IIIT Dharwad, MTech Course

AI in Healthcare

Case Study Assignment: 1

Title: Deep Learning for Optical Coherence Tomography (OCT) Image Classification using MedMNIST Dataset

Objective: To design, train, evaluate, and interpret a deep learning model to classify OCT images from the OCTMNIST dataset (MedMNIST) into multiple retinal disease categories. The study also includes model performance analysis, visual explanation using Grad-CAM, and addressing dataset imbalance.

Tasks:

- Explore the OCTMNIST dataset from MedMNIST and pre-process the images
- For model development, implement any two CNN architecture (Custom CNN or Pretrained) and modify it based on the requirement.
- Train the model using appropriate loss functions and optimization techniques.
- Note the Evaluation Metrics like Accuracy, Precision, Recall, F1-Score, Confusion matrix, AUC (Area Under Curve) for multiclass.
- Compare and analyze the results for the implemented two models.
- For Visualization & Explainability use Grad-CAM to highlight which part of the OCT image the model focuses on during classification and visualize predictions and confidence scores.
- You can try to address class imbalance issues if persists.

Submissions:

- A report of 3-4 pages including
    - Dataset Description
    - Methodology: Model design, Training strategy and parameters, Evaluation metrics
    - Experiments and Results
    - Explainability: Grad-CAM visualizations
    - Discussion: Challenges faced and Inference from the comparison of models
    - Conclusion and Future Work
- Accessible Google Colab link for evaluation (20 Marks)

- Rubrics:

Criteria	**Marks**
Dataset Handling	2
Model Development	4
Training & Evaluation	4
Grad-CAM & Explainability	3
Result Analysis & Discussion	3
Overall Code Quality	2
Report	2
Total	20