

Theorems about probabilistically checkable proofs (PCP) are famous hard-to-prove results from the theoretical computer science. They provide constructions of PCP systems with interesting surprising properties and serve as a starting point for proofs of NP-hardness of many approximation problems. Recently, a weaker combinatorial version of one of these theorems (Gap Label Cover) was proved using only combinatorial tools. After summarizing the main results in the classical PCP theory, I explore the combinatorial version thoroughly. Original results of this thesis consist of counterexamples to the expected behavior of two concepts from the classical theory in the combinatorial setting — probabilistic version and parallel repetition.