Supervisor's statement on PhD candidate Ing. Jiri Nadvornik and his submitted dissertation entitled Hierarchical Semi-Sparse Cubes - scalable solution for combining dimensionally multi-modal big data

Ing. Jiri Nadvornik enrolled into the doctoral degree study program Informatics at the Faculty of Information Technology at CTU in Prague (FIT) in Sep 2016. He successfully fulfilled all requirements set up by the law and by internal regulations of our university. Namely, he defended his doctoral study report in Feb 2021 and successfully passed his comprehensive doctoral examination in April 2021.

His dissertation research topic was motivated by the ever growing need for massively scalable tools for processing PetaByte-scale Big data in astroinformatics. His main research interest focused on methodologies, algorithms, data structures, and technologies for combining different kinds of multi-dimensional multimodal Big data with incompatible dimensions or sparsity. This data appear more and more in astronomy thanks to recent or prepared deployments of high-performance and high-throughput robotic astronomical instruments placed on satellites, arrays of radiotelescopes, and others. Ing. Nadvornik gained during the PhD studies invaluable expertise in processing big astronomical data using HPC systems, HDF5 middleware, and MPI programming environments. He developed a new concept of semi-sparse data structures needed to combine dimensionally multi-modal Big data. He then designed the architecture of so called HiSS-Cube framework. He managed to implement it, to run extensive experiments with it on the largest supercomputer in the country, and to analyze the performance and scalability of the framework. HiSS-Cube framework is made available as an open-source for the research community and was designed to be extensible to other big data scientific domains. Ing. Nadvornik's dissertation

I can state that the achieved results are valuable and that Ing. Nadvornik fulfilled all the requirements for successful PhD studies, conducted a significant piece of theoretical and experimental research, and managed to comprehend specific interdisciplinary challenges of processing combined dimensionally multi-modal Big data in astroinformatics. The main results of the dissertation were published in 2 impacted journals. His dissertation meets common requirements on dissertations in informatics and I recommend the submitted dissertation for the defense.

In Prague, December 5, 2023

Prof. Ing. Pavel Tvrdík, CSc.