

# Computing graph properties by randomized subcube partitions

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## Abstract

We prove a new lower bound on the randomized decision tree complexity of monotone graph properties. For a monotone graph property  $A$  of graphs on  $n$  vertices, let  $p = p(A)$  denote the threshold probability of  $A$ , namely the value of  $p$  for which a random graph from  $G(n, p)$  has property  $A$  with probability  $1/2$ . Then the expected number of queries made by any decision tree for  $A$  on such a random graph is at least  $\Omega(n^2 / \max\{pn, \log n\})$ .

Our lower bound holds in the subcube partition model, which generalizes the decision tree model. The proof combines a simple combinatorial lemma on subcube partitions (which may be of independent interest) with simple graph packing arguments. Our approach motivates the study of packing of "typical" graphs, which may yield better lower bounds.