DATA SCIENCE COLLOQUIUM
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Deep Learning meets Shearlets: Explainable Hybrid Solvers for Inverse Problems in Imaging Science

Pure model-based approaches are today often insufficient for solving complex inverse problems in medical imaging. At the same time, methods based on artificial intelligence, in particular, deep neural networks, are extremely successful, often quickly leading to state-of-the-art algorithms. However, pure deep learning approaches often neglect known and valuable information from the modeling world and suffer from a lack of interpretability.

In this talk, we will develop a conceptual approach towards inverse problems in imaging sciences by combining the model-based method of sparse regularization by shearlets with the data-driven method of deep learning. Our solvers pay particular attention to the singularity structures of the data. Focusing then on the inverse problem of (limited-angle) computed tomography, we will show that our algorithms significantly outperform previous methodologies, including methods entirely based on deep learning. Finally, we will also touch upon the issue of how to interpret the results of such algorithms, and present a novel, state-of-the-art explainability method based on information theory.

Chair: Prof. Sabine Le Borne

This term's Data Science Colloquium is organized in a hybrid format. Please subscribe here (https://lists.desy.de/sympa/subscribe/datasciencecolloquium) to our mailing list for the online Zoom links or for registering for the on-site event in the CFEL (Bldg. 99) seminar room IV, 1st floor via Indico.

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