

# **Supervisors' Opinion on the Ph.D. Thesis of**

**Petr Janků**

Petr's dissertation focuses on the theory and tools for string constraint solving, a technology for finding solutions to logical formulae that involve strings, their concatenations, regular properties, lengths, and more. The primary motivation for this work lies in automated reasoning about programs that manipulate strings, especially web applications, where string manipulations are at the root of many security vulnerabilities, such as cross-site scripting and SQL injections—pressing challenges in today's internet landscape. Reasoning about strings at the level required to analyze programs is both theoretically and practically challenging.

Petr has explored the use of finite automata to address this problem. He has developed or contributed to the development of several methods, algorithms, and prototype tools that have proven instrumental in advancing our research group to its current leading position in the field.

Among his contributions, I particularly value his work on identifying and extending the limitations of our automata-based approach. This work led to the definition of the straight-line fragment of string constraints, which remains a cornerstone of the current state-of-the-art. His research on leveraging alternating automata also stands out as one of the most innovative and original approaches in string constraint solving, opening intriguing new directions. These contributions have significantly shaped the field of string solving.

I regard these results as strong from both theoretical and practical perspectives. They have been published in top-tier venues, including POPL, PLDI, TACAS, and ATVA (where we received a Best Paper Award). A smaller result was published at EUROCAST, which, despite its modest presentation, has attracted nice citations. Petr was an indispensable member of our research team. He had many wild ideas, sometimes too wild, sometimes just wild enough to spark a research direction or make it take a critical turn. He also carried much of the implementation and experimentation effort, and it is safe to say that completing the aforementioned works would have been impossible without him.

The life behind the monastery walls snatched Petr away from me and from our research at a point when he was already ready to write his thesis, and life was then reluctant to give him back. I am glad that Petr has now found a way to bring his work to completion. His results are still relevant today and even central to the field of string constraint solving, standing the test of time. I am firmly convinced that he deserves to be awarded his Ph.D.

Brno, November 22, 2024

doc. Mgr. Lukáš Holík, Ph.D.