David Kozák

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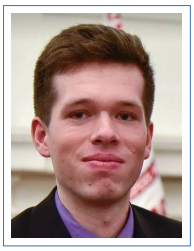

Short Overview

Focus Areas Static analysis, compilers, interpreters, virtual machines.
Main Languages Java (core development), Python (scripting and data processing).
Experience 9 years of development in Java, 4 years of contributing to GraalVM Native Image.

Skills

General Problem-solving, algorithms and data structures.
Other Languages Kotlin, JavaScript/TypeScript, C/C++.
Frameworks, libraries Spring, JPA/Hibernate, Java EE, React & Redux, JavaFX.
Soft Skills Public speaking, teaching, teamwork.

Work Experience

Dec 2024 – now **Senior Researcher**, *GraalVM, Oracle Labs*, Oracle, Brno

Sep 2020 – Dec 2024 **Research Assistant**, *GraalVM, Oracle Labs*, Oracle, Brno
- Working on **static analysis** methods for **ahead-of-time compilers**
- Call graph construction, points-to analysis, compiler optimizations
- Used *Rapid Type Analysis* to reduce the Native Image build time by up to **35%** compared to pure points-to analysis (without saturation)
- Developed *Whole-Program Sparse Conditional Constant Propagation*, reducing the size of Native Image binaries by **6.5%** without impacting the build time

Mar 2019 – Aug 2020 **Software Engineer**, *Knowledge Technology Research Group*, FIT BUT, Brno
- Developed a **search engine** for **semantically enhanced** documents
- Designed a **distributed system** with multiple types of components
- Designed a **special query language**, a **compiler**, and specialized **searching algorithms**

Sep 2018 – Feb 2019 **Software Developer**, *MPS Team*, JetBrains s.r.o., Prague
- **Language engineering** using MPS
- Building and maintaining **Domain Specific Languages** and **IDE support** for them

Jul 2018 – Aug 2018 **Internship**, *MPS Team*, JetBrains s.r.o., Prague
- **DSL engineering** and language engineering in general
- Converting **Antrl4** grammar into MPS project
- Automatic **detection of formatting** for a given language

Feb 2018 – Aug 2018 **Java Full Stack Developer**, *Aura*, Aura s.r.o., Brno
- Worked on an **information system** using JavaEE, Spring and Hibernate
- JSF on the presentation layer and Spring and Hibernate in the backend

Jun 2015 – Dec 2017 **Java Developer in Research**, *Automated Analysis and Verification Research Group - VeriFIT*, FIT BUT, Brno
- **Search-based testing** of concurrent Java programs using **noise injection**
- Integrated SearchBestie with **RoadRunner**, an open-source tool for dynamic analysis of concurrent Java programs
- Designed and evaluated new **heuristics for noise injection**

Jan 2015 – Dec 2015 **Android Developer**, *BeeeOn*, FIT BUT, Brno
- Worked on an application for an **IoT system**
- **Automated testing** support for the app

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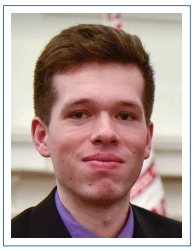

Education

2021 – now **Brno University of Technology**, *Doctor of Philosophy*, *Static Analysis, Compilers, Virtual Machines*

2017 – 2020 **Brno University of Technology**, *Master of Computer Science*, *Information Systems*
Dean's Award for excellent master thesis

Master Thesis *Indexing of Big Text Data and Searching in the Indexed Data*
Distributed systems, search engines, domain-specific languages, compilers.

Erasmus Student **Greece, Denmark, Portugal**, *Software Engineering*

2014 – 2017 **Brno University of Technology**, *Bachelor of Computer Science*, *Information Technology*
Red Diploma, Dean's and Rector's Award for excellent results in Bachelor studies

Bachelors Thesis *Fine-Grain Noise-Injection Heuristics for SearchBestie Infrastructure*
Testing and runtime verification of concurrent Java programs.

2010 – 2014 **Grammar School, Svitavy**

Research Activities

Research Paper **SAVAT**: **A Tool for Visualizing the Impact of Changes in Microservices**, *Co-author*, ECSA'25, Tool Paper
- — Presented a tool for change impact analysis of microservice systems

Research Paper **SkipFlow**: **Improving the Precision of Points-to Analysis using Primitive Values and Predicate Edges**, *Lead Author*, CGO'25
- — Developed an extension for the points-to analysis in GraalVM Native Image that propagates primitive constants interproceduraly and evaluates branching conditions during the analysis.
- — Achieved **9%** reduction in reachable methods on average without increase the analysis time.

Research Paper **Scaling Type-Based Points-to Analysis Using Saturation**, *Co-author*, PLDI'24
- — Using *saturation* to significantly speed up (more than **3x** on some benchmarks) the analysis at the cost of slightly reducing the precision.

Research Paper **Software Architecture Reconstruction for Microservice Systems using Static Analysis via GraalVM Native Image**, *Lead author*, SANER'24
- — Proposed a methodology for using GraalVM Native Image as a static analysis tool for microservices, provided results comparable with manual analysis, but significantly faster.

Research Paper **Comparing Rapid Type Analysis with Points-To Analysis in GraalVM Native Image**, *Lead author*, MPLR'23
- — Proposed how to use *Rapid Type Analysis* in GraalVM Native Image and provided extensions for incremental analysis using method summaries, reduced the analysis time by up to **64%**.

Achievements

May 2020 **Expert Panel Award**, *Excel@FIT*

Apr 2018 **UnIT Hackaton - Webapps**, *third place*

Dec 2017 **8 from BUT**, *first place*

Mar 2016 **EBEC Brno**, *second place*

Volunteering

Jul 2017 – Dec 2019 **ESN Member, Vicepresident**, *ESN BUT*, ESN CZ
- — Helped foreign students during their Erasmus in Brno
- — Organized and moderated meetings, maintained the ESN office