

A Penalized Weighted Least Squares Method with a Deep Learning Prior

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ABSTRACT

In low-dose computed tomography (LDCT), a penalized weighted least squares (PWLS) approach that incorporates the Poisson statistics of X-ray photons can significantly reduce excessive quantum noise. To improve the quality of LDCT images, prior information such as the total variation, Markov random field, and nonlocal mean, can be imposed onto the target image. However, this information may be limited to reflect the characteristics of the target images, thereby resulting in unexpected side effects (e.g. blurry images). In this talk, we introduce a PWLS method by combining it with a deep learning prior [1] to improve the image quality in LDCT. We found that our method reduced quantum noise in LDCT images and improved lesion visibility, thereby outperforming other PLWS methods, by imposing existing priors such as the total variation and the nonlocal mean.

REFERENCES

1. H.S. Park, K. Kim, and K. Jeon, "Low-Dose CT Image Reconstruction With a Deep Learning Prior", *IEEE Access*, Vol. 8, pp. 158647–158655, 2020.