Software and Tools for Computational Engineering
RWTH AACHEN UNIVERSITY
Software and Tools for Computational Engineering
Prof. Dr. rer. nat. Uwe Naumann

Master Thesis / Bachelor Thesis / Student Researcher Position

Case Studies in Algorithmic Differentiation Applied to *Computational Finance*, *Oil and Gas*, and *Atmospheric Remote Sensing*

Description: Algorithmic Differentiation is a program transformation technique for the automatic generation of *adjoint codes* for a given numerical simulation program. Adjoint codes play a crucial role in sensitivity analysis and optimization, since they deliver derivatives of computed outputs with respect to parameters in a runtime which is a constant multiple of the runtime of the original program. Sensitivity information reveal highly desirable properties of the underlying system.

Goal: In this thesis, a *smart application* of Algorithmic Differentiation tools to various simulation codes is to be done. This includes understanding and use of various techniques to reduce memory footprint or to increase performance. This can be achieved by, e.g., checkpointing and/or coupling of symbolic and algorithmic adjoints as well as by the use of numerical libraries already supporting adjoint calculations (the NAG AD Library, see `nag.co.uk`).

Profile: You should know C/C++. In addition, knowledge in the field of numerical simulation and optimization is required. Some Fortran experience might be advantageous as well.

If you are interested in a bachelor or master thesis or a student researcher position (up to 19 hours a week) on this topic, please do not hesitate to contact us!

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