# Impact of Crossover Bias in Genetic Programming

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## ABSTRACT

In tree-based genetic programming with sub-tree crossover, the parent contributing the root portion of the tree (which we refer to as the *root parent*) often contributes more to the semantics of the resulting child than the other parent (the *non-root parent*). In previous research, we found that when the root parent had greater fitness than the non-root parent, the fitness of the child tended to be better than if the reverse were true. Here we explore the significance of that asymmetry by introducing the notion of *crossover bias*, which allows us to bias the system in favor of having the more fit parent be the root parent.

We applied crossover bias to a variety of problems. In most cases we found that using crossover bias either improved performance or had no impact. Our results do, however, indicate the possibility that crossover bias may increase selection pressure and premature convergence. Crossover bias appears to be somewhat problem dependent, and significantly dependent on other parameter choices such as tournament size, elitism, and population size. Crossover bias has the largest impact when selection pressure is weaker, and the differences in the fitness of the parents is thus likely to be larger.