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MLGO: a Machine Learning Guided Compiler Optimizations Framework

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Abstract

Leveraging machine-learning (ML) techniques for compiler optimizations has been widely studied and explored in academia. However, the adoption of ML in general-purpose, industry strength compilers has yet to happen. We propose MLGO, a framework for integrating ML techniques systematically in an industrial compiler -- LLVM. As a case study, we present the details and results of replacing the heuristics-based inlining-for-size optimization in LLVM with machine learned models. To the best of our knowledge, this work is the first full integration of ML in a complex compiler pass in a real-world setting. It is available in the main LLVM repository. We use two different ML algorithms: Policy Gradient and Evolution Strategies, to train the inlining-for-size model, and achieve up to 7% size reduction, when compared to state of the art LLVM -Oz. The same model, trained on one corpus, generalizes well to a diversity of real-world targets, as well as to the same set of targets after months of active development. This property of the trained models is beneficial to deploy ML techniques in real-world settings.

Research Research Areas

Machine intelligence



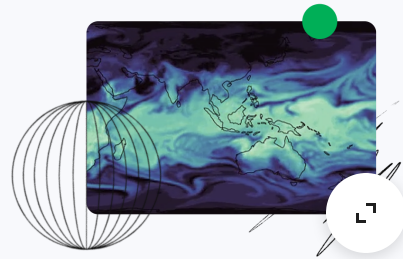
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