

PG 10 – Deep Learning for Inverse Problems

Task: Build a data-driven model to reconstruct CT images. The model should be evaluated on the LoDoPaB Grand Challenge (<https://lodopab.grand-challenge.org/>)

Data sets:

- LoDoPaB-CT <https://www.nature.com/articles/s41597-021-00893--z>

Methods:

! This should give you a first list of keywords for searching but it does not replace an intense literature research !

- As a starting point you may look into the following review
<https://www.cambridge.org/core/journals/acta-numerica/article/solving-inverse-problems-using-datadriven-models/CE5B3725869AEAF46E04874115B0AB15>
- and approaches already used by the challenge participants (learned primal-dual, deep image prior, etc.)
- Other approaches to potentially look into are:
Learned Regularizers:
 - Lunz, S. et al., 2018, *Adversarial Regularizers in Inverse Problems*, <https://papers.nips.cc/paper/2018/file/d903e9608cfbf08910611e4346a0ba44-Paper.pdf>
 - Mukherjee, S. et al., 2020, *Learned convex regularizers for inverse problems*, <https://arxiv.org/pdf/2008.02839.pdf>

Null space networks

- Schwab, J. et al., 2019, *Deep null space learning for inverse problems: convergence analysis and rates*, <https://iopscience.iop.org/article/10.1088/1361-6420/aaf14a>

NETT-approach

- Li, H., et al., 2020, *NETT: Solving Inverse Problems with Deep Neural Networks*, <https://iopscience.iop.org/article/10.1088/1361-6420/ab6d57>

As an entry point for DL for IP coding and method development you may do the following tutorial:

<https://oterobaguer.github.io/rtg-pi3-deep-learning/>