IMPLEMENTATION AND EFFICIENCY OF THE GENETIC PROGRAMMINGFOR CALCULATION OF SPECIAL FUNCTION

Lashchenko O.L., Uspenskyi V.B.
National Technical University
«Kharkiv Polytechnic Institute», Kharkiv

Genetic programming is a subfield of evolutionary computation that uses a computational model to find solutions to complex problems. It is a type of machine learning that mimics the process of natural selection and evolution to create new, optimized solutions to problems. At its core, genetic programming involves creating a population of random solutions or programs, and then evaluating their fitness function based on how well they solve a given problem. The programs are then evolved through a process of selection, crossover, and mutation, in a similar way to how genes are selected and evolve in biological systems. Selection involves choosing the fittest individuals from the population to be the parents of the next generation. Crossover involves combining the genetic material of two parents to create a new individual, while mutation involves randomly changing some of the genetic material to introduce diversity and prevent premature convergence. Over time, the fittest individuals from each generation will be selected, and their genetic material will be combined and mutated to create even better solutions. Genetic programming can be applied to a wide range of problems, from engineering and design optimization to machine learning and data analysis. It has been used to create novel solutions to problems in fields such as engineering, finance, biology, and artificial intelligence. A variety of approximation tasks includes curve fitting, function optimization, and system identification. Genetic programming can be used to solve approximation tasks, where the goal is to find a mathematical function that approximates a given set of input-output pairs. In this context, genetic programming involves evolving a population of candidate functions, represented as trees, where the nodes correspond to mathematical operations and the leaves correspond to input variables or constants. The fitness of each candidate function is evaluated by computing the error between its output and the true output for each input in the training set. The process of selection, crossover, and mutation is repeated for several generations until a satisfactory approximation is found or a predefined termination criterion is met. The resulting candidate function can then be used to predict the output for new inputs. Thus, with the help of genetic programming, a function can be obtained that best approximates the experimental data. Further, a study of the smoothing properties of the obtained function will be conducted and recommendations regarding the selection of the initial population will be formulated.