

Problem kernelization: polynomial-time data reduction with provable effect

René van Bevern

Novosibirsk State University, Russia

Abstract. Data reduction is an important tool when solving problems on large input data. In general, it is difficult to derive data reduction algorithms that are fast, correct, and effective at the same time: for example, consider a polynomial-time data reduction algorithm for an NP-hard problem that does not change the value of an optimal solution but provably reduces the input size by at least one bit. Using repeated application, this algorithm would solve the NP-hard problem in polynomial time, thus implying $P=NP$. The field of fixed-parameter algorithms spawned the concept of problem kernelization: provably correct and effective polynomial-time data reduction. The main idea is to bound the size of the reduced instance by a function not of the input size, but of additional instance parameters, so that repeated application does not necessarily shrink the instance further. This lecture gives an introduction and various examples for problem kernelization algorithms.