

LEARNING-BASED METHODS FOR IMAGE QUALITY IMPROVEMENT IN COMPUTATIONAL TOMOGRAPHY

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Improving image quality while reducing radiation exposure remains one of the central challenges of modern computational tomography. In particular, noise reduction constitutes a fundamental problem closely connected to mathematical modeling, inverse problems, and computational reconstruction algorithms. Alongside conventional analytical and iterative approaches, learning-based image enhancement methods have recently become increasingly important.

In this presentation, we introduce several deep learning architectures developed for noise suppression and image quality improvement in computational tomography. Special emphasis is placed on the underlying mathematical and physical modeling of the imaging process, including the simulation of realistic noise generation in a multi-slice cone-beam tomography system. The proposed approaches employ supervised learning strategies trained exclusively on mathematically generated phantoms with artificially simulated physical noise.

The work combines techniques from applied algebra, computational mathematics, mathematical physics, and machine learning, illustrating the interplay between data-driven methods and physically grounded modeling. The effectiveness of the proposed methods is demonstrated on both synthetic phantom data and real tomographic measurements, showing substantial improvements in reconstruction quality and robustness.

REFERENCES

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