## Correction to "Using the pseudo-dimension to analyze approximation algorithms for integer programming"

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**Abstract.** This note corrects a mistake in the WADS'01 paper titled "Using the pseudo-dimension to analyze approximation algorithms for integer programming".

Section 3 of [1] is about integer programs of the form

min  $c^T x$ , s.t.  $Ax \ge b$  and  $x \ge (0, 0, ..., 0)^T$ 

where all components of b and c, and all entries of A, are non-negative. It includes the claim that, without further loss of generality, all components of c are in fact strictly positive. This is correct: if any  $c_j = 0$ , whenever  $A_{ij} > 0$  the *i*th constraint can be satisfied at zero cost by using a large value of  $x_j$ , so we arrive at an equivalent problem by removing  $x_j$  and all such constraints.

Section 4 is about the class of integer programs obtained from the above by allowing negative entries in A. It includes the claim that, also in this case, w.l.o.g. all components of c are strictly positive, for the same reason. This is *not* correct. A counterexample is

min  $x_1$ , s.t.  $x_1 - x_2 \ge 0, x_1 \ge 0, x_2 \ge 1$ .

The optimum is 1, and, if we remove  $x_2$  and the constraint  $x_2 \ge 1$ , the optimum becomes 0.

Theorem 2 from Section 4 is applied to the minimum majority problem in Section 6.2. For this problem, all components of c are strictly positive.

Fortunately, it appears that the mistake in Section 4 has not misled anyone to try to apply Theorem 2 to show that 3-colorable graphs can be colored with  $O(\log n)$  colors in polynomial time.

## References

1. Philip M Long. Using the pseudo-dimension to analyze approximation algorithms for integer programming. In Workshop on Algorithms and Data Structures, pages 26–37. Springer, 2001.