

io-port 05917991**Chakraborty, Sourav; García-Soriano, David; Matsliah, Arie****Efficient sample extractors for juntas with applications.**

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Summary: We develop a query-efficient sample extractor for juntas, that is, a probabilistic algorithm that can simulate random samples from the core of a k -junta $f : 0, 1^n \rightarrow 0, 1$ given oracle access to a function $f' : 0, 1^n \rightarrow 0, 1$ that is only close to f . After a preprocessing step, which takes $\tilde{O}(k)$ queries, generating each sample to the core of f takes only one query to f' . We then plug in our sample extractor in the “testing by implicit learning” framework of Diakonikolas et al. [[DLM+07]], improving the query complexity of testers for various Boolean function classes. In particular, for some of the classes considered in [DLM+07], such as s -term DNF formulas, size- s decision trees, size- s Boolean formulas, s -sparse polynomials over \mathbb{F}_2 , and size- s branching programs, the query complexity is reduced from $\tilde{O}(s^4/\epsilon^2)$ to $\tilde{O}(s/\epsilon^2)$. This shows that using the new sample extractor, testing by implicit learning can lead to testers having better query complexity than those tailored to a specific problem, such as the tester of Parnas et al. [PRS02] for the class of monotone s -term DNF formulas. In terms of techniques, we extend the tools used in [CGM11] for testing function isomorphism to juntas. Specifically, while the original analysis in [CGM11] allowed query-efficient noisy sampling from the core of any k -junta f , the one presented here allows similar sampling from the core of the closest k -junta to f , even if f is not a k -junta but just close to being one. One of the observations leading to this extension is that the junta tester of Blais [Bla09], based on which the aforementioned sampling is achieved, enjoys a certain weak form of tolerance.

Keywords: property testing; sample extractors; implicit learning
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