Genetic Programming in Automated Theorem Proving
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Abstract:

There are numerous automated theorem-proving approaches, but the majority of them rely on human knowledge, databases of existing lemmas, and heuristics to put it all together. One way to prove a theorem is for example to start at the base assumption and apply every possible rule of deduction, exploring every branch of the possible deduction tree, until the goal result is reached, with the steps thus forming the proof. Unfortunately, this would only work for the smallest of proofs, since such random/exhaustive search of deduction steps would produce a combinatorial explosion of possibilities, each of which we'd have to test, an intractable problem once we go past even the smallest of proof sizes.

Fortunately, there are nature-inspired search methods that improve our ability to search vast solution spaces. One of the more popular nature inspired optimization/search algorithms is based on evolution. In this presentation I discuss how genetic programming is used within the domain of automated theorem proving (ATP), as per the 3 papers that cover this subject.