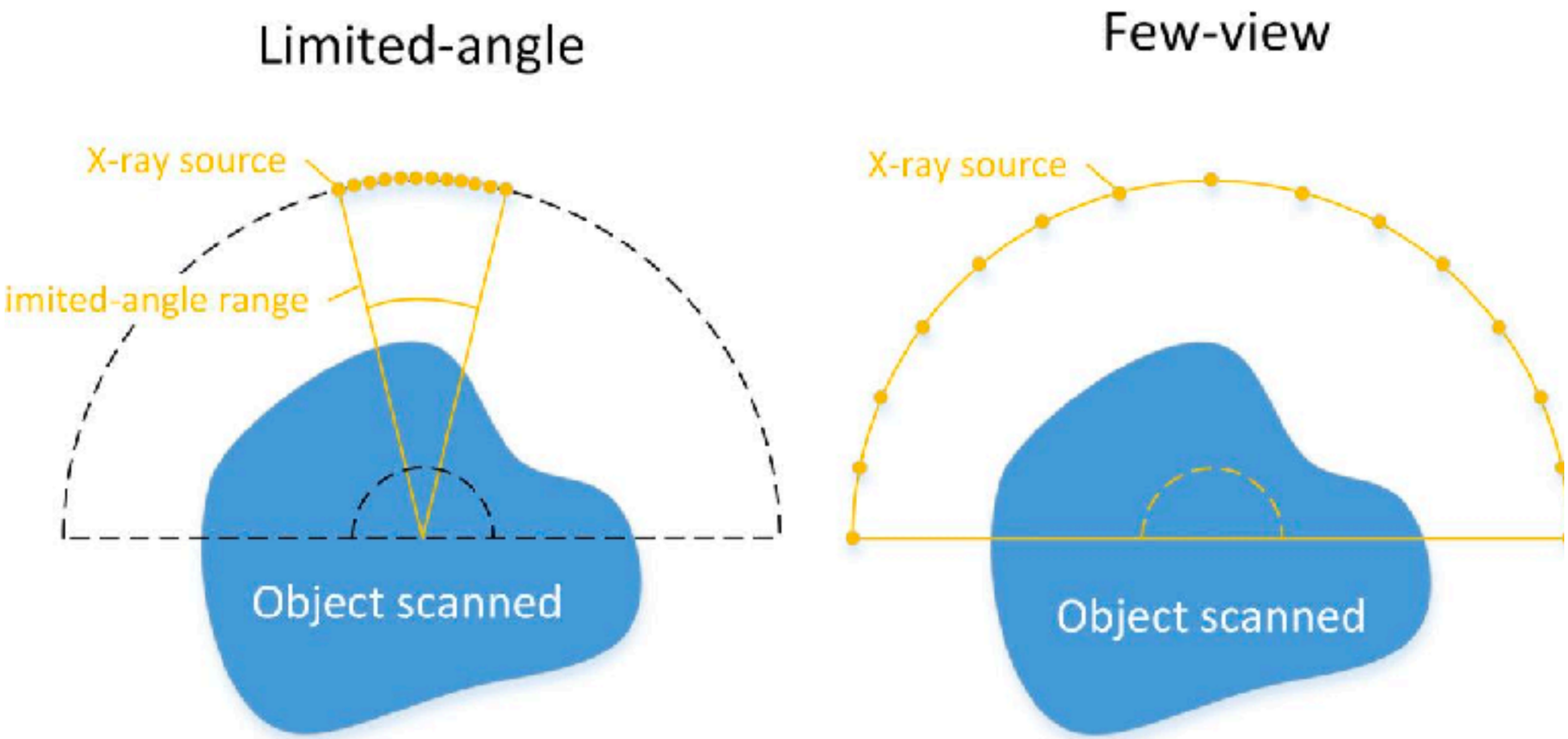
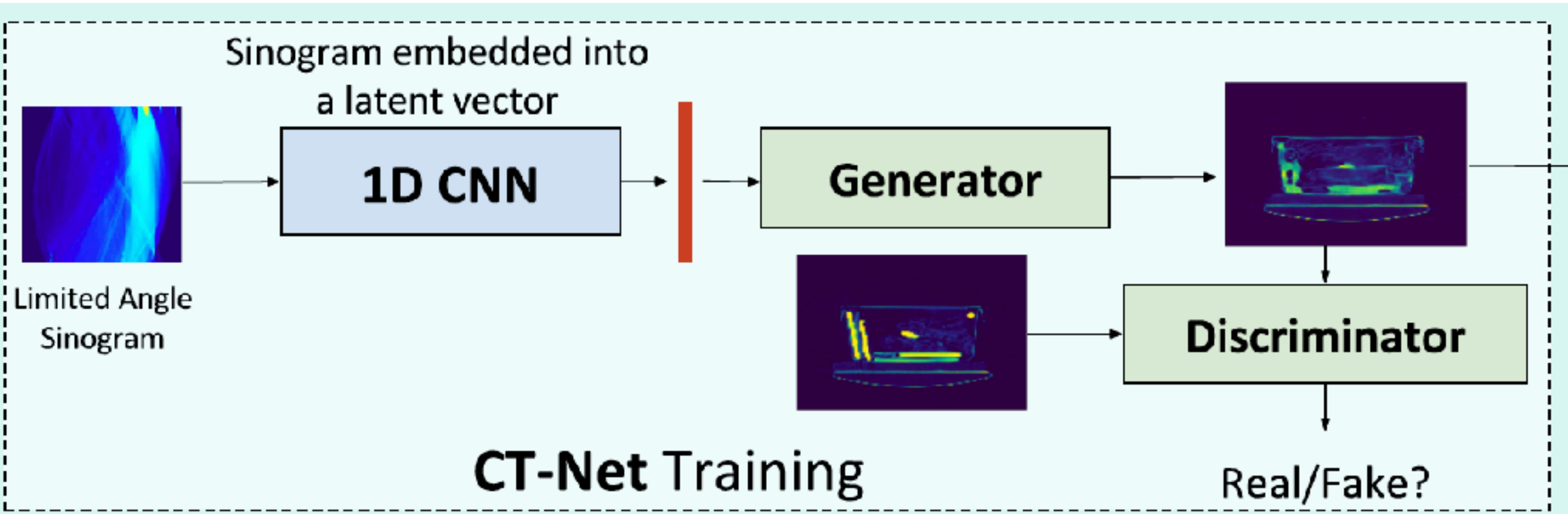
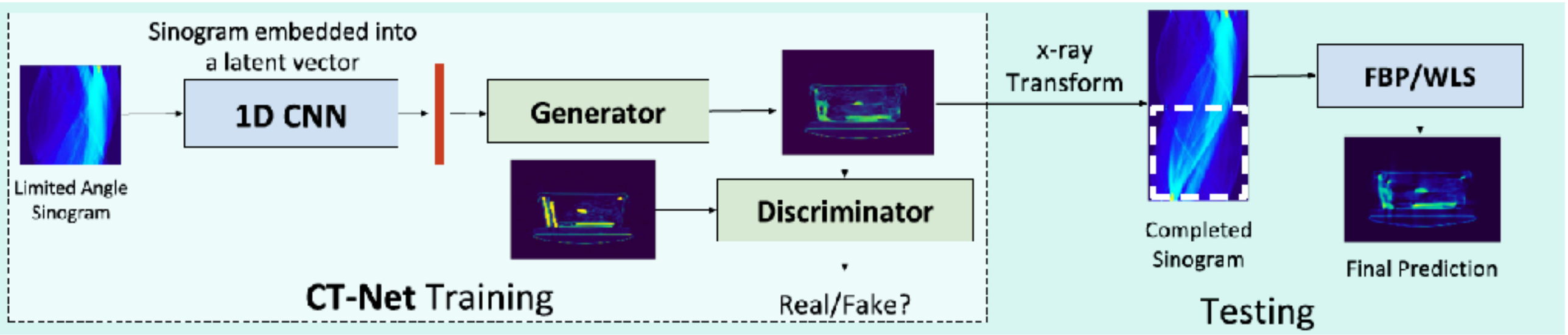
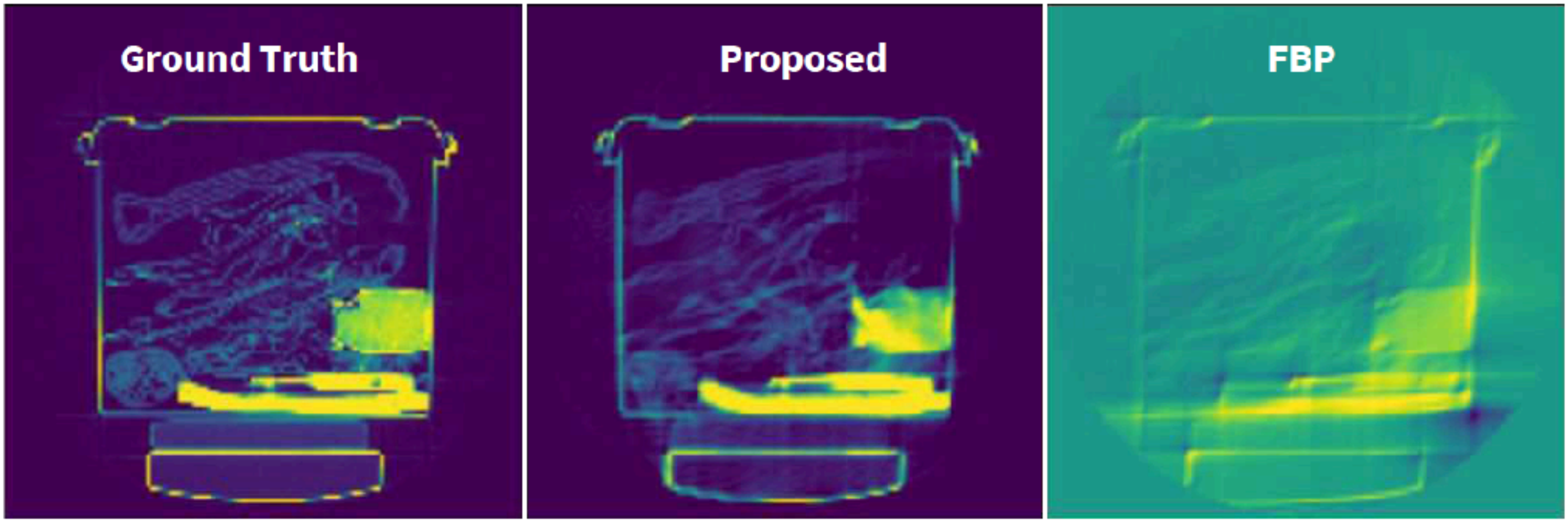
Lose The Views: Limited Angle CT Reconstruction via Implicit Sinogram Completion

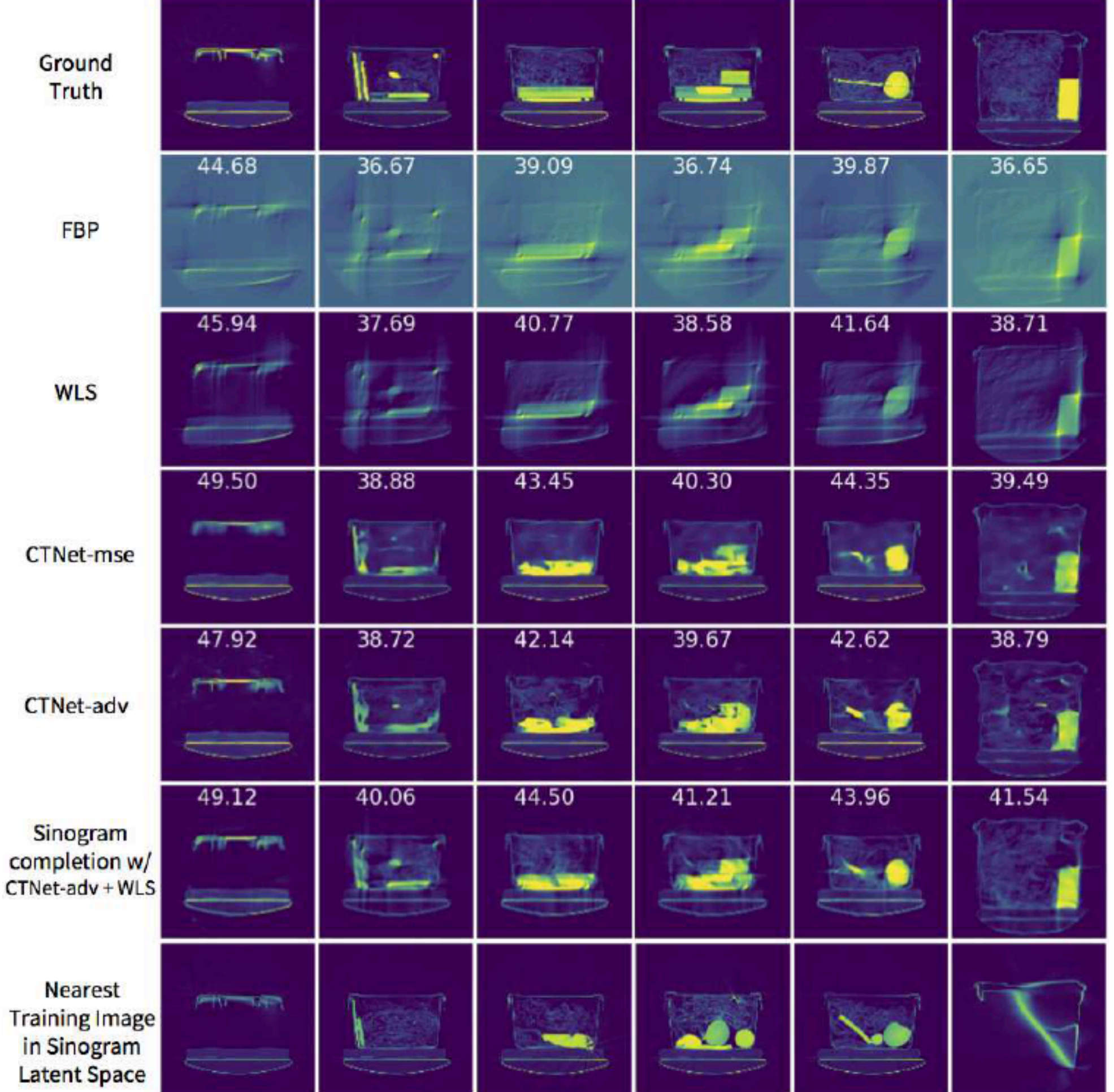
Presenter: Hongming Shan


Limited-angle
X-ray source
imited-angle range
Object scanned
Few-view
X-ray source
Object scanned

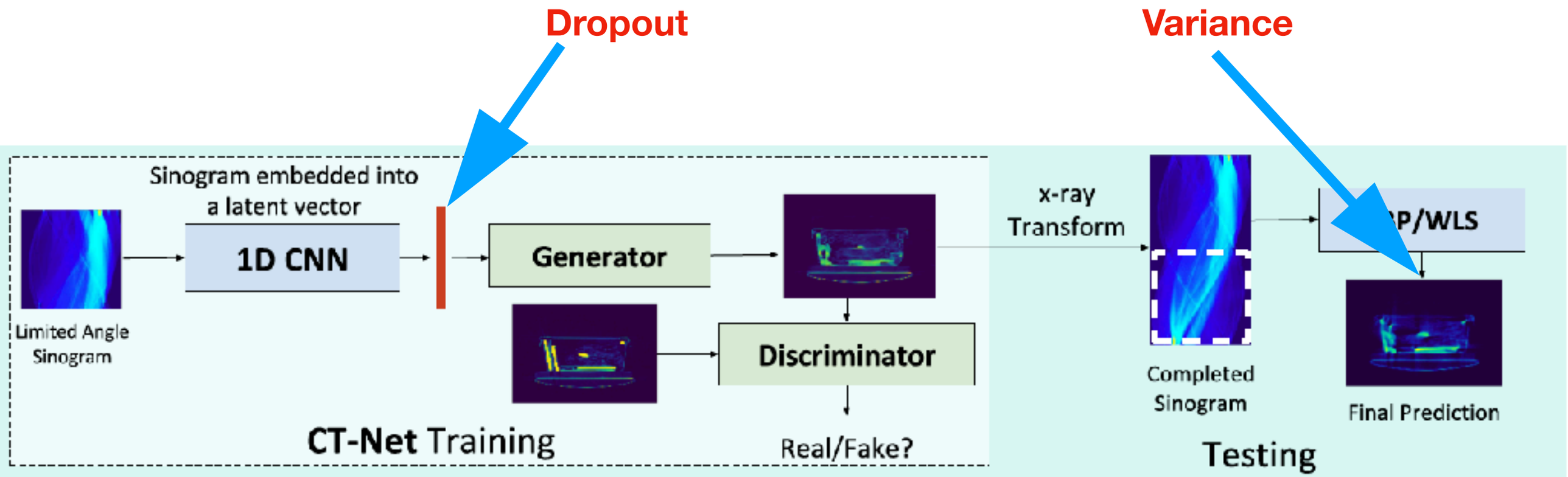

Sinogram embedded into
a latent vector
1D CNN
Generator
Limited Angle
Sinogram
Discriminator
CT-Net Training
Real/Fake?


Sinogram embedded into
a latent vector
1D CNN
Generator
Limited Angle
Sinogram
Discriminator
Real/Fake?
CT-Net Training
x-ray
Transform
Completed
Sinogram
FBP/WLS
Final Prediction
Testing

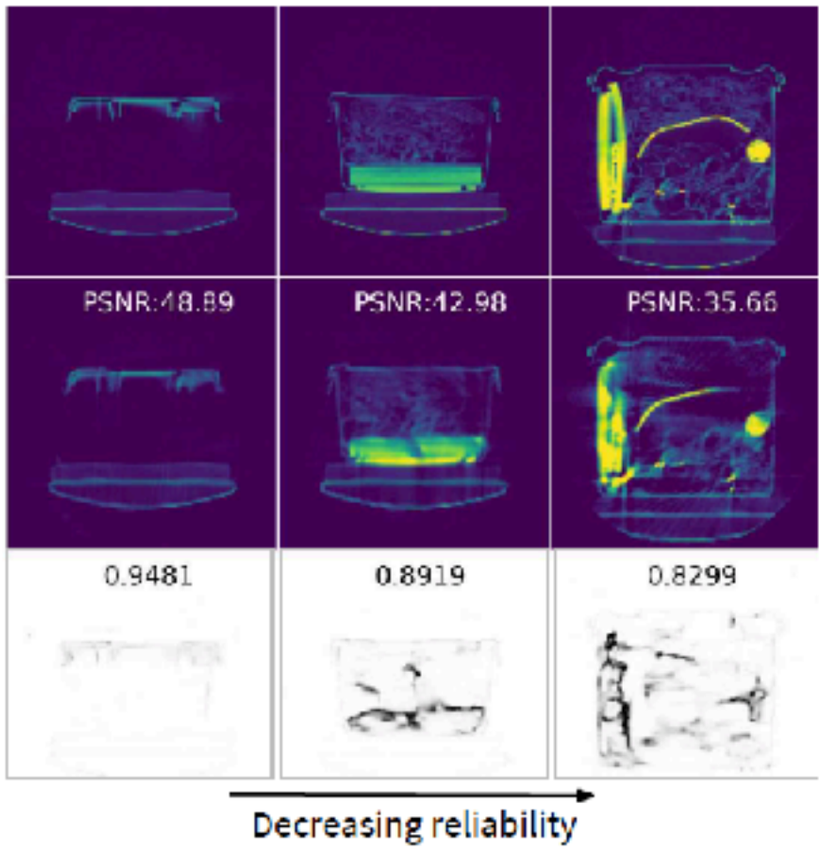

Ground Truth
Proposed
FBP


Ground Truth
FBP
44.68
36.67
39.09
36.74
39.87
36.65
WLS
45.94
37.69
40.77
38.58
41.64
38.71
CTNet-mse
49.50
38.88
43.45
40.30
44.35
39.49
CTNet-adv
47.92
38.72
42.14
39.67
42.62
38.79
Sinogram completion w/ CTNet-adv + WLS
49.12
40.06
44.50
41.21
43.96
41.54
Nearest Training Image in Sinogram Latent Space

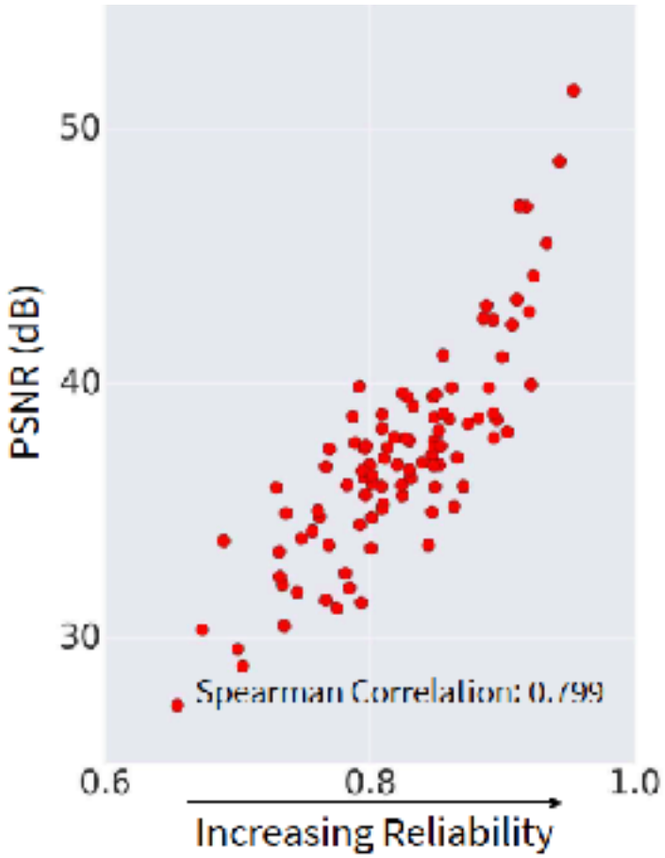
A New Confidence Score for Reconstructions from Limited Angle Sinograms



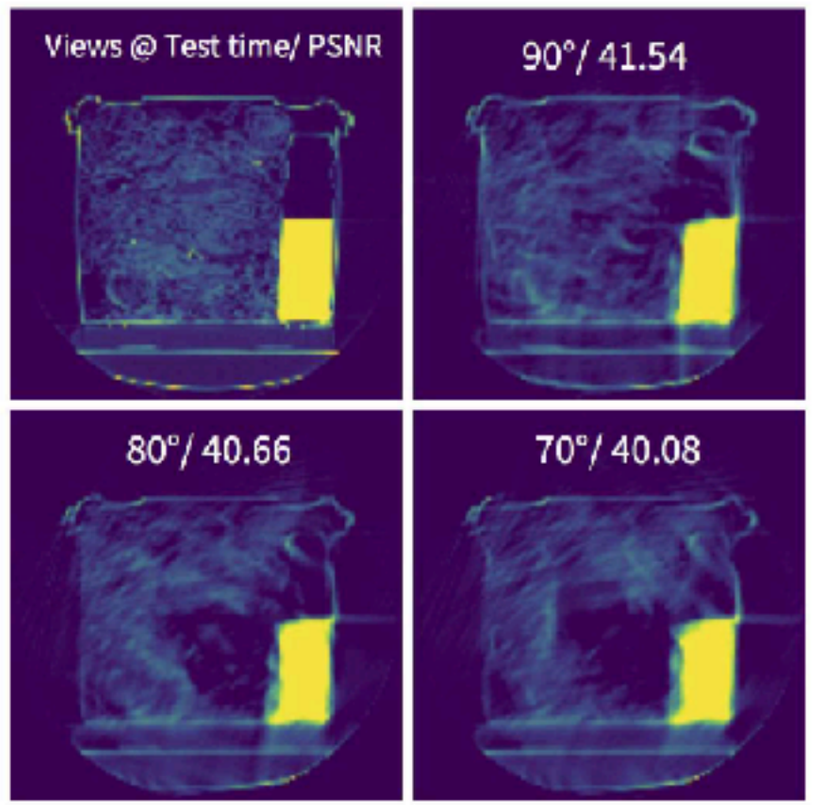
$$r_k = \exp\left(-\frac{\sum_i \sum_j V_{ij}}{||\hat{Y}_k||_2}\right), \qquad (4)$$



(a) top row: ground truth, middle: proposed reconstruction, and bottom row: pixel-wise confidence map. Light indicates more confident.



(b) PSNR v Reliability



(c) Robustness to different views at test time: top left is ground truth, and others are reconstructions using CTNet-adv+WLS.