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LEARNING DETERMINISTICALLY RECOGNIZABLE TREE SERIES

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ABSTRACT

We devise a learning algorithm for deterministically recognizable tree series where the weights are taken from a commutative group. For this, we use an adaptation of the minimal adequate teacher model that was originally introduced by Angluin. The algorithm runs in polynomial time and constructs the unique minimal deterministic bottom-up finite state weighted tree automaton that recognizes the tree series in question.

Keywords: Algorithmic learning, tree series, weighted tree automaton, minimal adequate teacher

1. Introduction

We propose a learning algorithm for aa-deterministically recognizable tree series, i.e., tree series which are accepted by deterministic automata in which every state is final. In traditional language learning, the aim is to derive an explicit formal description of an unknown language $U \subseteq T^*$ from examples or similar information. An algorithm accomplishing this task for a given class C of languages is called a learner for C. The theory of language learning was initiated by Gold in a seminal paper on language identification in the limit [25]. Gold considered two sources of information, leading to the notions of learning from text and learning from an informant. In the first case, the learner receives an exhaustive stream of positive examples; in the second, the stream consists of all pairs $(u, \chi_U(u))$, where $u \in T^*$ and χ_U is the characteristic function of U, thus providing both positive and negative examples. The learner responds with a guess (an automaton, say) each time it receives a new piece of information. The language U is learned in the limit if all but a finite number of the guessed automata