CT Scan Image Classification for COVID-19 Data -Approach

1. Data Preprocessing:

- Collect a dataset of COVID-19 CT scan images along with their corresponding labels (COVID-19 positive or negative).

- Split the dataset into training, validation, and test sets.

- Preprocess the CT scan images by resizing them to a consistent input size, applying normalization to bring pixel values within a certain range (e.g., [0, 1]), and augmenting the data (if required) with techniques like rotation, flipping, and zooming.

2. Model Construction:

- Import the necessary libraries (e.g., TensorFlow, Keras).2

- Load the ResNet architecture (e.g., ResNet-50, ResNet-101) pre-trained on a large image dataset (e.g., ImageNet).

- Remove the last fully connected layer and replace it with a new dense layer with the number of output classes as 2 (COVID-19 positive or negative).

- Optionally, you can freeze some of the earlier layers to prevent their weights from being updated during training.

3. Model Compilation:

- Compile the model using an appropriate loss function, an optimizer, and a suitable evaluation metric (e.g., accuracy, precision, recall).

4. Model Training:

- Train the modified ResNet model on the training dataset.

- Use the validation dataset for monitoring the model's performance during training and to prevent overfitting.

- Implement techniques like learning rate scheduling and early stopping to improve training efficiency and prevent overfitting.

5. Model Evaluation and Fine-Tuning:

- Evaluate the trained model using the test dataset to assess its generalization performance.

- Calculate metrics such as accuracy, precision, recall, F1-score, and ROC-AUC to measure the model's performance.

- Generate a confusion matrix to visualize the true positive, true negative, false positive, and false negative predictions

- Fine-tune hyperparameters (learning rate, batch size, etc.) and architectural choices based on the evaluation results to enhance model performance.

6. Interpretation and Visualization:

- Visualize the model's learned features using techniques like gradient-weighted class activation mapping to highlight areas in the CT scan images that contributed most to the classification decision.