Speaker:
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Title:

RIFS: Run-time Invariant Function Specialization

Abstract:
Compilers support optimization techniques such as function specialization and constant-value propagation to eliminate certain redundant operations at compile time. However, as compilers must prove that values are constant to exploit these techniques, optimization opportunities are often limited. We propose run-time invariant function specialization (RIFS), a profile-guided compiler technique that optimizes value invariant function calls through specialization. Our technique leverages a binary instrumentation profiling tool to learn invariant function call arguments that can subsequently be optimized via function specialization. To implement our technique, we introduce a fully automatic and safe LLVM code transformation pass that can be easily integrated into existing compilation pipelines. We study RIFS in the context of 12 real-world applications and show that our approach substantially improves over existing techniques such as PGO and BOLT. RIFS achieves a speedup of 4.21% and instructions reduction of 6.67% on average over the LLVM baseline (-O3). RIFS improves execution time by 3.15% over PGO+BOLT and reduces instructions by 5.79% on average, respectively.