

# Master's or Bachelor's Thesis:

## Design and Implementation of a Benchmark for Predicting System Health in High Performance Computing

### Background

In a current project at our chair, we analyse modern High Performance Computing (HPC) systems with heterogeneous architectures towards exascale computing. A central element in this project is to find a reliable prediction method, which can determine the current system health state in a given HPC environment.

Different methods are being evaluated by our research group currently. One of those is to run an efficient and fast benchmark in order to determine abnormality in system performance. Using such a benchmark and corresponding historical data, one is capable of predicting upcoming system faults, which may lead to a failure.

Multiple performance counters are considered as useful for this benchmark: floating-point operations per second (FLOPS), memory bandwidth and InfiniBand (IB) bandwidth. In this work, further relevant metrics are to be determined and a set of fast-running benchmarks are to be developed. These benchmarks are to be developed on our MAC Research cluster and to be verified and evaluated on SuperMUC.

### Requirements

- Knowledge in performance analysis
- Ideally experience with HPC or scalable applications
- C/C++ Programming, Parallel Programming, common tools such as Git, Slack, etc.
- A scripting language
- Knowledge in software engineering, especially requirements analysis and engineering
- Ideally experience with the common job scheduler on HPC: SLURM

### Work Packages

- Requirements Engineering: find proper metrics for predicting system health
- Design and implementation of theses benchmarks
- Evaluation on MAC-Cluster and SuperMUC
- Documentation

### Contact

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