Project Report: Plane Classification using Convolutional Neural Networks (CNN)

Objective:

The main objective of this project was to build a Convolutional Neural Network (CNN) model to classify different types of planes. The model was trained and validated using a dataset of plane images.

Data Preparation:

The dataset was divided into three sets: training, validation, and testing. The images were stored in different directories for each set. The directories for each set were created dynamically if they did not exist. A random sample of images from the training set was moved to the validation set for each class.

Model Architecture:

The model was built using the Sequential API from Keras. It consisted of several Conv2D layers with varying numbers of filters, followed by Batch Normalization, Max Pooling, and Dropout layers. The model also included a Flatten layer and two Dense layers at the end. The final Dense layer used a softmax activation function for multi-class classification.

Training:

The model was trained for 100 epochs using the Adam optimizer with a learning rate of 0.0001. The loss function used was categorical cross-entropy, which is suitable for multi-class classification problems. The training process also included callbacks for saving the model weights after each epoch if the validation accuracy improved.

Evaluation:

The trained model was used to make predictions on the test set. The performance of the model was evaluated using a confusion matrix, which provided a detailed view of the model's performance across all classes.

Challenges and Learnings:

The project presented an opportunity to gain hands-on experience with CNNs and image classification tasks. It also highlighted the importance of data preparation, model architecture selection, and hyperparameter tuning in achieving good model performance.

Conclusion:

This project demonstrated the application of Convolutional Neural Networks for image classification tasks. Despite some challenges, the project was successful in achieving its objective of building a plane classification model.