

## Research Associate / Ph.D. candidate (m/f/d) 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.

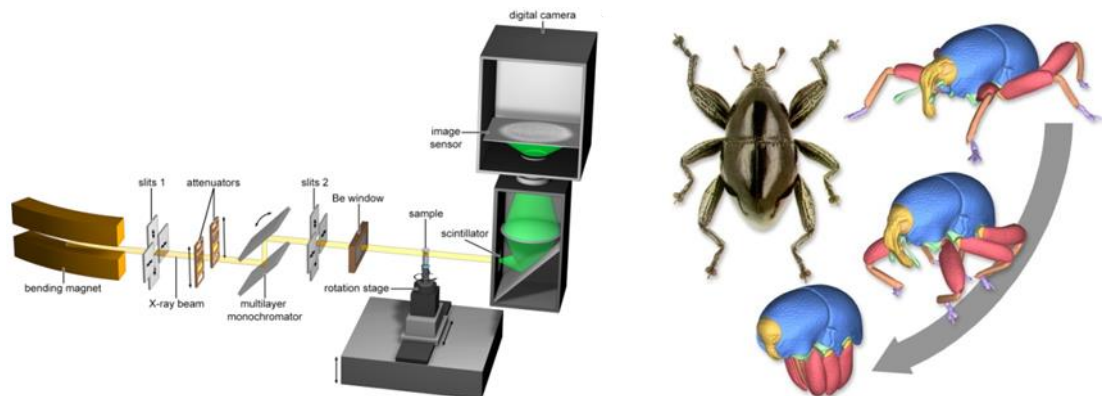


Figure 1: X-ray imaging setup (left), photograph and 3D interactive model of a sample obtained from such setup (right)

This includes:

- 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

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| <b>Qualification:</b>                             | <p><b>The following qualifications are required</b> seeking your consideration for this position.</p> <ul style="list-style-type: none"> <li>• Master degree in computer science</li> <li>• C/C++ and Python; OpenCL / CUDA and knowledge of Image processing beneficial</li> <li>• Fluency in spoken and written English</li> </ul>                                                                                                                  |
| <b>We offer:</b>                                  | We offer an attractive and modern workplace with access to excellent facilities of KIT, diverse and responsible tasks, a wide scope of advanced training options, supplementary pension with the VBL (Pension Authority for Employees in the Public Service Sector), flexible working time models, a job ticket (BW) allowance, and a cafeteria/canteen.                                                                                              |
| <b>Salary:</b>                                    | The remuneration occurs on the basis of the wage agreement of the civil service in TV-L, E13.                                                                                                                                                                                                                                                                                                                                                         |
| <b>Institute:</b>                                 | Laboratory for Applications of Synchrotron Radiation (LAS)                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Contract duration:</b>                         | limited to three years                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Starting date:</b>                             | As soon as possible                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Application up to:</b>                         | 18.02.2019                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Contact person in line-management:</b>         | For more information please contact Dr. Tomáš Faragó, E-Mail: <a href="mailto:tomas.farago@kit.edu">tomas.farago@kit.edu</a>                                                                                                                                                                                                                                                                                                                          |
| <b>Application:</b>                               | <p>Please send only complete applications including CV, motivation letter, copies of academic degrees and transcripts of records as a single pdf file by email to Ms. Esra Aran (Email: <a href="mailto:esra.aran@kit.edu">esra.aran@kit.edu</a>)</p> <p>We prefer to balance the number of employees (m/f/d). Therefore we kindly ask female applicants to apply for this job.</p> <p>If qualified, severely disabled persons will be preferred.</p> |
| Karlsruhe Institute of Technology Personalservice | 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.                                                                                                                                                                                                                           |