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Squeezing Software Performance via Eliminating Wasteful Computation Operations



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Inefficiencies abound in complex, layered software. A variety of inefficiencies show up as wasteful memory operations, such as redundant or useless memory loads and stores. Aliasing, limited optimization scopes, and insensitivity to input and execution contexts act as severe deterrents to static program analysis. Microscopic observation of whole executions at instruction- and operand-level granularity breaks down abstractions and helps recognize redundancies that masquerade in complex programs. In this talk, I will describe various wasteful memory operations, which pervasively exist in modern software packages and expose great potential for optimization. I will discuss the design of a fine-grained instrumentation-based profiling framework that identifies wasteful operations in their contexts, which guides nontrivial performance improvement. Furthermore, I will show our recent improvement to the profiling framework by abandoning instrumentation, which reduces the runtime overhead from 10x to 3% on average.