bindings; work across the whole library, including the transducer support for Z3-Noodler and the integration of BDD-based symbolic representations. GitHub
- MaMONata Author. Adapter between the automata libraries Mata and MONA. GitHub
- Z3-in-NFA-reduction Author. SAT-based reduction of nondeterministic automata using Z3. GitHub
- Benchmark Viewer Author. In-browser viewer for Google Benchmark results. GitHub

Teaching

- Autumn 2026 **Project supervisor**, *Analysis & Problem Formulation; A Program that Solves a Problem*, 1st semester, BSc, Aalborg University
- Spring 2026 **Project supervisor**, *Design, Definition and Implementation of Programming Languages*, 4th semester, BSc, Aalborg University
- Autumn 2025 **Project co-supervisor**, *Analysis & Problem Formulation; A Program that Solves a Problem*, 1st semester, BSc, Aalborg University
- Autumn 2025 **Teaching assistant**, *Distributed Systems*, 1st semester, MSc, Aalborg University
- Autumn 2024 **Teaching assistant**, *Introduction to Software Engineering*, 1st semester, BSc, Brno University of Technology

Service

- 2026 **Artifact Evaluation Committee**, CAV 2026
- 2026 **Subreviewer**, RP 2026
- 2025 **Subreviewer**, TACAS 2026

Skills

- Programming C/C++ (development), Python (scripting, data processing, visualisation)

Languages Czech (native), English (C1)