Variable neighborhood programming for symbolic Regression

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Abstract

In the field of Automatic Programming (AP), the solution of a problem is a program, which is usually represented by an AP tree. A tree is built using functional and terminal nodes. For solving AP problems, we propose a new local search procedure that adapts the 'elementary tree transformation' (ETT) into this specific tree. The elementary tree transformation is the process of removing an edge and adding another one to obtain a new feasible tree. Our results indicate that the neighborhood of an AP tree, that have two types of nodes, is smaller than the neighborhood size of a spanning tree with a single type of nodes. As our new ETT local search can be part of many AP metaheuristics, it can be used to solve various AP problems. In this paper, we incorporate it into the Basic Variable Neighborhood Programming (BVNP) scheme to solve the Symbolic regression problem. BVNP is the basic method of the recently proposed Variable Neighborhood Programming (VNP) algorithm. It is AP meta-heuristic which combines stochastic and deterministic changes of neighborhoods. Experimental comparison with Variable Neighborhood Programming without ETT, Genetic Programming, and Artificial Bee Colony Programming shows clearly better speed of convergence and computational stability of the proposed method.