

Abstract

The goal of property testing is to quickly distinguish between objects which satisfy a property and objects that are ϵ -far from satisfying the property. There are now several general results in this area which show that natural properties of combinatorial objects can be tested with “constant” query complexity, depending only on ϵ and the property, and not on the size of the object being tested. The upper bound on the query complexity coming from the proof techniques are often enormous and impractical. It remains a major open problem if better bounds hold. Hoppen, Kohayakawa, Moreira, and Sampaio conjectured and Klímošová and Král’ proved that hereditary permutation properties are strongly testable, i.e., can be tested with respect to Kendall’s tau distance. The query complexity bound coming from this proof is huge. Even for testing a single forbidden subpermutation it is of Ackermann-type in $1/\epsilon$. We give a new proof which gives a polynomial bound in $1/\epsilon$ for testing a single forbidden subpermutation. Maybe surprisingly, for testing with respect to the rectangular distance, we prove there is a universal (not depending on the property), polynomial in $1/\epsilon$ query complexity bound for two-sided testing hereditary properties of sufficiently large permutations. We further give a nearly linear bound with respect to a closely related metric which also depends on the smallest forbidden subpermutation for the property. Finally, we show that several different permutation metrics of interest are related to the rectangular distance, yielding similar results for testing with respect to these metrics.