

CHRIST (Deemed to be University)
Department of Computer Science
Master of Artificial Intelligence and Machine Learning

Course: MAI371 – Deep Learning

Exercise No: LAB Exercise – 7

Date: 04 – 04 – 2024

Duration: 2 Hrs

Question (10 Marks)

As a Deep Learning expert your task is to implement ResNet and a custom CNN architecture for classifying chest X-ray images. Provided with two datasets—Dataset A, featuring X-ray images from a public repository with a diverse range of thoracic conditions, and Dataset B, containing X-ray images from a specific medical institution focused on tuberculosis detection—you must preprocess the data, design and implement both models, and evaluate their performance. Additionally, you'll compare the custom model against ResNet, incorporating techniques like batch normalization and dropout layers.

1.Data Preprocessing:

- Standardize the sizes of images in Dataset A and Dataset B, normalize pixel values, and apply augmentation techniques.
- Incorporate additional preprocessing steps for Dataset B, tailored to tuberculosis detection.

2. ResNet and Custom CNN Architecture Implementation:

- **ResNet:**
 - Implement a ResNet architecture, focusing on residual blocks with skip connections.
 - Include batch normalization after each convolutional layer to stabilize and accelerate training.
 - Incorporate dropout layers to prevent overfitting.
- **Custom CNN:**
 - Design a custom CNN architecture for chest X-ray classification.
 - Integrate convolutional layers, max-pooling layers, and fully connected layers.
 - Utilize batch normalization after convolutional layers and dropout layers to enhance model generalization and prevent overfitting.

3. Training:

- Split both datasets into training, validation, and test sets.
- Configure training pipelines for ResNet and the custom CNN, utilizing appropriate optimizers and learning rate schedules.
- Train models with iterative forward and backward passes, updating parameters to minimize loss.

4.Evaluation:

- Evaluate the trained ResNet and custom CNN models on the test sets of Dataset A and Dataset B.
- Compute evaluation metrics such as accuracy, precision, recall, and F1-score to assess performance.
- Visualize predictions and analyze error patterns.

5.Comparison

Analyze and compare the performances of ResNet and the custom CNN on both Dataset A and Dataset B. Assess their accuracies in detecting various thoracic conditions, considering the impact of incorporating batch normalization and dropout layers. Explore differences in classification accuracy and error patterns between the models.

Evaluation Rubrics:

- Resnet Implementations (3 Marks)
- Custom CNN(4 Marks)
- Comparison(3 Marks)

Total:10 Marks

General Instruction:

1. Ensure that your code includes relevant comments to enhance readability and understanding. Subsequently, upload your code to GitHub for version control and collaborative access.
2. Include descriptive comments within the code, explaining its functionality and logic.
3. In the Google Classroom submission, include the GitHub URL where your code is hosted.
4. Attach a PDF document named "your_register_number_exercise_No.pdf" to the submission.The PDF document should include screenshots of the code and the output screen.
5. Upload the answer document&GitHub URL in Google Classroom on or before the deadline mentioned.Evaluation will not be considered for late submission