Learning 3D Gaussians for Extremely Sparse-View Cone-Beam CT Reconstruction – Supplementary Material

Table 4. DIF-Gaussian is robust to varying angles. Results are evaluated on a single model trained with 6 views. PSNR/SSIM: dB/10^{-2}. Resolution: 256^3.

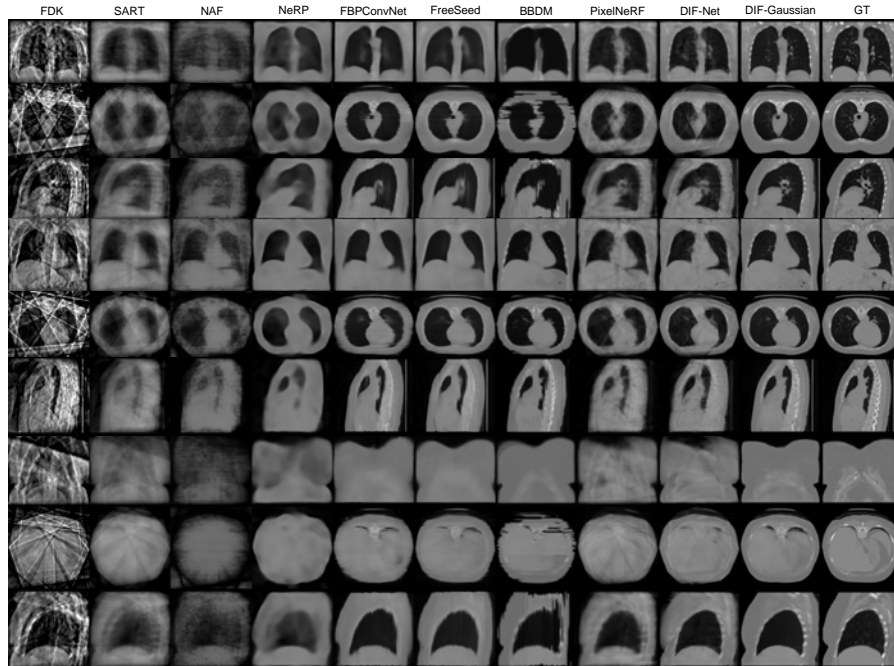| 6-View Projection Angles	LUNA16 [2]	ToothFairy [1]
+0°: [0°, 30°, 60,° 90°, 120°, 150°]	28.48|91.31	27.92|90.19
+5°: [5°, 35°, 65°, 95°, 125°, 155°]	28.49|91.30	27.92|90.18
+10°: [10°, 40°, 70°, 100°, 130°, 160°]	28.47|91.31	27.93|90.19
+15°: [15°, 45°, 75°, 105°, 135°, 165°]	28.48|91.32	27.93|90.20
+20°: [20°, 50°, 80°, 110°, 140°, 170°]	28.48|91.31	27.92|90.19

Fig. 3. Visualization of different methods on 6-view LUNA16 [2] (chest CT) reconstruction. The reconstruction resolution is 256^3.

Implementation of TTO. The network is optimized using Adam (LR=1e-7). In each iteration, one projection view is selected (i.e., batch_size=1). For a view, we randomly select 512 rays and 512 points are sampled in each ray. Loss converges after 60 iterations. Efficiency: 0.465±0.005 s/iter, and 28 seconds per-sample optimization.
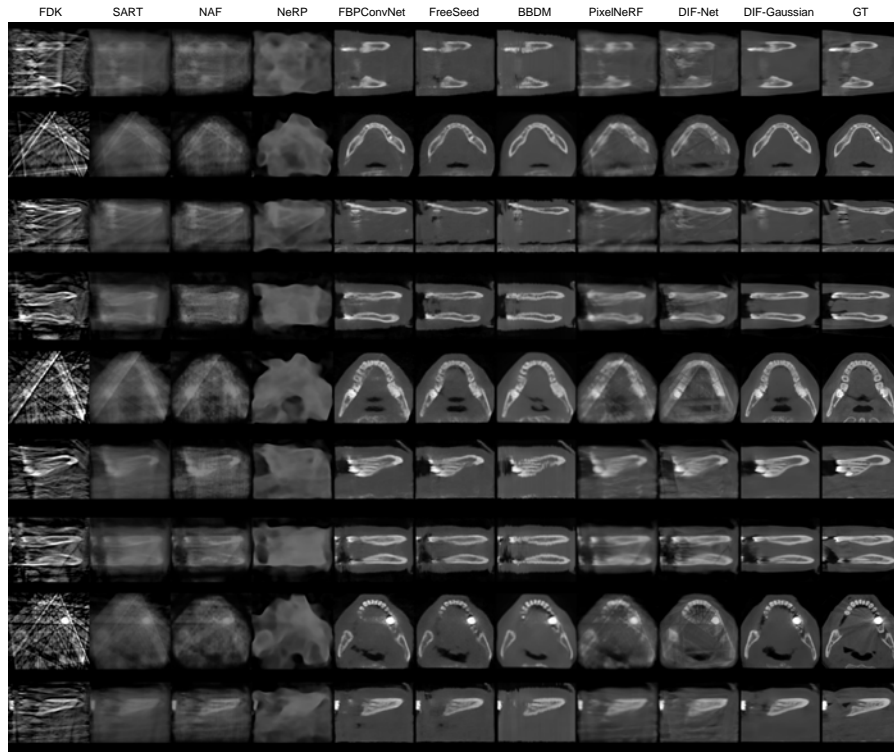
Fig. 4. Visualization of different methods on 6-view ToothFairy [1] (dental CBCT) reconstruction. The reconstruction resolution is 256^3.

Statistical analysis. In Table 1, std (PSNR/SSIM) of our method and DIF-Net are [LUNA16: 6/8/10-view] Ours: 0.02/0.10, 0.03/0.08, 0.02/0.09. DIF-Net: 0.13/0.21, 0.09/0.17, 0.11/0.19. [ToothFairy: 6/8/10-view] Ours: 0.03/0.08, 0.02/0.08. 0.03/0.09. DIF-Net: 0.12/0.23, 0.10/0.18, 0.13/0.19.

References

1. Cipriano, M., Allegretti, S., Bolelli, F., Di Bartolomeo, M., Pollastri, F., Pellacani, A., Minafra, P., Anesi, A., Grana, C.: Deep segmentation of the mandibular canal: a new 3d annotated dataset of cbct volumes. IEEE Access **10**, 11500–11510 (2022)
2. Setio, A.A.A., Traverso, A., De Bel, T., Berens, M.S., Van Den Bogaard, C., Cerello, P., Chen, H., Dou, Q., Fantacci, M.E., Geurts, B., et al.: Validation, comparison, and combination of algorithms for automatic detection of pulmonary nodules in computed tomography images: the luna16 challenge. Medical image analysis **42**, 1–13 (2017)