Geometric Semantic Genetic Programming

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Geometric Semantic Genetic Programming (GSGP) is a recently introduced version of Genetic Programming (GP), that uses new genetic operators called Geometric Semantic Operators (GSOs), instead of the traditional crossover and mutation. GSOs have the important property of inducing a unimodal error surface for any supervised learning problem in which fitness is calculated using a distance between outputs and targets on training data (like for instance in regression and classification). This property makes of GSGP one of the most exciting and promising advances in GP.

This presentation begins with an introduction to optimization and to fitness landscapes, essential concepts to understand the properties of GSOs. Then, GP is briefly introduced and GSGP is defined and discussed. In this discussion, the main drawback of GSOs is also presented. After this introduction, the presentation focuses on a new implementation of GSGP, that contains a workaround to GSOs’ drawback and thus makes GSGP usable in practice for the first time. Subsequently, some recent experimental results on a set of complex real-life problems is presented, showing how, together with a great optimization power on training data, GSGP can also have a good generalization ability, in some particular conditions. The presentation terminates discussing the most recent hot topics in GSGP, consisting in combining GSOs with local search strategies.