Abstract:

20 questions is one of the simplest examples of a combinatorial search game: Alice thinks of an English word, and Bob's job is to figure it out by asking Yes/No questions. The worst-case complexity of the game is clearly \( \log n \), so to spice things up, we assume that Alice chooses her input according to some distribution known to Bob, and Bob now aims to minimize the expected number of questions.

An optimal solution to this problem was found already in 1952. However, the optimal strategy could ask arbitrarily complex Yes/No questions. We ask what happens when we constrain Bob to asking only "simple" questions, and what happens if Alice is allowed to lie a few times.

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