

Scientific Highlights

Deep Learning Reconstructions— State-of-the-Art Abdominal Imaging

Purpose of the Study

Deep learning reconstruction (DLR) CT algorithms can reduce image noise associated with lower radiation doses while preserving image texture and diagnostic performance, often overcoming the limitations of filtered backprojection (FBP) and hybrid iterative reconstruction (HIR) methods, and future DLR software developments combined with new CT hardware technologies such as photon-counting CT promise dramatically improved image quality.¹ This study aimed to investigate the quality of the images reconstructed by Super Resolution* Deep Learning Reconstruction (SR-DLR) for abdominal CT imaging domains, with emphasis on the supporting evidence for diverse clinical tasks.¹

- DLR algorithms greatly reduce image noise associated with lower radiation doses while preserving image texture and diagnostic performance.¹
- SR-DLR can dramatically improve lesion delineation compared to HIR.¹
- Matrix increase from 512 to 1024 improved spatial resolution, resulting in further improvement from PIQE SR-DLR.¹

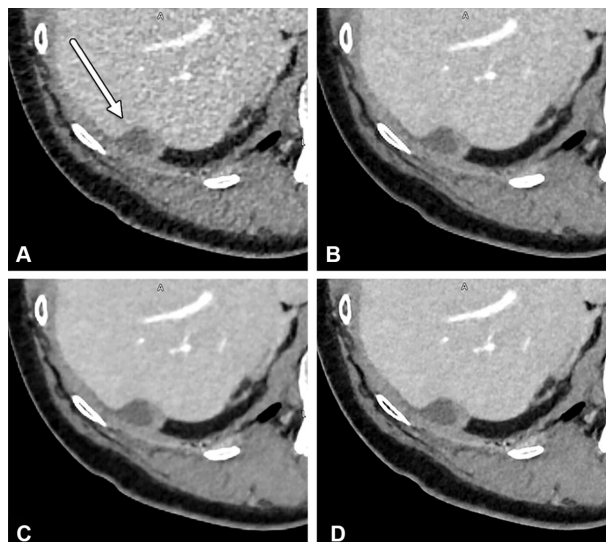


Figure 1: A: AIDR3D, B: AiCE DLR, C: PIQE 512 Matrix, D: PIQE 1024 Matrix. Axial contrast-enhanced CT images show a small metastasis along the posterior hepatic capsule (arrow in A). Improved signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) are noted with AiCE (B). Further image quality improvement is noted using the new PIQE algorithm, with better characterization of the lesion such as outer wall thickening (C). When needed, the image matrix can be increased from 512 to 1024 for improved spatial resolution, resulting in even further improvement with the PIQE algorithm (D).

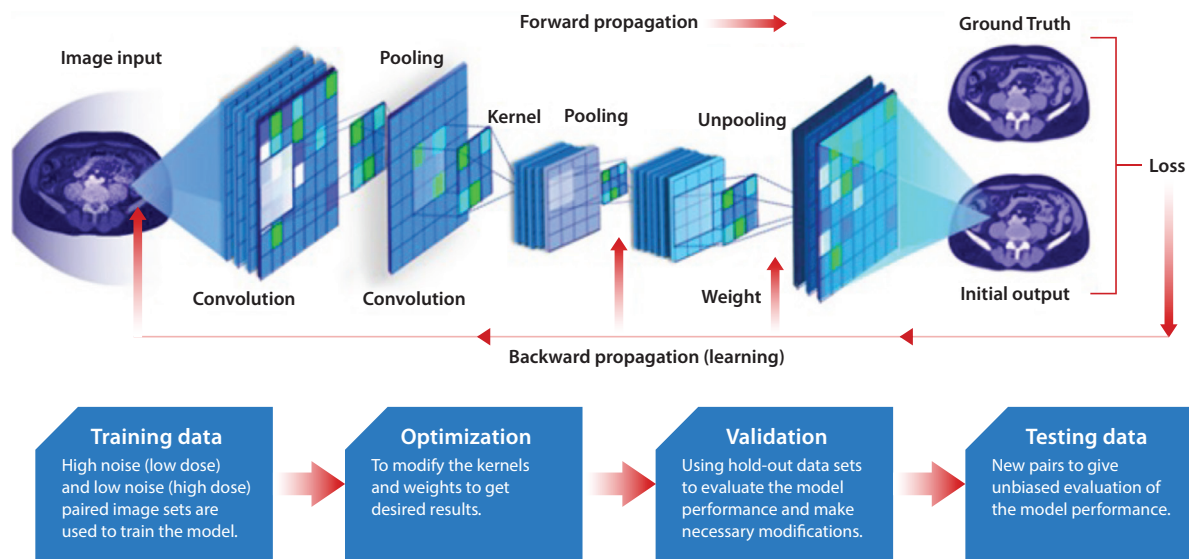


Figure 2: Layout of key steps in the training of a CNN. The network compares output and ground truth images using detected loss of information to iteratively learn and adjust through backward propagation.

Conclusion

SR-DLR algorithms greatly reduce image noise associated with lower radiation doses while preserving image texture and diagnostic performance. SR-DLR methods may be able to harmonize the triad of high-quality images with lower radiation doses and high reconstruction speed, thus overcoming the limitations of FBP and HIR methods.¹ Existing evidence in the literature supports clinical adoption of DLR and SR-DLR methods to facilitate radiation dose reductions across different clinical scenarios, depending on the imaging task.¹

REFERENCE

*PIQE is designed to fully utilize the maximum resolution of the detector

1. Mileto, Achille, et al. "State-of-the-Art Deep Learning CT Reconstruction Algorithms in Abdominal Imaging." *RadioGraphics* 44.12 (2024): e240095.

<https://pubs.rsna.org/doi/abs/10.1148/rg.240095>

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These results are based upon the customer's specific experience. There is no guarantee that other sites will achieve the same results due to variations in clinical setting, patient presentation and other factors.

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