EE5613 : MEDICAL IMAGING

RING ARTIFACT REDUCTION

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DATASET CREATION

1

Sinogram Creation for the DICOMs in the Dataset

2

Adding Noise to the Sinogram

3

BackProjecting it to create the Ring Artifacted Image

4

Saving It as h5 files

5

Uploading it into Kaggle

DATASET CREATION

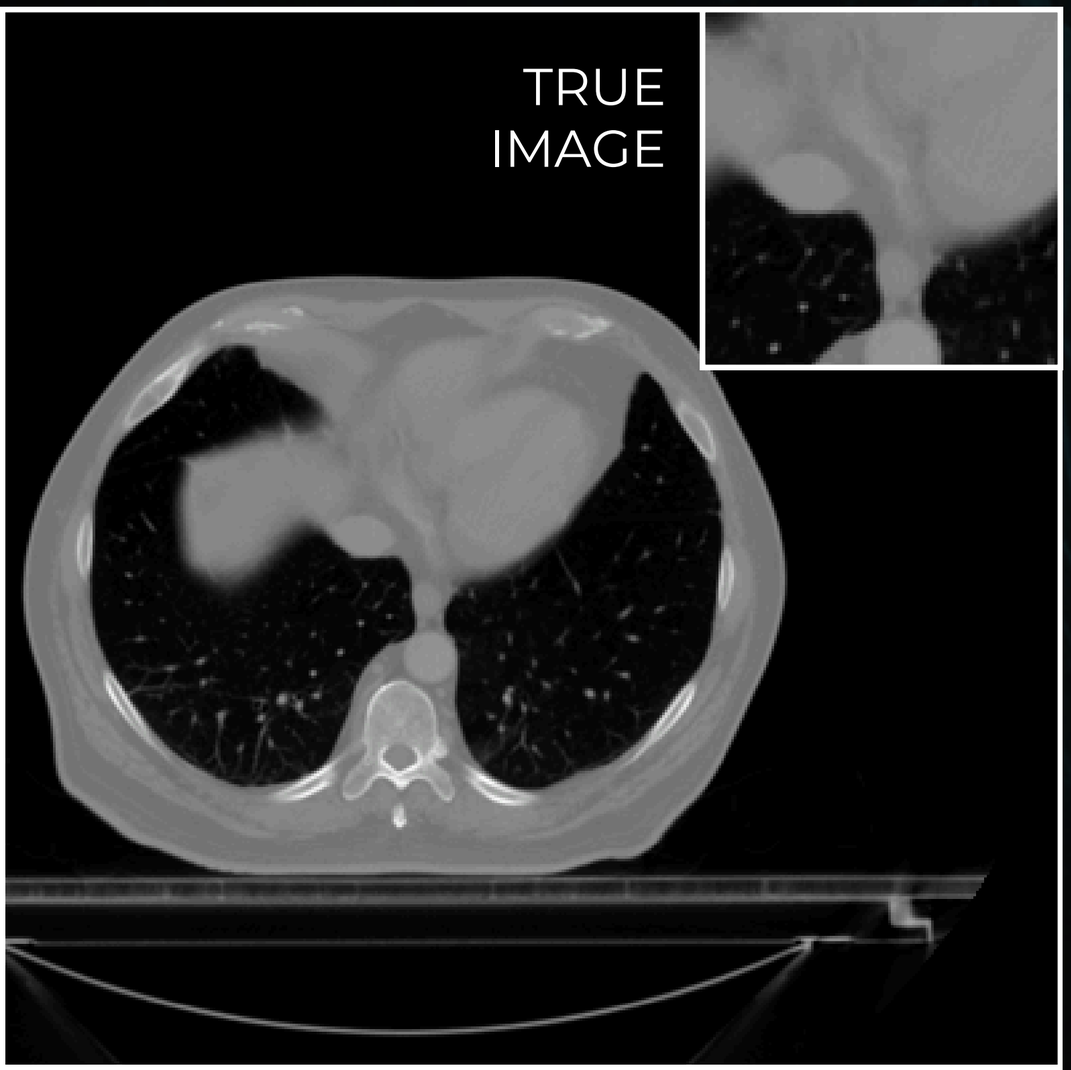
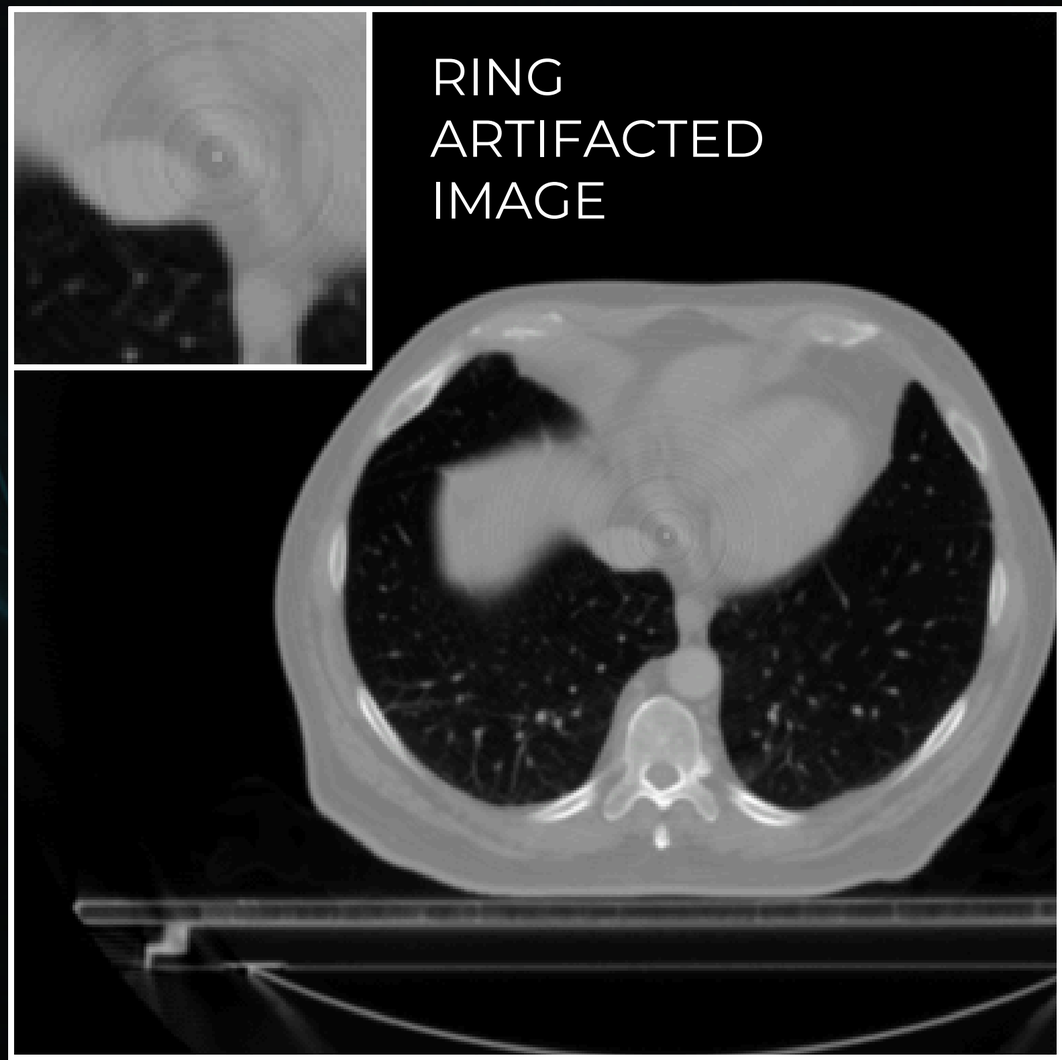
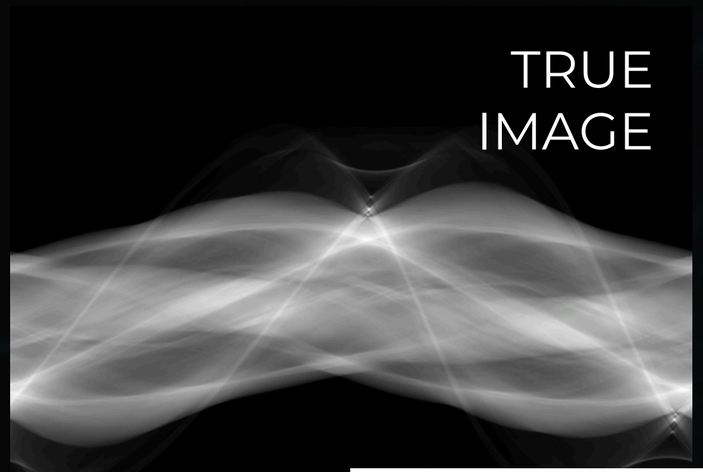


IMAGE DOMAIN



DATASET CREATION

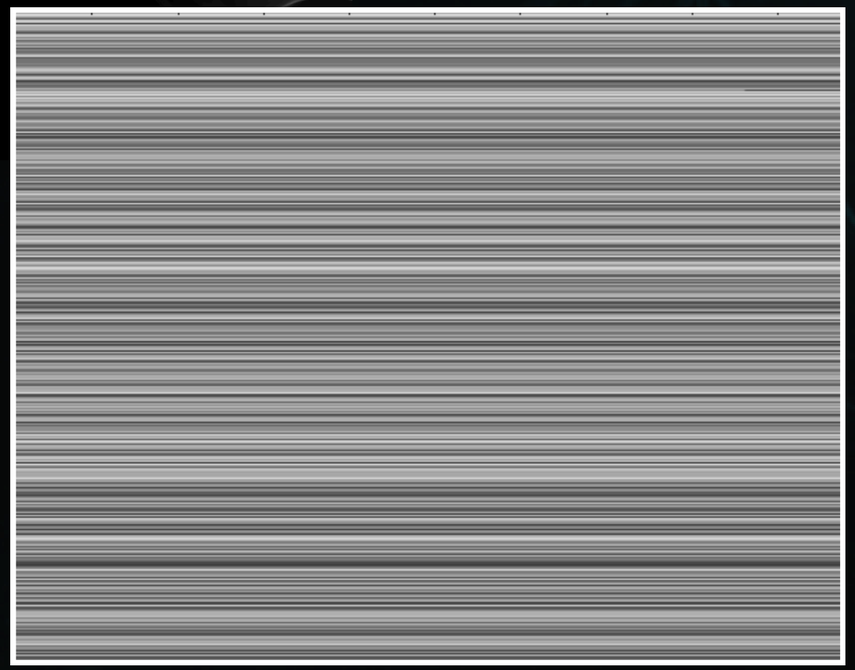
TRUE IMAGE

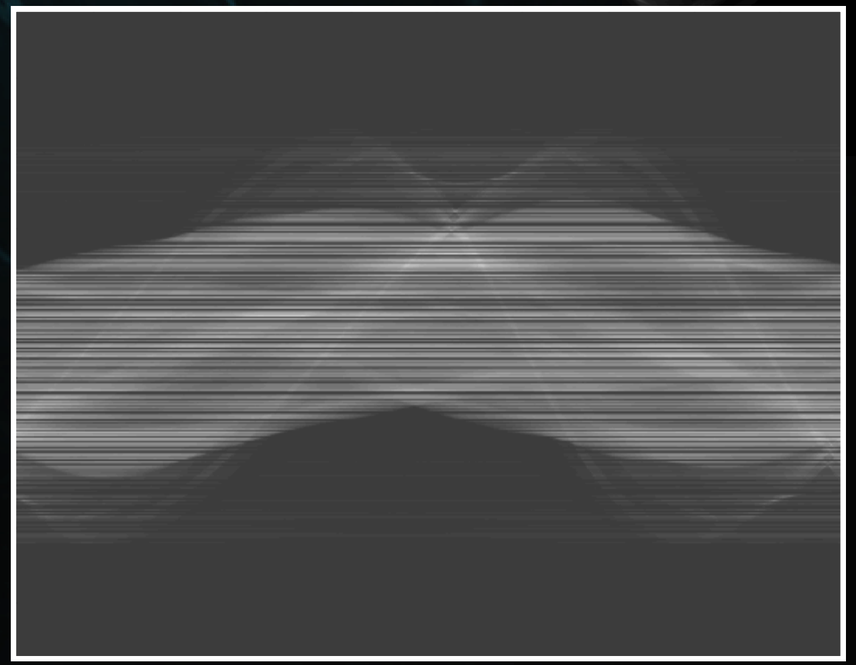


RING ARTIFACTED IMAGE

SINOGRAM DOMAIN

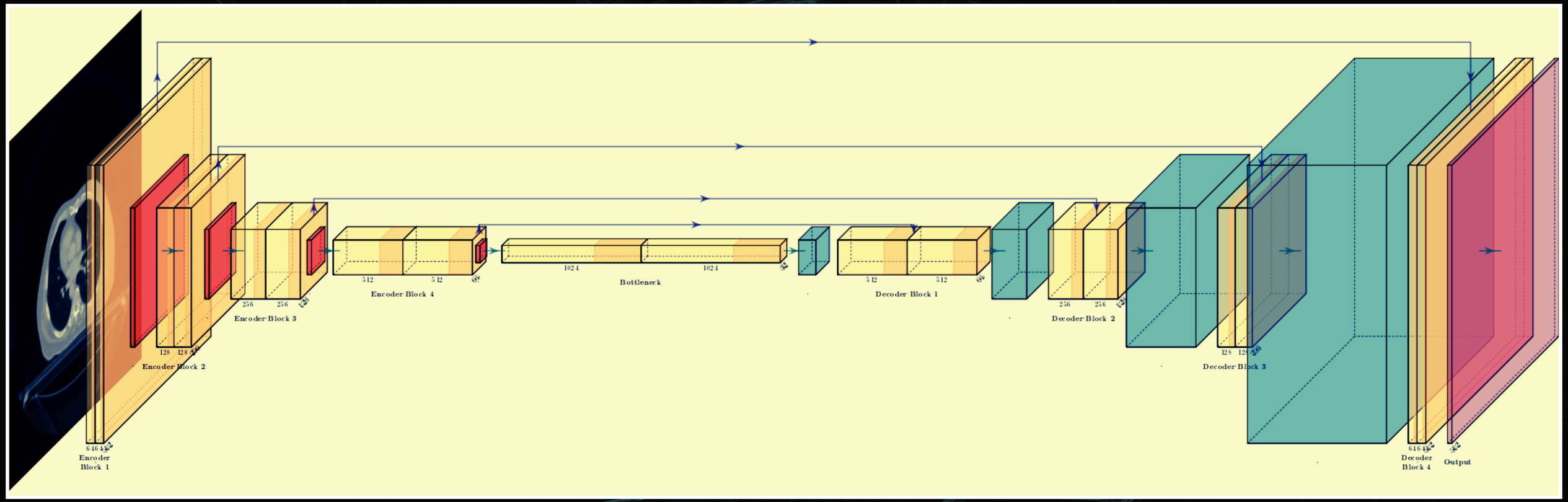
SENSITIVITY





DIFFERENCE

MODEL ARCHITECTURE



MODEL ARCHITECTURE

MODEL PARAMETERS

- **Input and Output Channels:** Configured for grayscale images with one input and one output channel, adjustable for RGB or multi-class segmentation.
- **Encoder Blocks:** Four EncoderBlock modules with two convolutional layers each, ReLU activations, increasing filters (64 to 512), and max pooling for downsampling.
- **Bottleneck:** Two convolutional layers with 1024 filters and ReLU activations, capturing abstract features.
- **Decoder Blocks:** Four DecoderBlock modules with up-convolutions to increase resolution, concatenating with encoder outputs, and decreasing filters (1024 to 64).
- **Final Layer:** A convolutional layer with a kernel size of 1 maps 64 feature channels to the output channels, typically followed by sigmoid or softmax activation.

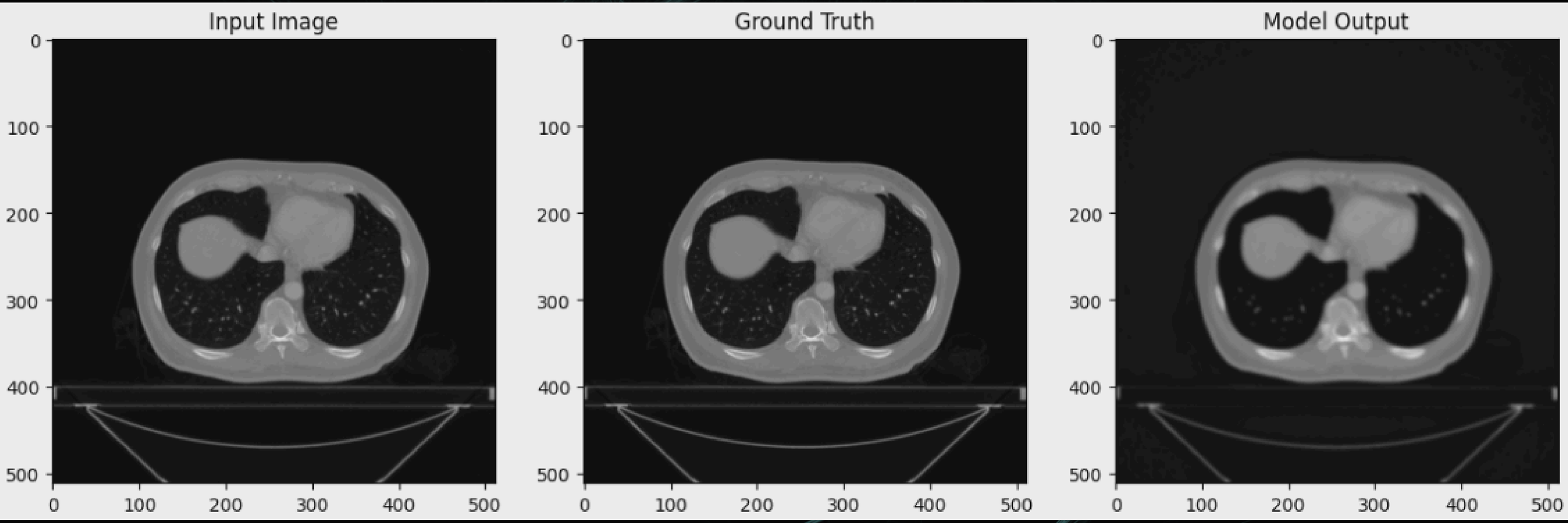
MODEL TRAINING

TRAINING PARAMETERS

- The training process iterates over **100 Epochs**, with an early stopping mechanism **activated after 2** consecutive epochs of no improvement in validation loss.
- Model checkpoints are saved after each improvement in validation loss, ensuring retention of the best-performing models.
- TensorBoard SummaryWriter logs training progress under directories named with timestamps and learning rates.
- The model is trained on a GPU ('cuda') for accelerated computation, utilizing the PyTorch framework for deep learning tasks.
- The training loop tracks both training and validation losses, enabling performance evaluation and monitoring model convergence.

RESULTS

IMAGE DOMAIN

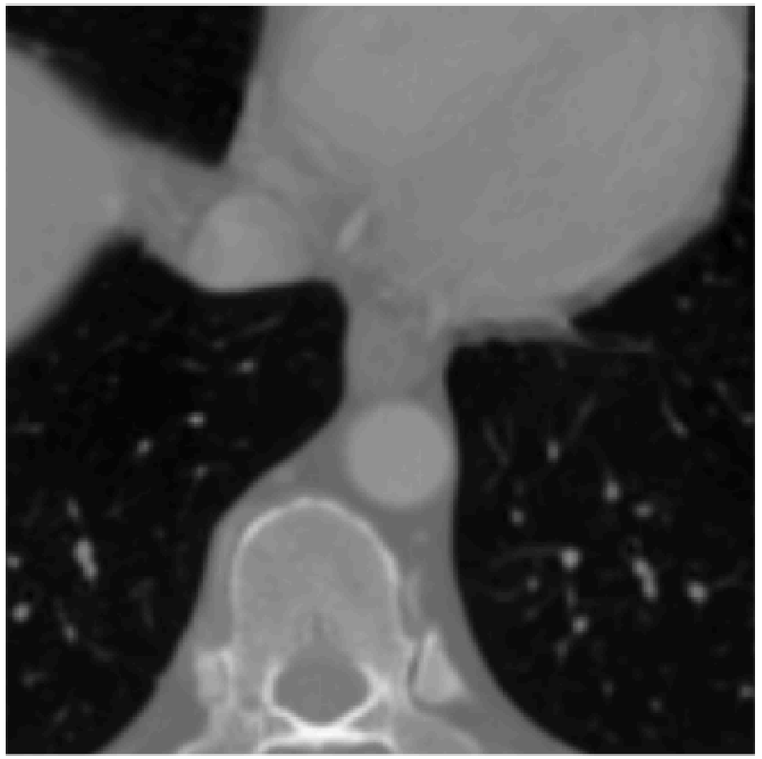


RESULTS

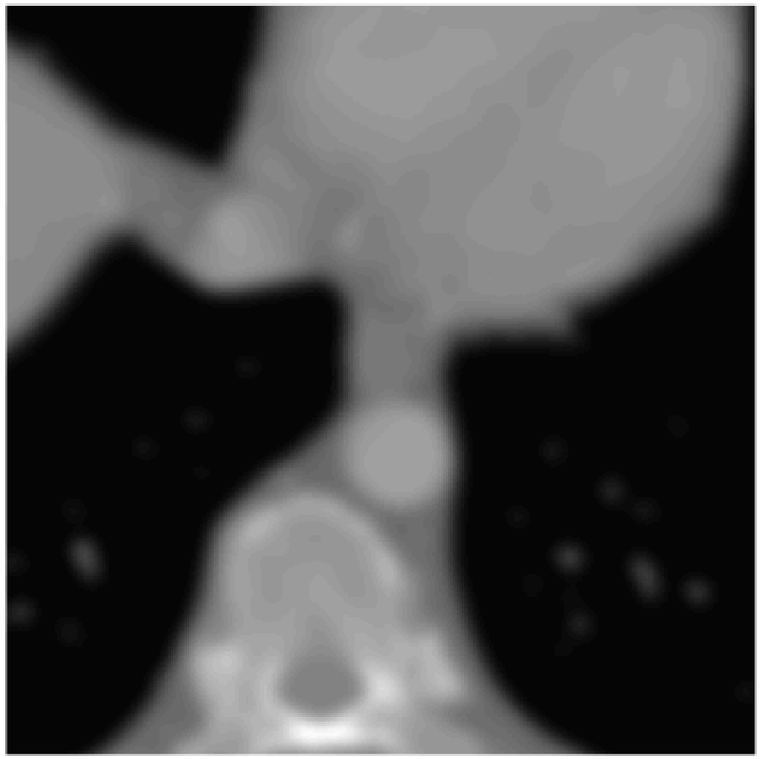
IMAGE DOMAIN

Input Image

Ground Truth

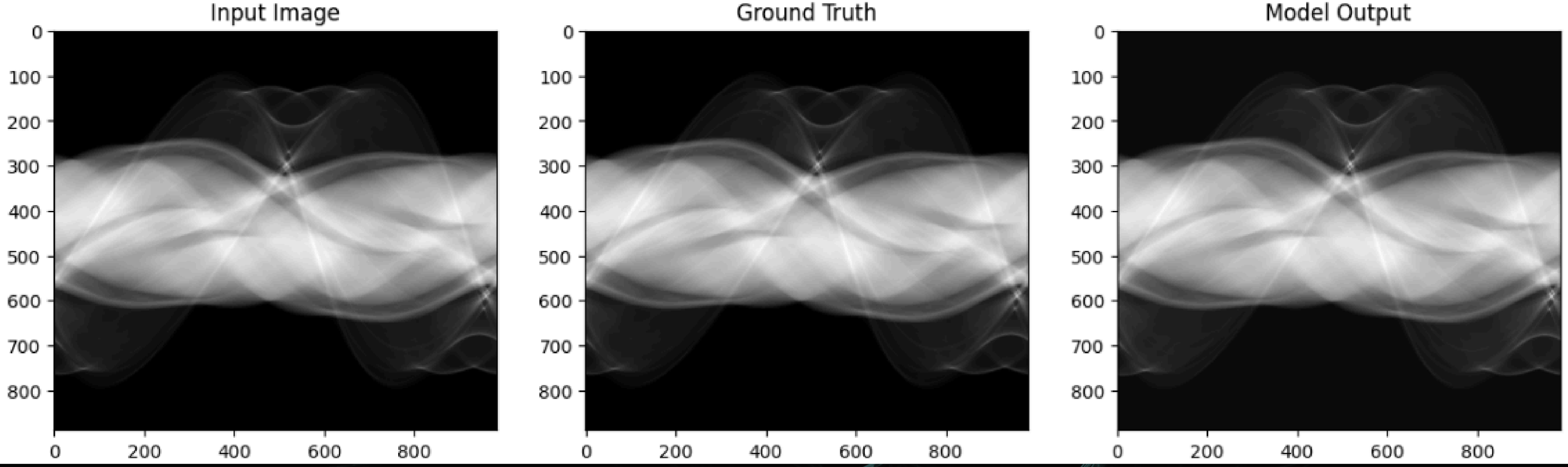


Model Output



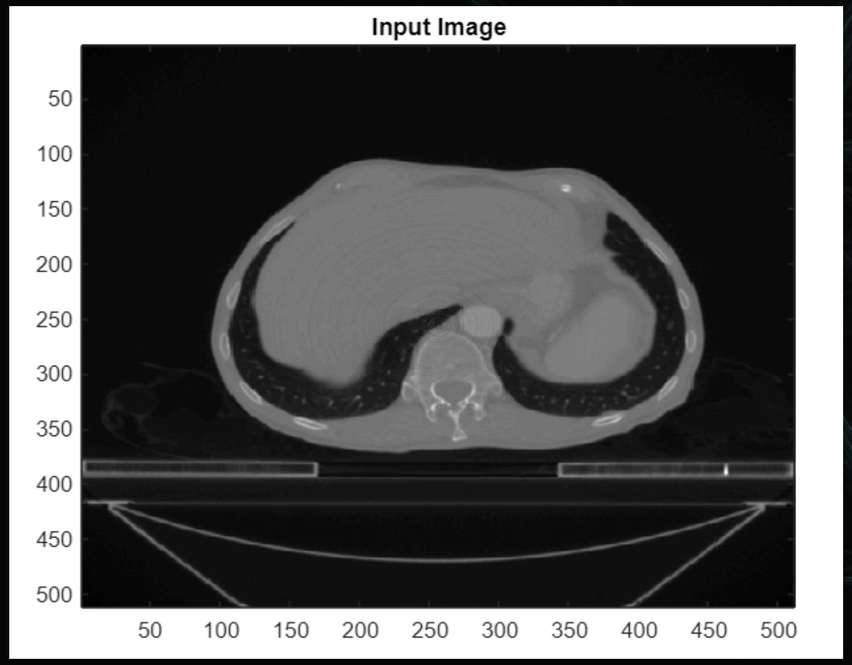
RESULTS

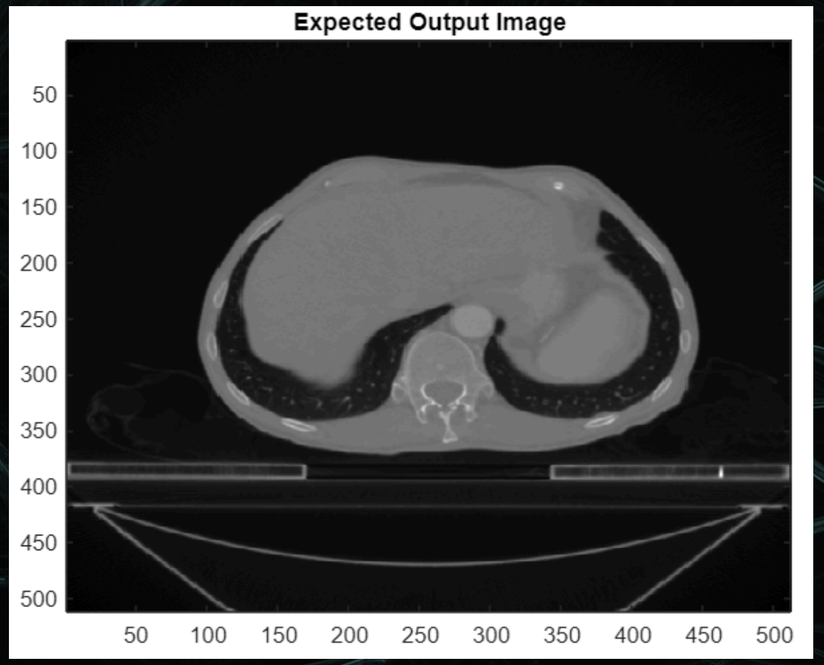
SINOGRAM DOMAIN

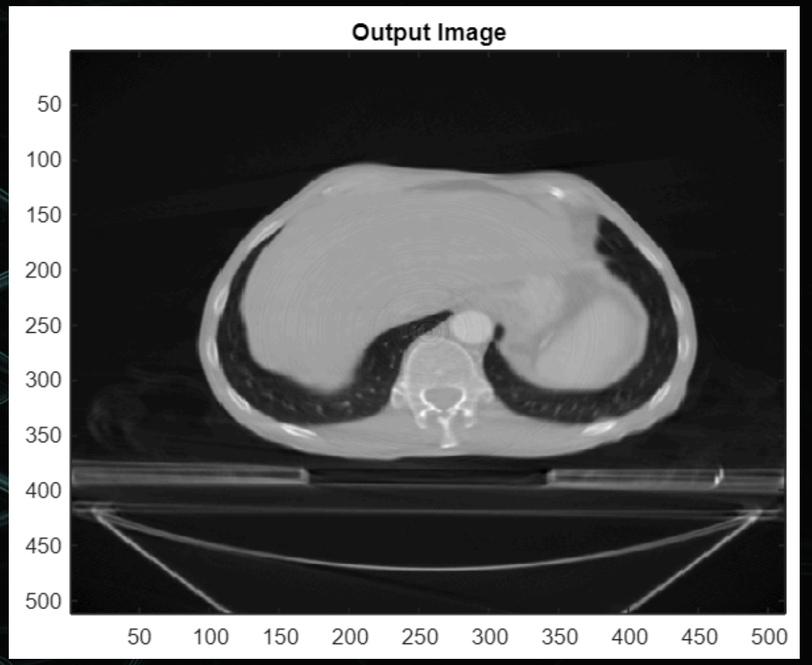


RESULTS

SINOGRAM DOMAIN

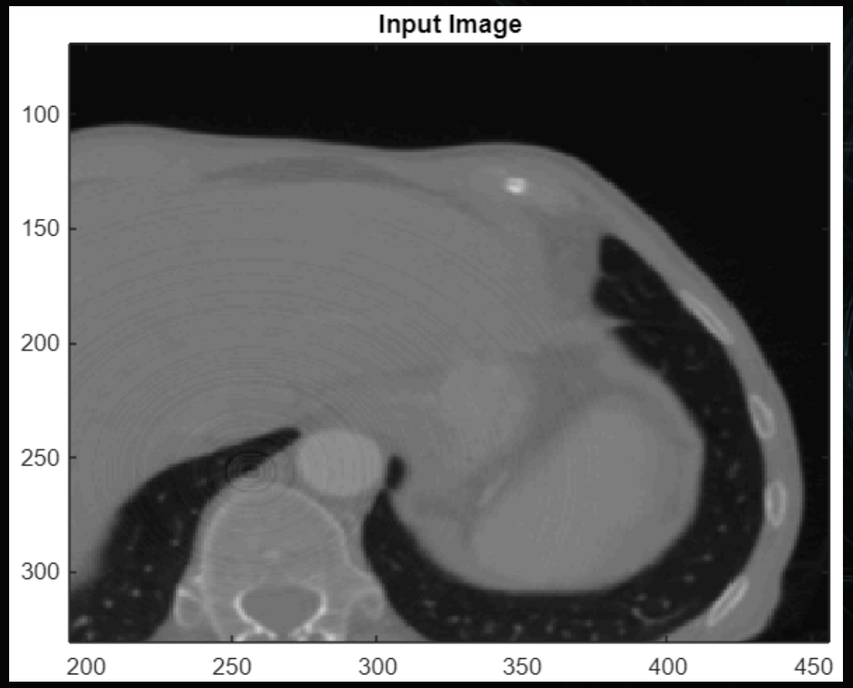


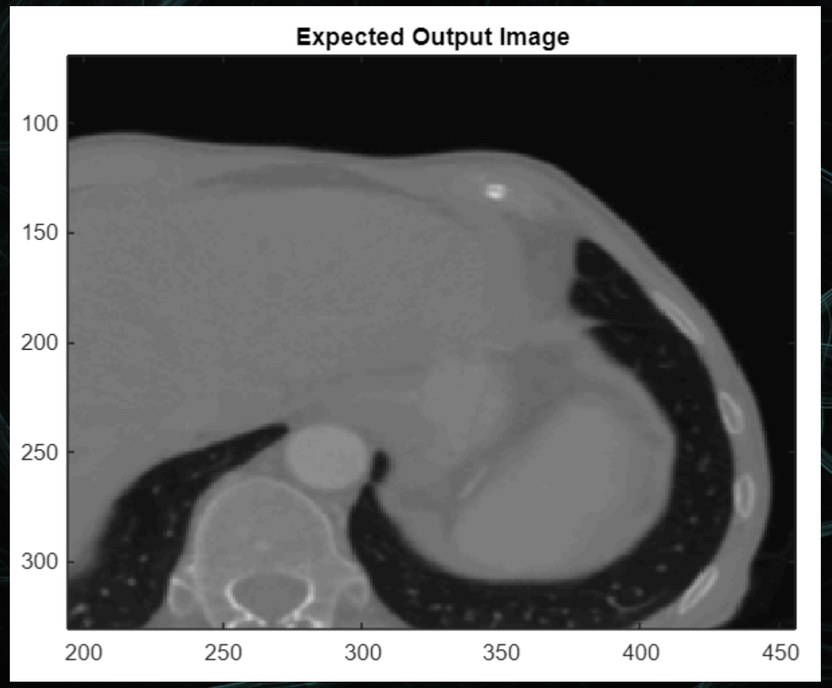


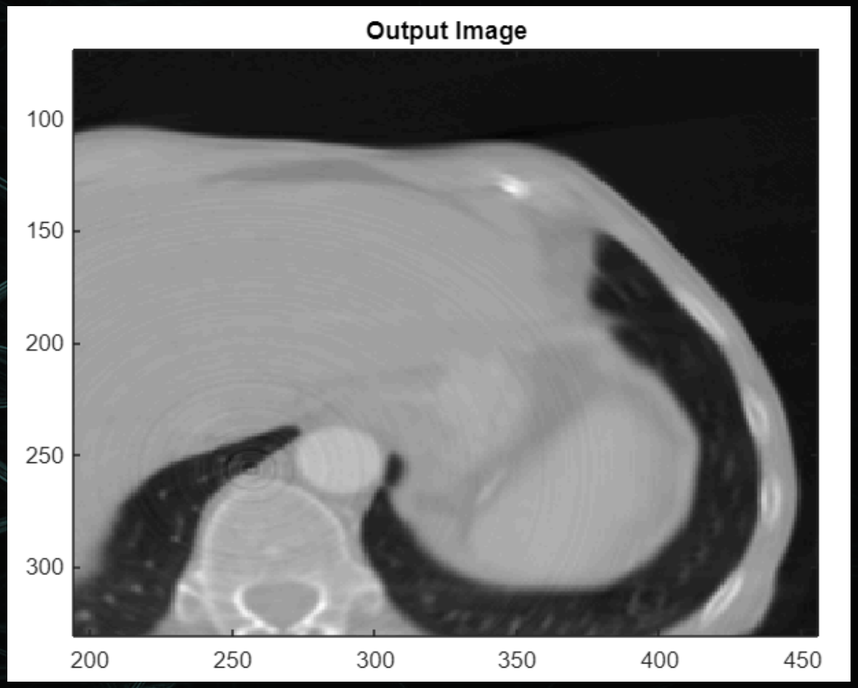


RESULTS

SINOGRAM DOMAIN

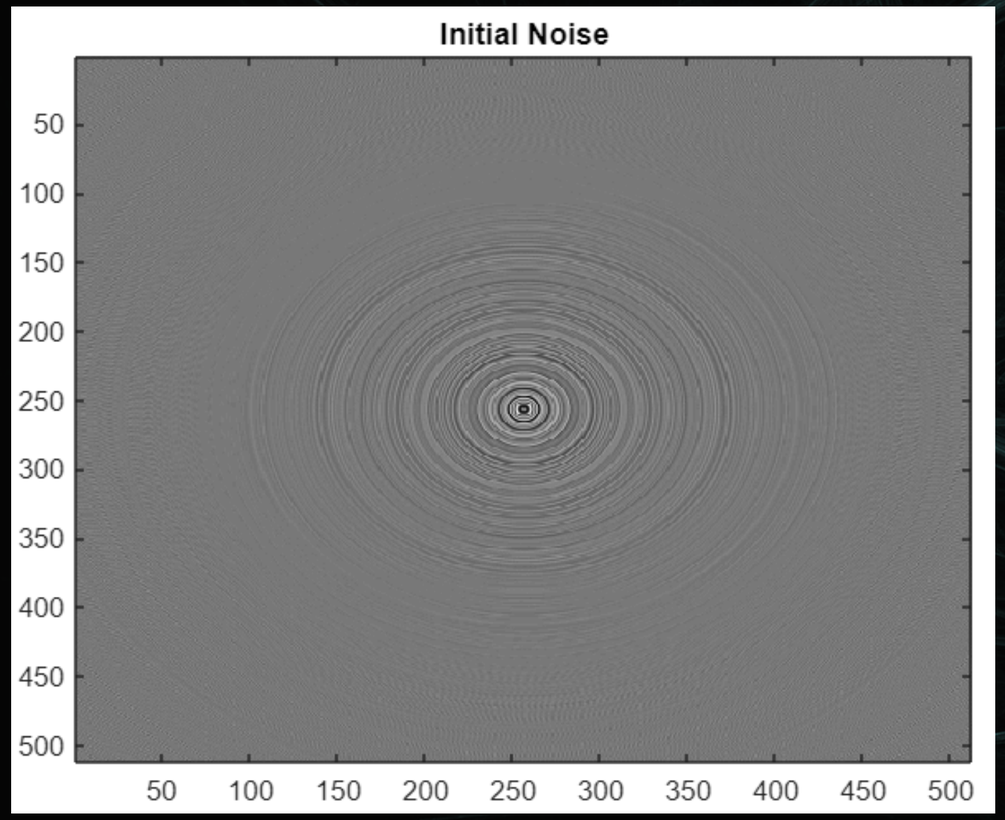


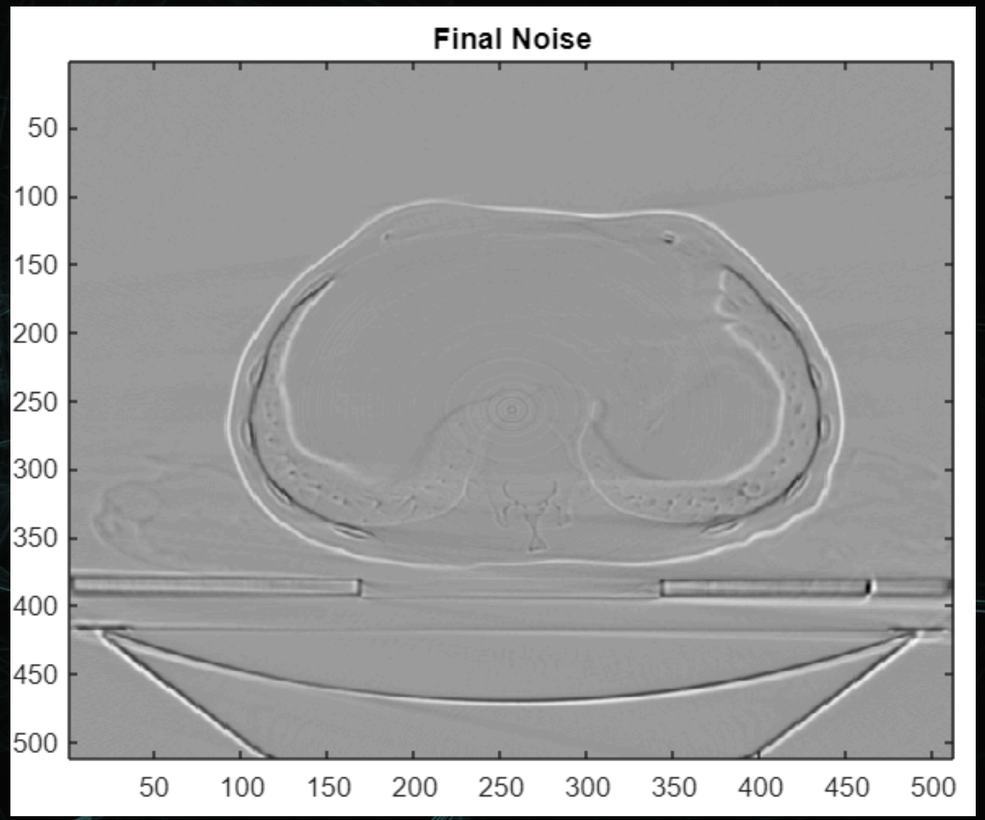




RESULTS

SINOGRAM DOMAIN





INFERENCE

IMAGE DOMAIN	SINOGRAM DOMIAN
• Doing Ring Artifact Reduction in Image domain results in the lose of features of the image as it blurs the image more than it reduces the ring artifact • It was faster as the data size was lower	• Doing Ring Artifact Reduction in Sinogram domain results in the image getting a little blurred, but most of the features are intact. It also reduces the ring artifact significantly • Since there was a greater size for each data, it took more time and stores more data.

THANK YOU