Preface

A *computational model* is a framework to do computations according to certain specified rules on some input data. One of the earliest attempts to capture the intuitive notion of an "algorithm" was the *Turing machine*, which is now used as a synonym for it. Nowadays, there are many computational models that are interesting from a theoretical *and* a practical point of view. These models come for example from automata theory, formal language theory, logic, or circuit theory. All models can be considered with additional resource bounds (on the time, for example) or with syntactic restrictions.

In order to understand the computational power of a model, it is very useful to study in particular the following problems with respect to that model:

- the *satisfiability problem*: given an algorithm of the model, does there exist an input that is accepted by the algorithm?
- the *equivalence problem*: given two algorithms of the model, do they compute the same function?
- the *"almost" equivalence problem*: given two algorithms of the model, is there an "easy" transformation of the algorithms such that they compute the same function?

The theory of computation is the study of the inherent difficulty of computational problems, their *computational complexity*. In this monograph, we study the computational complexity of the satisfiability, equivalence, and "almost" equivalence problems of various computational models. In particular we consider Boolean formulas, circuits, and various kinds of branching programs.

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