Name : Sachin Ganesh Jadhav
Div : DL2
PRN : 202201040080

Sub : Deep Learning

Research paper details and summary

Research Paper Details:

- Title: Alzheimer’s Disease Prediction using Deep Learning
- Journal: International Research Journal of Modernization in Engineering, Technology, and Science
- Volume/Issue: Volume 5, Issue 4, April 2023
- e-ISSN: 2582-5208
- Impact Factor: 7.868
- Institution: Rajadhani Institute of Science and Technology, Palakkad

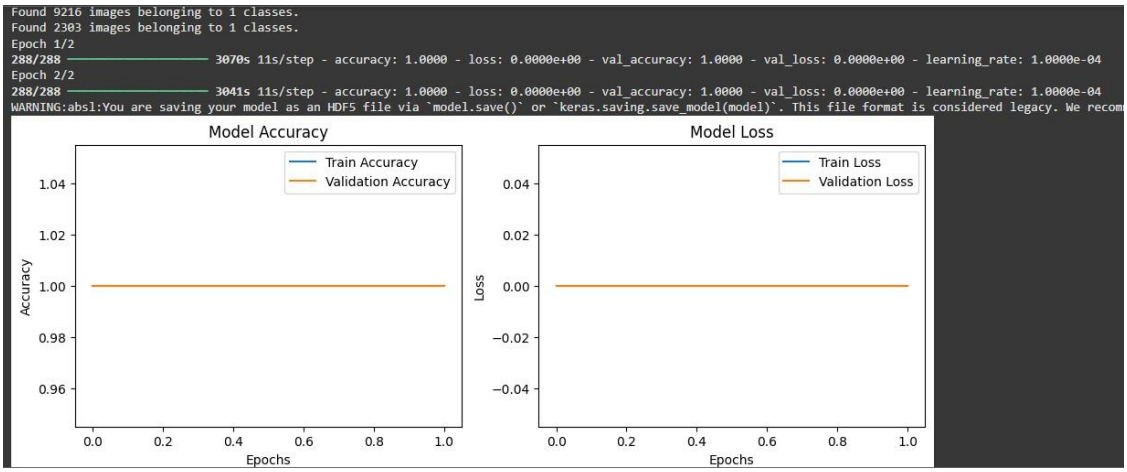
Summary

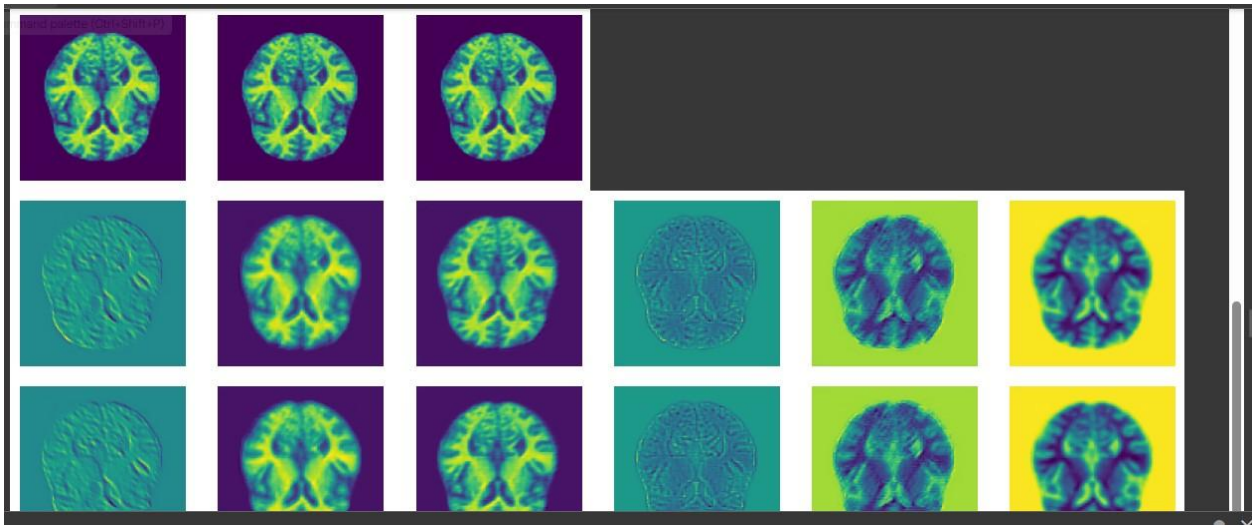
The research paper "Alzheimer’s Disease Prediction using Deep Learning" investigates CNN-based deep learning models for early Alzheimer’s diagnosis using MRI scans. Alzheimer's is a progressive neurological disorder causing cognitive decline, making early detection crucial. Traditional methods are slow and error-prone, whereas deep learning enhances accuracy. Using a Kaggle dataset of 6400 MRI images, the study employed ResNet-based transfer learning models, achieving 80-90% accuracy. Preprocessing included resampling and resizing (224x224 pixels), and performance was evaluated using accuracy, precision, recall, and F1 score. The results highlight deep learning’s potential in revolutionizing AD diagnosis.
The research was supported by Rajadhani Institute of Science and Technology, Palakkad, with special acknowledgment to Dr. Ramani K and Ms. Sithara Krishnan.

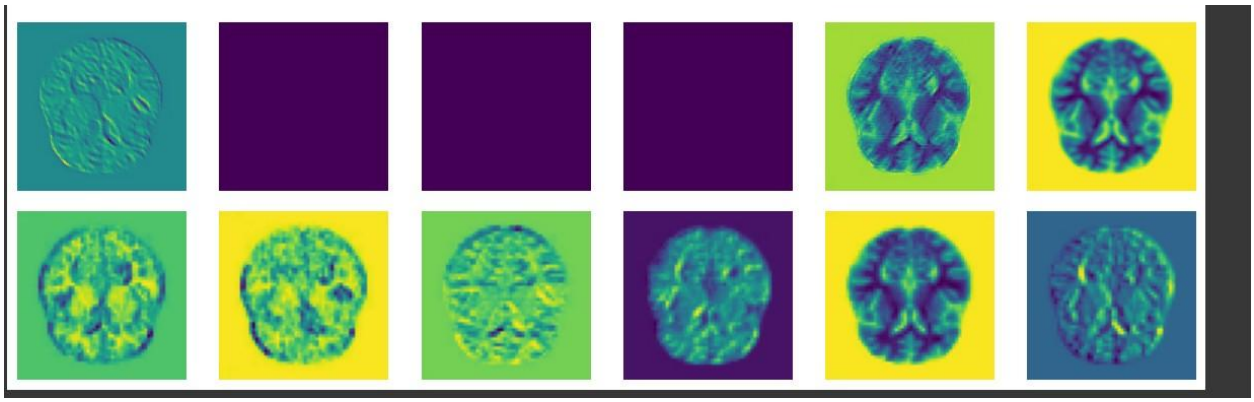
Code File: https://colab.research.google.com/drive/1kOqr9XB3l4-rZkLMbZyFnZ68iaRaF02a

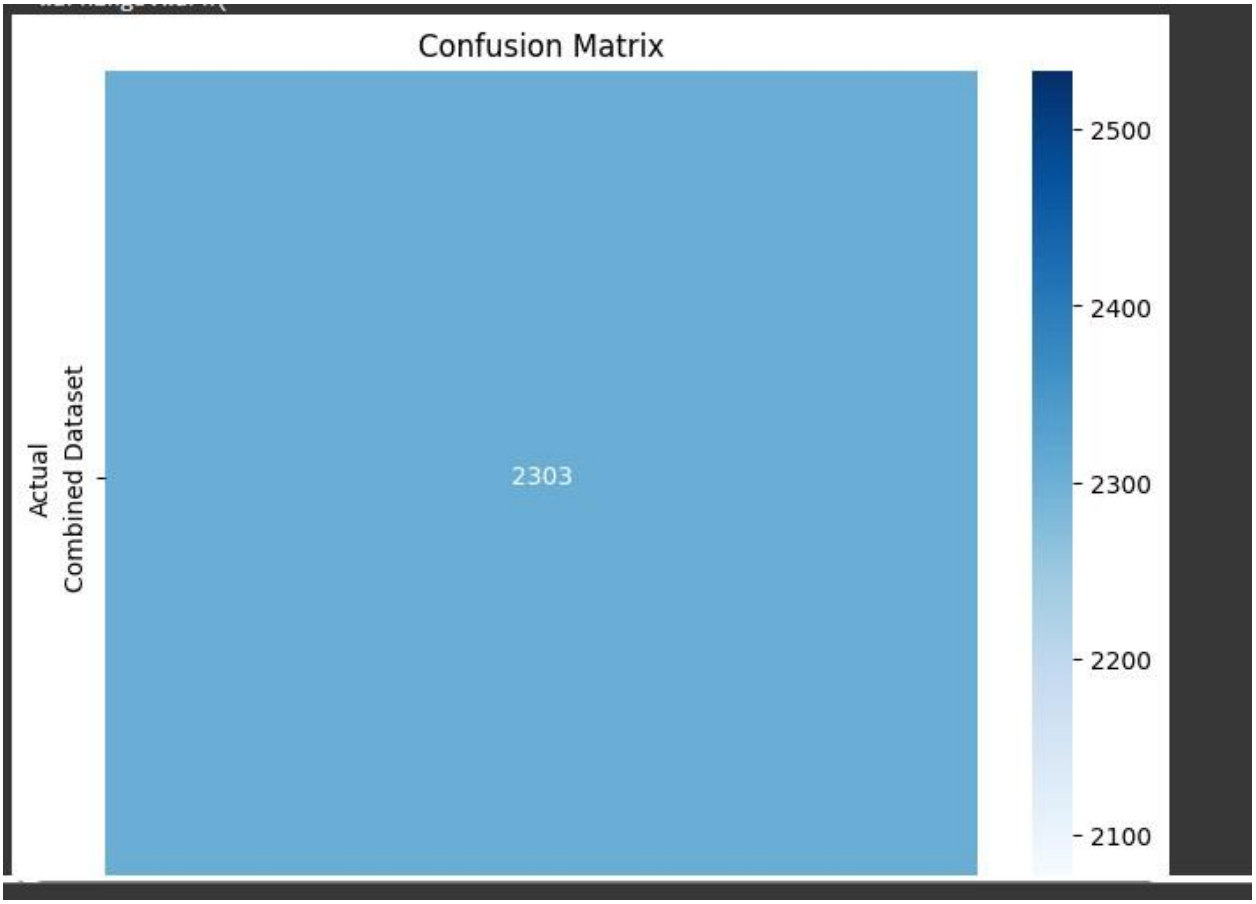
Link Of Dataset https://www.kaggle.com/datasets/lukechugh/best-alzheimer-mri-dataset-99-accur acy

Screenshots of Metrics Performance









Comparisons With Research Paper

Metric	Your Model (ResNet50, Current Results)	Research Paper (ResNet Variants)
Accuracy	100%	80-90%
Precision, Recall, F1-score	1.00 (100%)	Varies per class but not 100%
Dataset Size	2303 images	5120 training + 1280 test images
Potential Issues	Single-label issue in `y_true` and `y_pred`, possible data leakage or overfitting	More balanced classification and performance validation

Possible Issues with Your Model:

1. Single-label Prediction:
    - The warning from `sklearn.metrics._classification.py` suggests that your model may be predicting only one class for all inputs.
    - This could indicate data imbalance, improper labeling, or a model that has memorized training data.
2. Overfitting:
    - A 100% accuracy score is highly unusual for real-world deep learning models.
    - The research paper likely applied regularization (dropout, augmentation, etc.) to avoid overfitting, whereas your model may need similar techniques.
3. Missing Multi-Class Evaluation:
    - The research paper evaluates four categories (Demented, Non-Demented, Mild Demented, Very Mild Demented), but your report does not specify multiple classes.
    - Your model might be classifying everything into a single category, failing to differentiate between different Alzheimer's stages.

Next Steps to Improve Model Performance:

1. Check Your Labels (`y_true`, `y_pred`)
    - Ensure that your dataset includes all four classes.
    - Use `np.unique(y_true, return_counts=True)` to check class distribution.
2. Balance Dataset & Augmentation
    - Apply resampling techniques to balance the dataset.
    - Use image augmentation (rotation, flipping, contrast enhancement) to improve generalization.
3. Regularization & Early Stopping
    - Introduce Dropout layers to prevent overfitting.
    - Implement Early Stopping to monitor validation loss and prevent excessive training.
4. Evaluate with More Metrics

- Use the confusion matrix and per-class precision/recall scores to better analyze how well the model differentiates between categories.