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Optimizing Compilers: Challenges and Opportunities

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The increasing trend of heterogeneity and custom architectures makes software productivity and portability of high-performance applications extremely challenging. Compilers can play a prominent role in addressing these software issues. However, a fundamental challenge faced by optimizing compilers involves modeling and minimizing data movement overheads. The cost of data movement currently dominates the costs associated with arithmetic/logic operations, both in terms of energy and time. While the computational complexity of algorithms in terms of elementary arithmetic/logic operations is quite well understood, the same is not true of the data movement complexity of computations. More effective models of data movement complexity are needed to build useful optimizing compilers for current/emerging platforms. One promising approach is to develop domain/pattern specific optimization strategies. This talk will feature examples of domain-specific optimization for tensor and stencil computations on GPUs.

ABOUT:
Dr. Sadayappan's research interests include compiler optimization for heterogeneous systems, domain/pattern-specific compiler optimization, characterization of data movement complexity of algorithms, and data-structure-centric performance optimization. He earned a bachelor's degree from the Indian Institute of Technology Madras and his M.S. and doctorate from Stony Brook University. He is an Institute of Electrical and Electronics Engineers Fellow.

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