

The Erlangen National High Performance Computing Center (NHR@FAU) is looking for a

Master thesis student for

Implementation and performance analysis of level-blocked sparse matrix power kernels (MPK) in Trilinos

The thesis will be hosted and supervised by the research division at Erlangen National High Performance Computing Center (NHR@FAU), which is led by Prof. Dr. Gerhard Wellein (Department of Computer Science, FAU).

Tasks

Trilinos is a collection of software libraries extensively used to solve (non-)linear equations and optimization problems (see <https://trilinos.github.io>). A time-consuming component of many sparse solvers in Trilinos is the multiplication of a vector with the power of a sparse matrix (called MPK).

We have developed a highly optimized version of the MPK in a library called RACE. Your task is to interface the RACE library with the Trilinos software and perform a comparative study to quantify the benefit of RACE's optimization strategies.



Within the master thesis, the focus will be in the following areas:

- Getting familiar with Trilinos framework
- Understanding the RACE library and the MPK optimization strategies
- Performance benchmarking of (preconditioned-)linear solvers that use MPK; e.g., variants of GMRES
- Conducting numerical study with the solvers

Required skills:

- Student of computational engineering or computer science
- Profound knowledge of the Linux OS and C++ (knowledge on C++ templates will be useful)
- Good knowledge on compilation and linking libraries (Trilinos uses cmake)
- Knowledge on numerical linear algebra
- Basic knowledge on sparse matrices and their data structure
- And most important: your interest 😊

Please direct any inquiries or applications to

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