Karlsruhe Institute of Technology

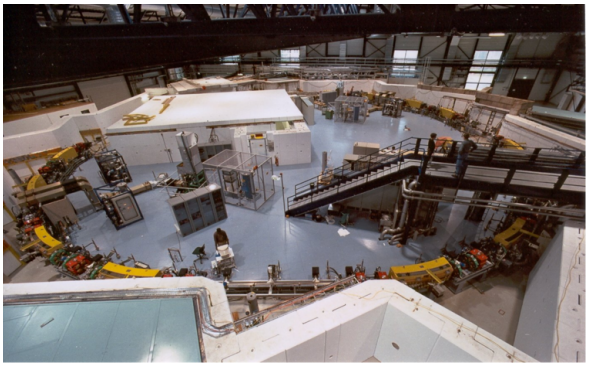
Institute for Data Processing and Electronics
Data Processing Group (PDV)

Bachelor Thesis: Evaluation of the GPU accelerated UFO Framework for High-Speed Tomography

Imaging Detectors at modern synchrotron light sources generate large data sets in the order of 40 Gigabytes per 3D reconstructed image. Up to now, these data sets have been reconstructed and analyzed in complex post-processing cycles that made fast turnaround times impossible.

The Data Processing Group (PDV) at the Institute for Data Processing and Electronics (IPE) is currently developing a framework called UFO based on GPUs and multi-core CPUs to decrease the computation time of numerical intensive algorithms. The framework is a streaming system with computation nodes arranged as pipelines and fork-join constructs. Each computation node is either offloading its work to the GPU or working in possibly several CPU threads. The high dimensionality of the possible tuning parameters makes it impossible to quantify performance increases by hand and an automated solution is needed.

The student's task is to design and implement a test environment to evaluate different performance metrics such as run-time and throughput under varying system parameters of UFO-based applications. Eventually, the UFO framework is evaluated inside the test environment with synthetic data and real data from the ANKA synchrotron light source.



The ANKA Synchrotron at KIT

The student is expected to have strong C knowledge and is able to work and develop using a Linux-based desktop. Some Python knowledge for analysis tasks and GObject knowledge to understand the UFO framework is a plus but not required.

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