SYDA model checklist[1199]

Table no.	Index
1	General
2	Training Data
3	Evaluation Data
4	Project config details
5	Metrics
6	Use
7	Clinical Evaluation
8	Ethical considerations
9	Informed consent
10	Legal

1 General[1200]

Project Name	Synthetic Data Shadow
Report version	Version number (can it be maintained somewhere else)
Person developing the model	Srinivasan Duraimani
Date	(The date of submitting this DOC)
Model name	CT image generator (or could be filename "model.pt or model.h5")
Model description	This Model Generates realistice synthetic ct scans given a set of image properties.
Model type	Data Generator
Model version	0.0
Link to Github Repository	git link to be shared after model artifacts are stored with version control

2 Training Data[1201]

2.1 Data version 0[1390]

Details about Data version 0 can be found here switch to preview mode to view the full contents

2.2 Annotation protocol[1204]

No Annotation was required for this Model. Since the model is trained to only generate realistic images from random Noise inputs.

3 Evaluation Data[1205]

Evaluation Data would Not be Applicable for a Generative Model.

3.1 Dataset[1206]

N.A

3.2 Demographic Details and Stats[1207]

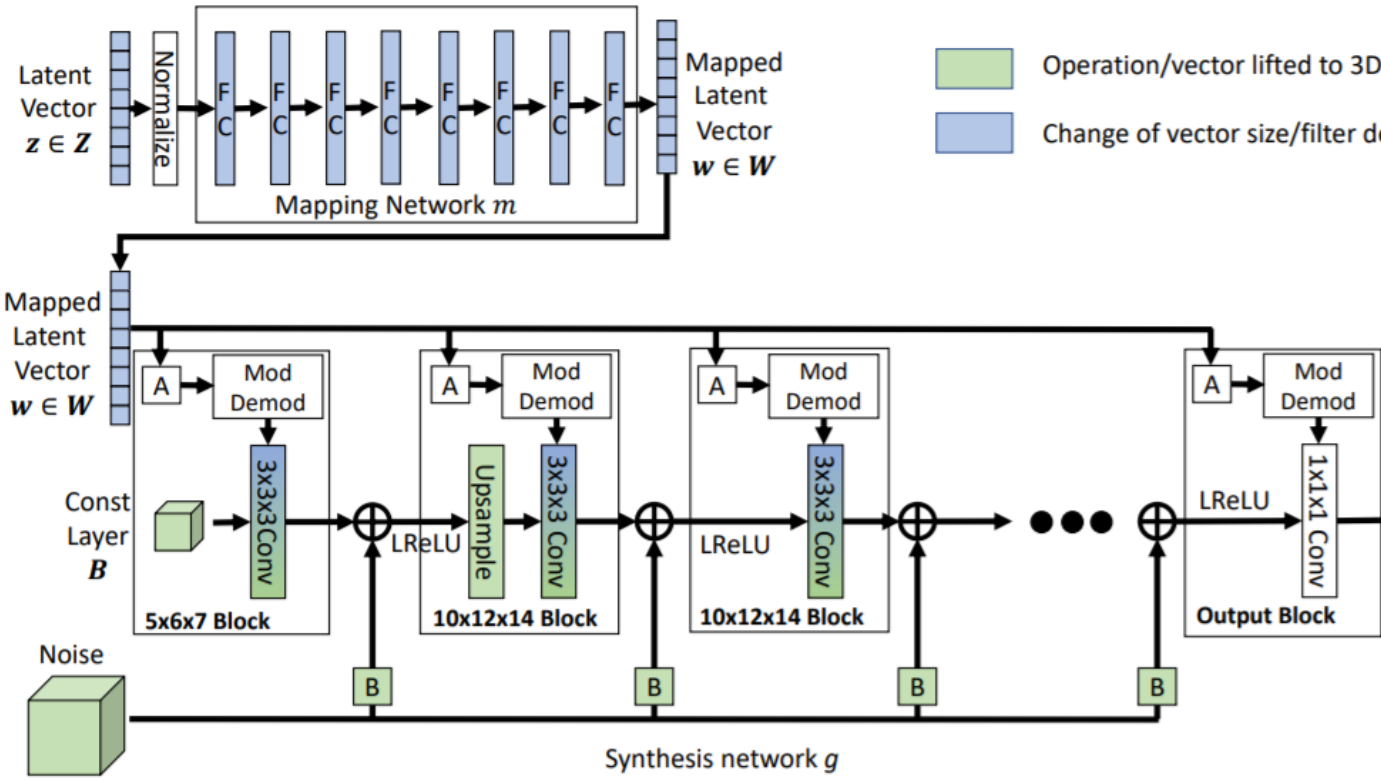
N.A

3.3 Annotation protocol[1208]

N.A

4 Project Config[1209]

4.1 Algorithm[1210]



The Generative model has 2 models a mapping Network that consists os 8 Linear Layers and a Synthesis Network. The Mapping network Starts with an input of Latent vector Z in our case its 96, and generates W which will be 96. The Synthesis Networks Starts from a const 4x4x4x512 tensor that is fed into a 3x3x3 Convolution layer this similar block is repeated 5 times with Upsampling done before each block. the W is also injected into the convolution layers. Additional Noise B is added after the Convolution and before Upsampling. this model generates images of shape 128x128x128 pixels with 1.5x1.5x1.5 voxel spacing in the range of -1 to 1. which can be converted to a range of -1000 to +1000 to simulate HU values of CT scans.

The Discriminator is a simple convolutional model with downsampling done that predicts the validity of an image as real or fake. The loss is a min max game between the Generator and Discriminator along with path regularization of real images.

4.2 Pre-Processing Steps[1211]

We do the following preprocessing steps:

During Training:

- convert the dicom images into niftii's
- resample the niftii images to a consistent 1.5x1.5x1.5 mm voxel spacing
- extract the image data, affine data and image attributes and convert it into a tf record
- tf records as they get extracated in the training code they are checked for voxel spacing of 1.5x1.5x1.5 mm
- the values are scaled from -1000 to +1000, to range -1 to +1, clipping outliers
- the image is resized with a maintained aspect ratio and by th elongest side, to 128
- all sides are then padded with padding value of -1
- converted to tensors for training.

During inference:

- convert the dicom images into niftii's
- resample the niftii images to a consistent 1.5x1.5x1.5 mm voxel spacing
- load the niftii image
- the values are scaled from -1000 to +1000, to range -1 to +1, clipping outliers
- the image is resized with a maintained aspect ratio and by th elongest side, to 128
- all sides are then padded with padding value of -1
- converted to tensors for inference.
- Once the tensors pass through the model creating a generated image of range -1 to +1.

4.3 Libraries Used[1212]

1. torch==1.7.1+cu110
2. torchvision==0.8.2+cu110
3. torchaudio==0.7.2
4. torchmetrics
5. pytorch_lightning
6. monai[all]
7. addict
8. kornia
9. pycm
10. cloudml-hypertune
11. google-cloud-storage
12. gcsfs
13. tensorflow
14. fsspec[gcs]
15. gsutil
16.

4.4 Parameters and Hyper-parameters[1213]

5 Metrics[1214]

Dataset Name	Dataset description	MS-SSIM	Perceptual loss
Data version zero	Training Dataset	0.19	24.34

6 Intended Use[1215]

Limitations	GPU's are required
Intended Use	It is Used to Generate Non Contrast Abdomen CT scans (No stone) for building ML models.
Intended User	Radiologists
Out of scope use cases	-

7 Clinical Evaluation[1216]

8 Ethical considerations[1217]

9 Informed Consent[1218]

10 Legal information[1219]