

The Complexity of Determining Critical Sets

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1 Upper Bounds

Look at the decision problem of deciding whether there is a minimum clue of size less than k . Then

$$(x, k) \in \text{FCPA} \leftrightarrow \exists c_x \text{ of size } k, S_x \supset c_x, \forall S' \neq S_x, S' \supset c_x \text{ } S_x \text{ is a solution of } x, \text{ and } S' \text{ is not.} \quad (1)$$

knowing the length of the minimum size clue with a binary search, we can find a minimum clue. So $\text{FCPA} \in \Sigma_2^P$.

2 Lower Bounds

Definitely $NP \subset \text{FCP}$. Since we can solve NP -hard problems.