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# On the differential approximation of MIN SET COVER

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## Abstract

We present in this paper differential approximation results for MIN SET COVER and MIN WEIGHTED SET COVER. We first show that the differential approximation ratio of the natural greedy algorithm for MIN SET COVER is bounded below by  $1.365/\Delta$  and above by  $4/(\Delta + 1)$ , where  $\Delta$  is the maximum set-cardinality in the MIN SET COVER-instance. Next we study another approximation algorithm for MIN SET COVER that computes 2-optimal solutions, i.e., solutions that cannot be improved by removing two sets belonging to them and adding another set not belonging to them. We prove that the differential approximation ratio of this second algorithm is bounded below by  $2/(\Delta + 1)$  and that this bound is tight. Finally, we study an approximation algorithm for MIN WEIGHTED SET COVER and provide a tight lower bound of  $1/\Delta$ . Interesting point about our results is that they also hold for MAX HYPERGRAPH INDEPENDENT SET in both the standard and the differential approximation paradigms.