LEHRSTUHL A
FÜR MATHEMATIK

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E I N L A D U N G

zu einem Vortrag
im Rahmen des Graduiertenkollegs
„Experimentelle und konstruktive Algebra"

am Dienstag, 10.10.2017

Zeit: 14:00 Uhr

Ort: SeMath

Vortragender: Prof. Dr. Martin Raum
                               Chalmers University (Göteborg)

Titel: Employing Hardware Accelerators in Theoretical Mathematics

Abstract: The market for hardware accelerators has grown remarkably fast during the past decade. They are being routinely employed in industry and some of the sciences. Close to all new supercomputing facilities come equipped with them. Only two weeks ago a doubling of the peak performance of the then world's top two super computer Tianhe-2 was reported due to enhanced accelerator configuration. In mathematics, both applied and theoretical, accelerators have, however, hardly had any impact to this point. A large part of the talk will be occupied by a survey of the currently three most common types of accelerators and details on their performance characteristics: Manycore units (e.g. GPUs), vector units (e.g. Xeon Phi), and field programmable gate arrays (FPGAs). We include a very brief exposition of how to use them in Julia, the programming language adopted by the recently granted Transregio on symbolic tools. This part of the talk does not require prior knowledge in theoretical mathematics.
Towards the end of the talk, we report on a case study: The enumeration of isogeny classes of hyperelliptic curves over finite fields. A working implementation on GPUs yields a speed up by a factor of almost 40. By work of Bergström, van der Geer, and Faber, this allows us to determine Hecke eigenvalues of Siegel modular forms far beyond what was previously feasible. We also report on ongoing joint effort concerning an FPGA-based implementation. This includes a hardware based mod-p multiplier, outperforming any known technique. Solutions developed in this context are potentially interesting to other problems, e.g. Gröbner basis calculations.

Alle Interessenten sind herzlich eingeladen.