Doctoral Position in Numerical Analysis

The Institute for Numerical Analysis is offering a doctoral position for a DFG-supported project on *Numerical Algorithms, Frameworks, and Scalable Technologies for Extreme-Scale Computing* within a joined Swiss-German cooperation with the University of Lugano, Switzerland. The position is full time (E13 TV-L) according to the regulations of the State of Lower Saxony, starting 1st January 2023 or earlier by agreement.

Institute for Numerical Analysis

The Institute for Numerical Analysis at Technische Universität Braunschweig conducts research in several scientific fields of numerical analysis and scientific computing such as high performance computing for large-scale problems arising from engineering applications or data science applications, numerical treatment of partial differential equations, model order reduction and numerical linear algebra. Within this project we are offering a doctoral position to be lead by Professor Matthias Bollhöfer.

The position is financed by a grant of the DFG and is for three years with a starting date as agreed (January 1st, 2023 or earlier). The position amounts to the regulations of an E13 TV-L salary as defined by Lower Saxonian law. The projects includes funding for travel.

Is this interesting for you? We welcome applications at your earliest convenience.

Project description

With funding from the DFG and SNSF, the project aims to establish computational methods that resolve fundamental challenges imposed by large-scale analytics, deep analysis, and precise predictions by advancing and preparing the foundation for the next generation of sparsified numerical methods. Our proposed algorithms rely on the innovative coupling of sparsified numerical linear algebra and nonlinear optimization methods for data-intensive applications. The inherently deterministic character of these methods, when coupled with high communication demands, requires the development of robust approximation methods under the condition of extreme-scale computational science. This includes scientific libraries providing high-quality, reusable software components for constructing applications, as well as improved robustness and portability. These developments will be driven by research on mathematical software, extreme-scale computing and an effort to push these developments toward applications.

Among the topics which are in the focus of our joined research are numerical methods as well as mathematical & scientific HPC software for

- Parallel Recursive Selected Inversion,
- Bayesian Computing,

- Trace of the Matrix Inverse,
- Fast Updating of Factorizations,
- Scalable Sparse Numerical Linear Algebra,
- Optimization methods.

Specifically in the DFG-funded part, at TU Braunschweig we are going to conduct research on numerical methods for *Parallel Recursive Selected Inversion* and numerical methods along with scientific HPC software for *Fast Updating of Factorizations*.

Qualifications

To qualify for a doctoral position, the doctoral researcher is required to have completed a master's degree and qualify for a PhD program in mathematics.

Priority will be given to a candidate's qualification and according to what is stipulated in the paragraph above.

Other requirements are:

- a master's degree in mathematics with focus on numerical analysis. Particularly, good knowledge of numerical linear algebra methods is appreciated,
- advanced programming skills,
- good ability to co-operate as well as independency and take initiative,
- strong skills in written and spoken English,

Desired qualifications include:

- A strong background in numerical linear algebra methods for large-scale problems,
- ability to perform a theoretical analysis of numerical methods,
- ability to program (MATLAB, C, C++, OpenMP).

Application

A full application should include:

- personal letter,
- curriculum vitae (CV) with publication list,
- certified copy of master's degree certificate,
- list of completed academic courses and grades,

- copy of master's thesis and relevant articles,
- other documents that the applicant wishes to claim.

Submit your application as a PDF marked with the reference **NumESC**, both in the file name and in the subject field of the email, to m.bollhoefer@tu-bs.de. The application can be written in English or German. Please submit your application at your earliest convenience.

Further information

For more information, please contact Matthias Bollhöfer (m.bollhoefer@tu-bs.de).

We look forward to receiving your application.