What cannot be learned with bounded memory

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Abstract

How does computational learning change when one cannot store all the examples one sees in memory? This question has seen a burst of interest this past year, leading to the surprising theorem that there exist simple concepts (parities) that require an extraordinary amount of time to learn unless one has quite a lot of memory.

In this work we show that in fact most concepts cannot be learned without sufficient memory. This subsumes the aforementioned theorem and implies similar results for other concepts of interest. The new results follow from a general combinatorial framework that we developed to prove lower bounds for space bounded learning.

Joint work with Michal Moshkovitz, The Hebrew University.