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Autoconfiguration Techniques for Metaheuristic Algorithms and Symbolic Regression

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Abstract:

This dissertation delves into the advanced area of autoconfiguration frameworks with a special focus on symbolic regression methods, such as genetic programming and analytical programming. Symbolic regression is a form of regression analysis that seeks to identify mathematical expressions that best describe a relationship between given variables. It's a field that has seen growing interest due to its potential to uncover underlying mathematical relationships in data without pre-specified models, interpretability and explainability. However, the complexity and computational intensity of these methods, especially when dealing with large datasets or complex problems, pose significant challenges. One of the primary objectives of this research is to develop and refine approaches for autoconfiguration in symbolic regression. Autoconfiguration refers to the process where algorithms autonomously adjust their parameters and structures to optimize performance. This is particularly crucial in symbolic regression, where the selection of appropriate configurations can dramatically influence the success and efficiency of the model discovery process. The dissertation will explore the several aspects of autoconfiguration, including the selection of operators, control parameters, and even the structure of the algorithms themselves. The challenge here lies in developing a methodology that is not only effective but also adaptable to a variety of symbolic regression problems. Parallelization will be another key area of focus. Given the computational demands of symbolic regression, especially in scenarios involving complex data or real-time analysis, parallel computing offers a promising solution. Optionally, the dissertation may address the challenge of reducing computational complexity in symbolic regression. This involves developing strategies to simplify the computational processes without compromising the accuracy or robustness of the results. By addressing these challenges, the research aims to significantly advance the field of symbolic regression, making it more accessible, efficient, and applicable to a wider range of real-world problems. The goal is to provide robust, scalable, and efficient algorithmic/autoconfiguration frameworks that can be employed in various domains, from scientific research to industry applications, where symbolic regression can provide valuable insights.

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