Experiment Section

June 18, 2020

1 Experimental Evaluation

After adding the multi-phase ranking function learning algorithm to SVMRanker, we conducted experiments on constructed data set of loop programs to compare the algorithms of learning nested ranking function, of multi-phase ranking function and algorithm in the state-of-the-art tool LassoRanker embedded in Ultimate Automizer. Our dataset is composed of C programs and Boogie programs, where 96 loop programs in C are taken from library of termination competition SV-COMP and 134 loop programs in Boogie are chosen from repository of Ultimate Automizer. For the configuration of experments, we use a server with a 3.6 GHz Intel Core i7-4790 CPU and 16GB RAM, timeout is set to 300 seconds for each case.

1.1 Overview of the Experiments

As shown in Table 1.1, we use our 231 examples as inputs to SVMRanker and LassoRanker. For SVM-Ranker, we use "Nested, 2-Multi, 4-Multi" to represent the sythesising of nested ranking function, 2-phases-bounded and 4-phases-bounded multiphase ranking function respectively. In the experiment, we try different number of phases of nested ranking function according to the result of the learning. Furthermore, we use linear and non-linear templates for nested ranking function and use only linear templates for multiphase learning.

From table 1.1, it is obvious our new algorithm for multiphase r.f. is more powerful and can solve more cases than that of nested r.f. learning. From the comparation between "2-Multi" and "4-Multi", it is clear that larger bound on phases is given, more ranking functions can be found. Besides, since the number of terminating cases of multiphase learn is almost the same as LassoRanker, we can tell that our multiphsae learning algorithm enhance the capability of SVMRanker to deal with linear loops programs in our data set.

As for the total running time of this experiment. The total time of multiphase r.f. learning is much more than nested r.f. learning. This can be attribute to the backtracking and incremental learning of multiphase. Thought the long running time, we are still optimistic about our tool that it solves the same number of terminating cases as LassoRanker but only uses about half of their time.

1.2 Detailed Evaluation

(a) Time consumed in each stage.

(b) Advantage on non-linear loops.

	SVMRanker			LassoRanker
	Nested	2-Multi	4-Multi	
Terminating	54	72	78	72
Non-teminating	50	50	50	52
Unknown	126	108	102	106
Total Time	196s	1183s	4693s	2053s

Table 1: General Experiment Results