Dr. Edgar SOLOMONIK, (ETH Zürich) will present a seminar entitled:

"Provably-Efficient Algorithms for Tensor Computations"

Abstract:

This talk targets the design of communication-efficient parallel algorithms for numerical linear algebra. By combining volumetric inequalities and analysis of intervals within dependency graphs, we obtain lower bounds on synchronization costs for dense matrix factorizations, shortest-paths-finding algorithms, and stencil computations. Known parallel algorithms attain these bounds for many cases, but we introduce asymptotic improvements to approaches for the symmetric eigenvalue problem and for stencil computations. We then study the communication complexity of algorithms for tensor contractions, considering the effect of symmetry and sparsity. Such structure is present in tensors employed within coupled-cluster methods to solve the many-body Schrödinger equation. We provide a framework that allows succinct implementation of these methods, by automatically decomposing and redistributing tensors to execute minimal-cost algorithms for tensor functions. We evaluate our algorithms and implementation by benchmarks of coupled-cluster calculations that achieve a performance of nearly one petaflop/s when using tens of thousands of cores.

Lausanne, 6 October 2015/DK/cr

The MATHICSE seminars are announced at http://mathicse.epfl.ch/seminars