Boolean function monotonicity testing requires (almost) $n^{1/2}$ non-adaptive queries.

Summary: We prove a lower bound of $\Omega(n^{1/2-c})$, for all $c > 0$, on the query complexity of (two-sided error) non-adaptive algorithms for testing whether an $n$-variable Boolean function is monotone versus constant-far from monotone. This improves a $\tilde{\Omega}(n^{1/5})$ lower bound for the same problem that was obtained in [X. Chen et al., “New algorithms and lower bounds for testing monotonicity”, in: Proceedings of the 55th annual IEEE symposium on foundations of computer science, FOCS 2014, Los Alamitos: IEEE Computer Society. 286–295 (2014)], and is very close to the recent upper bound of $\tilde{O}(n^{1/2}/\varepsilon^2)$ by S. Khot et al. [“On Monotonicity Testing and Boolean Isoperimetric type Theorems”, Electronic colloquium on computational complexity, ECCC. TR15-011 (2015)].

Keywords: Boolean functions; monotonicity testing; property testing