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Electrical Engineering and Computer Science Seminar

Advance Software stack to increase performance portability and efficiency on emerging large-scale systems

Dr. Gokcen Kestor

Friday, February 14, 2020

12:00 PM – 1:20 PM in COB 114

Faculty Host: Prof. Dong Li

Biography

Gokcen Kestor is a senior research scientist in the high-performance computing group at Pacific Northwest National Laboratory. She earned a Master's degree and a doctorate in computer science from the Universitat Politècnica de Catalunya in Spain in 2013. Her research solves computer science challenges in HPC software, such as scalability, programmability, and portability. Her research is in HPC system software, mainly focuses on providing performance and energy efficiency on advanced HPC systems through runtime and compiler optimizations. She has expertise in programming models, resilience, emerging architectures, compiler, and runtime systems. Before joining PNNL, she also worked at the Barcelona Supercomputing Center (Barcelona, Spain) and Oak Ridge National Laboratory (Oak Ridge, TN), where she focused on shared memory programming models and runtimes.

Abstract

In this talk, we will discuss approaches to develop efficient resilience techniques for distributed task-based programming models on large-scale systems and to automatically generate efficient code for target architectures from high-level, domain-specific languages. We will present a localized fault recovery approach for nested fork-join programs in the presence of fail-stop failures. This approach tracks the relationships between the work executed by various threads during the execution, under work stealing, and precisely computes the work lost and recovers from an arbitrary number of failures. Experimental evaluation demonstrates low overheads in the absence of failures, recovery overheads on the same order as the lost work, and much lower recovery costs than alternative strategies. In addition, we will present our current research on a compiler infrastructure that includes a unified, flexible, and expressive intermediate representation, a cost model that quantifies memory and compute requirement of a given computation, a set of optimizations including domain-specific optimizations, tiling and fusion, and an approach for effective code generation on heterogeneous systems.

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