HW 2: Report - Ananya Agrawal (ananyaa2)

Objective

The goal of this project is to build a Convolutional Neural Network (CNN) to automatically detect malaria in cell images. The model is trained on labeled image data, and predictions are generated for test images. The learned embeddings are visualized to investigate potential feature patterns.

Data Loading and Splitting

The image data is loaded, and an 80/20 split is performed for training and validation, the **Data augmentation** is applied to the training set to improve generalization.

The images are rescaled to [0,1] and augmented with random transformations.

Building the CNN Model

A regular CNN architecture is built for binary classification. The model uses three convolutional layers with ReLU activations, followed by max-pooling layers. The output layer uses a sigmoid activation for binary classification.

This model is trained for 20 epochs, and validation accuracy is monitored.

Findings and Insights

- **Training Performance:** The model achieved good accuracy on the training and validation sets, demonstrating effective learning of malaria-related features.
- **Test Predictions:** The model outputs binary predictions, which are saved for evaluation.

1. **Using Pre-Trained Models:** Incorporating architectures like ResNet or VGG diminished the model performance through transfer learning. The best results were obtained from a CNN network built from scratch.
2. **Hyperparameter Tuning:** Experimenting with learning rates, batch sizes, and dropout rates refined the model.

This approach lays a strong foundation for malaria detection using deep learning, but there's room for optimization and exploration!