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## Average-case complexity of detecting cliques

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### 概要

We investigate the average-case complexity of the  $k$ -CLIQUE problem on random graphs with an appropriate density of edges. Our results are lower bounds of  $n^{k/4}$  for two well-studied classes of circuits: bounded-depth circuits and monotone circuits. Besides being the first lower bounds for  $k$ -CLIQUE in the average-case (and moreover essentially tight), these results lead to a new “size hierarchy theorem” for  $AC^0$  and settle a longstanding open question in finite model theory.

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