Pareto Optimal Modeling using Genetic Programming

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The proposed research activity involves aspects from data mining, evolutionary computation (specifically, genetic programming) and multi objective optimization generating a Pareto-front of solutions.

The research will be based on genetic programming for solving symbolic regression problems, i.e., based on give data (input-output data from real-world systems) an evolutionary algorithm evolves mathematical expressions for fitting the given data optimally and generalizing well to new data points.

In a first step, such a system will be extended by an optimizer, e.g. an evolutionary strategy, to fine-tune the constants which are evolved by genetic programming as parts of the mathematical expressions.

In a second step, genetic programming will be extended by a suitable approach for Pareto optimization, such that the common conflict between solution accuracy (i.e., accuracy of the prediction measured by, e.g., a nonlinear correlation coefficient) and solution complexity (i.e., size of the resulting mathematical expression, measured by a suitable complexity measure) can be handled well. This approach will deliver a set of suitable solutions, covering the Pareto front.

The resulting system will be applied and tested by using several real-world test cases, such as formulation data from chemistry and time series data from stock markets.

The project has a strong potential for exciting results, because such a system will have a wide range of applications. At the same time, you do not have to start from scratch, because there are many open source genetic programming systems available.

Interested?

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