

Assignment 3

Problem Statement

Build a CNN to classify normal and tuberculosis from X-Rays, and visualize the effect of CNN layers. Build a Image Denoise Auto-Encoder for X-Rays

Data:

<https://www.kaggle.com/datasets/tawsifurrahman/tuberculosis-tb-chest-xray-dataset>

Task:

1. Create a dataframe with image path and class of the chest x-rays
2. Display 16 random x-rays from input set
3. Load the training image generator with rescale using Image Data Generator of Tensorflow, apply any two following augmentation,
 - a. Rotation
 - b. Shifting
 - c. Horizontal Flip
 - d. Shearing
 - e. Zooming
- Split the dataset by 80:20 ratio, select color mode as grayscale, and class mode binary with target image shape as 128 x 128
4. Load the validation images using Image Data Generator but with only rescale option
5. Build the CNN model - Define the model, with number of channels as 1 with targeted image shape, add 2 convolution and max pooling layers, followed by flatten, and one hidden layer, create an output layer with sigmoid activation.
6. Create a custom callback function for the model, set the condition if the model exceeds 70% or 80% accuracy then stop training the model
(Reference https://www.tensorflow.org/guide/keras/custom_callback)
7. Evaluate the validation set, compute F1 score and build confusion matrix
8. Visualize the effect of CNN layers on any image. Comment on the output layer images.
9. Display 10 random images with actual and predicted from validation set
10. Create a separate folder and copy tuberculosis images, add a Gaussian noise on those new copied data
11. Define two ImageDataGenerator one for clean and other for noisy images, set the same configuration
12. Build an AutoEncoder for Image Denoise, apply your trained auto-encoder on any 8 random samples and display the comparative result