PhD position
Simulation-based Algorithm Design and Data Mining for X-ray Imaging

Job description:
State-of-the-art X-ray imaging methods often require sophisticated data processing pipelines composed of advanced pre-processing, 3D reconstruction, segmentation, and other steps. To achieve accurate analysis results, the imaging conditions should be tuned for a particular experiment. However, it is often not straightforward to assess how a change in imaging quality will affect the analysis result. Moreover, often there is a variety of algorithms available for solving a specific task (filtered back projection or iterative methods for 3D reconstruction), each of them performing differently on the same input data. For these reasons, it is necessary to create virtual X-ray imaging data representing typical imaging problems and systematically investigate the dependencies between datasets with different image quality, algorithms and their parameters.

- Investigate common challenges for 3D and 4D X-ray imaging data processing incl. reconstruction, automated segmentation and analysis algorithms
- Design synthetic data sets which represent such problems
- Implement image metrics and workflows for systematic algorithm evaluation
- Benchmark selected algorithms using the developed evaluation workflows
- Investigate and implement two approaches which use simulation to improve the algorithms:
  - Usage of simulated datasets for algorithm parameter tuning
  - Incorporation of simulated data into iterative algorithms which use forward-backward modeling to converge to an improved result
- Implement refined algorithms using OpenCL and integrate them into DAQ protocols
- Establish an online, open-access database of simulated datasets for algorithm evaluation

Figure 1: X-ray imaging setup (left), photograph and 3D interactive model of a sample obtained from such setup (right)
Qualification: The following qualifications are required seeking your consideration for this position.
  • Master degree in computer science
  • C/C++ and Python; OpenCL / CUDA and knowledge of Image processing beneficial
  • Fluency in spoken and written English

We offer:
  • Interdisciplinary environment consisting of physics, biology and computer science specialists which enables fast professional growth in multiple directions
  • Work with state-of-the-art technology on several pioneering projects

Salary: The remuneration occurs on the basis of the wage agreement of the civil service in TV-L.

Institute: Laboratory for Applications of Synchrotron Radiation (LAS)

Contract duration: limited to 3 years

Starting date: as soon as possible

Application up to: until the 02.09.2018

Contact person in line-management: Dr. Tomáš Faragó, phone: +49 721 608 22164,
E-Mail: tomas.farago@kit.edu

Application: Application can be submittet to

Karlsruhe Institute of Technology (KIT)
Ms. Esra Aran
E-Mail: esra.aran@kit.edu

We prefer to balance the number of female and male employees. Therefore we kindly ask female applicants to apply for this job.

If qualified, handicapped applicants will be preferred.

Kit is certified as a family-friendly university (familienfreundliche Hochschule) and offers part-time employment, leaves for family-related reasons, dual career options, and individual coaching for family-work balance.