IJCAI–13 Formatting Instructions*

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Abstract

The *IJCAI–13 Proceedings* will be printed from electronic manuscripts submitted by the authors. The electronic manuscript will also be included in the online version of the proceedings. This paper provides the style instructions.

1 Introduction

2 General Test Game

A *test game* $G = (A, \mathbb{B}, m, t)$ consists of a set of potential problems $A = \{a_1, a_2, \ldots, a_n\}$ to test and k types of test takers $\mathbb{B} = \{B_1, B_2, \ldots, B_k\}$ that may participate the test. The l-th type test takers has an unsolvable problem set $B_l \subseteq A$. The memorize capacity function $m : \mathbb{B} \to \mathbb{N}$ denotes how many problems a particular test taker can memorize. During the test, t out of n problems will be tested and a particular test taker will pass the test if each of those tested problems is either not in the unsolvable problem set or memorized.

The *test game* is a 2-player Bayes game between the tester and the test taker where the test taker's type has uncertainty. Let p_l be the probability that type-l test taker occurs. The game has only two outcomes, pass or fail.

TO BE CONTINUED

2.1 Hardness on Test Size

2.2 Hardness on Memorize Capacity

Theorem 1. *Even if test size is* 2*,* OPTIMAL TEST STRATEGY *is coNP-hard when memorize capacity is non-constant.*

Proof. We reduce INDEPENDENT SET instances to test games with test size 2 and ask the complementary question: is u the highest utility that the tester can get. That question has a yes answer if and only if the dual minimax LP [reference] has a feasible solution with objective at most u. For a graph $G = (V, E)$, let V be our test problem set. Add $|E| + |V| + 2$ types of test takers as follows:

- For each edge $e = (v_i, v_j) \in E$, add one type of test takers l_e with tester utility equals 1 if they fail and 0 if they pass. This type of test takers cannot solve only two problems, v_i, v_j. The number of problems they can memorize is 0.
- For each vertex v, we add one type of test takers l_v with tester utility equals $d_G - d(v)$ if they fail and 0 if they pass. Here d_G is the maximum vertex degree in G and $d(v)$ is the degree of vertex v. This type of test takers cannot solve only one problem v and the number of problems they can memorize is 0.
- Add one auxiliary type of test takers l_A with tester utility equals $a \cdot \varepsilon$ if they fail and 0 if they pass where $a = \binom{|V|}{2} - |E| - \binom{k}{2}$. This type of test takers cannot solve any problems but they can memorize 2.
- Finally, add one type of test takers l_K with tester utility equals $u^{l_K} = \varepsilon$ if they fail and 0 if they pass. This type of test takers cannot solve any problems but they can memorize k of them.

Then we show that deciding whether $u = (2d_G + a \cdot \varepsilon)/L$ is an upper-bound for the tester's utility, or equivalently whether we can find a dual solution with objective as low as $u = (2d_G + a \cdot \varepsilon)/L$ in our dual minimax LP, is equivalent to finding a size-k independent set in G. Recall that a dual solution is a strategy for test takers to memorize problems. If no one memorizes, the tester's utility U_r to test a problem set r is $U_r = (2d_G + a \cdot \varepsilon + \varepsilon)/L$ if $r \notin E$ and $U_r = (2d_G - 1 + a \cdot \varepsilon + \varepsilon)/L$ if $r \in E$. To lower the objective, test takers l_A, l_K should memorize problem sets that bring the maximum of U_r down. No matter what the strategy is (as long as they only memorize unsolvable problems), $\sum_r U_r$ is a constant. And because U_r for $r \notin E$ is much larger than U_r for $r \in E$ in terms of ε, it's better to only decrease U_r for $r \notin E$. The only way to do that is to let l_A test takers only memorize pairs of problems that are not edges and let l_K test takers only memorize size-k indepedent sets of problems. If there's a size-k independent set, let l_K test takers memorize one size-k independent set all the time and let l_A test takers memorize all pairs of problems that are not covered by that independent set with uniform probability. That will make $U_r = (2d_G + a \cdot \varepsilon)/L$ for $r \notin E$ and $U_r = (2d_G - 1 + a \cdot \varepsilon + \varepsilon)/L$ for $r \in E$. This is the best they can achieve and this can only be achieved when a size-k independent set exists in G.

$\square$

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3 One-Problem Test Game

4 Experiment

5 Conclusion

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A LaTeX and Word Style Files

The LaTeX and Word style files are available on the IJCAI–13 website, `http://www.ijcai-13.org/`. These style files implement the formatting instructions in this document.

The LaTeX files are `ijcai13.sty` and `ijcai13.tex`, and the BibTeX files are `named.bst` and `ijcai13.bib`. The LaTeX style file is for version 2e of LaTeX, and the BibTeX style file is for version 0.99c of BibTeX (*not* version 0.98i). The `ijcai13.sty` file is the same as the `ijcai07.sty` file used for IJCAI–07.

The Microsoft Word style file consists of a single file, `ijcai13.doc`. This template is the same as the one used for IJCAI–07.

These Microsoft Word and LaTeX files contain the source of the present document and may serve as a formatting sample.

Further information on using these styles for the preparation of papers for IJCAI–13 can be obtained by contacting `pcchair13@ijcai.org`.

References