# MSc Project
# Deep Learning for Dark Field Radiographies

**Abstract:** Dark Field Radiography [1] poses a promising new tool for characterization of lung disease in medicine such as lung fibrosis. For optimal quantitative analyses artificial intelligence techniques like Deep Learning and Radiomics [2] pose a powerful tool. In this interdisciplinary project, AI tools will be developed for automated quantification of radiotherapy-induced lung damage (lung fibrosis) using dark field radiogaphies and CTs of mice. Data will be provided by a biology research group in which mice received radiotherapy and immunotherapy. The resulting algorithns will be directly applied for translational research purposes and implemented in scientific publications. The following work package are planned for the master thesis project:

- Development of a 2D U-Net [3] based segmentation algorithm of the lung for dark field chest radiographies
- Quantitative analyses using radiomic features and correlation to lung fibrosis
- State of the art transfer learning End-To-End Deep Learning based prediction of lung fibrosis
- Integration of longitudinal analysis of multiple time points into the Deep Learning pipeline
- Exploratory implementation of CT-based analyses

## Requirements:

- Interest in medical imaging
- Programming skills in python (and pytorch)
- Prior experience in machine learning

## Contact:

PD. Dr. Jan C. Peeken (jan.peeken@tum.de)
Prof. Dr. Julia A. Schnabel (julia.schnabel@tum.de)
Daniel Lang (daniel.lang@tum.de)

# References

[1] Franz Pfeiffer et al. “Hard-X-ray dark-field imaging using a grating interferometer”. In: *Nature materials* 7.2 (2008), pp. 134–137.

[2] Jan C Peeken et al. “Radiomics in radiooncology–challenging the medical physicist”. In: *Physica medica* 48 (2018), pp. 27–36.

[3] Olaf Ronneberger, Philipp Fischer, and Thomas Brox. "U-net: Convolutional networks for biomedical image segmentation". In: *Medical Image Computing and Computer-Assisted Intervention–MICCAI 2015: 18th International Conference, Munich, Germany, October 5-9, 2015, Proceedings, Part III 18*. Springer. 2015, pp. 234–241.