

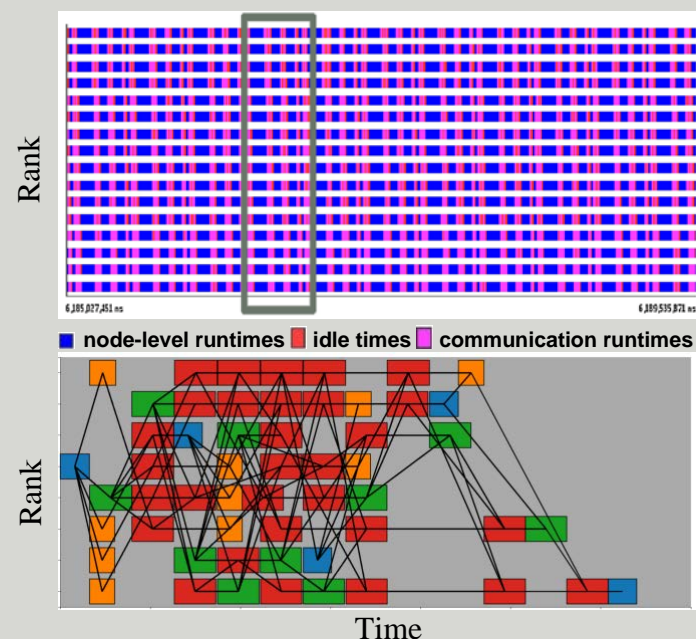
The Erlangen National High Performance Computing Center (NHR@FAU) is looking for a

## Bachelor/Master thesis student for Evaluation and Extension of a Parallel Simulation Framework

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

**DisCosTiC (Distributed CosT in Clusters):** This library aims to predict the runtime for large-scale parallel applications in an efficient manner. The simulation framework is based on analytical first-principle models. For the execution part, it currently utilizes a fundamental analytic Roofline and an improved node-level performance model. The framework simulates a task-DAG (directed acyclic graph) style model for the workflow and the MPI message matching semantics. The focus lies on compute-bound and memory-bound benchmarks (e.g., stencil codes), running in a strong-scaling scenario on highly parallel systems.



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

- Getting familiar with the DisCosTiC framework and reproduction of the simpler test cases
- Setting up micro-benchmark tests and a proxy application
- Software verification and performance evaluation of the simulation via detailed comparison with large-scale algorithms running on the clusters
- (For master thesis) Extension of the DisCosTiC toolkit via integration of an improved energy model

### Required skills

- Student of (computational) engineering or computer science
- Profound knowledge of C/C++ and the Linux OS
- Basic knowledge of code parallelization with MPI and OpenMP
- Basic knowledge of both node- and cluster-level performance engineering is preferable
- Nature of work: Theory (25%), Conception (25%), Implementation (50%)

**Please direct any inquiries or applications to**

Ayesha Afzal <[ayesha.afzal@fau.de](mailto:ayesha.afzal@fau.de)>  
Georg Hager <[georg.hager@fau.de](mailto:georg.hager@fau.de)>  
Gerhard Wellein <[gerhard.wellein@fau.de](mailto:gerhard.wellein@fau.de)>

Erlangen National High Performance Computing Center  
Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU)