TREELEAF TECHNOLOGIES PVT. LTD.

Task Description:

**Object Detection in Images**

You are tasked with building an object detection model for a self-driving car project. The dataset provided contains images from a front-facing camera mounted on a car, and it includes various objects such as pedestrians, cars, and traffic signs.

Your goal is to develop a deep learning model for object detection using convolutional neural networks (CNNs). Please follow the steps below:

Data Exploration:

- Load and explore the dataset. Provide insights into the distribution of classes and any preprocessing steps you think are necessary.

Model Development:

- Choose a suitable pre-trained CNN architecture (e.g., VGG16, ResNet, or MobileNet) for transfer learning.
- Fine-tune the selected model on the given dataset for object detection. Implement any necessary modifications, such as adding a region proposal network (RPN) or adjusting the output layer for bounding box predictions.

Evaluation:

- Split the dataset into training and testing sets.
- Train your model on the training set and evaluate its performance on the testing set.
- Use appropriate evaluation metrics such as precision, recall, and F1 score for each class.

Visualization:

- Provide visualizations of the model's predictions on a few sample images. Include bounding boxes and class labels.

Optimization:

- Suggest at least one strategy to optimize the model's performance. This could include hyperparameter tuning, data augmentation, or model architecture adjustments.

Communication:

- Write a brief report summarizing your approach, key findings, and potential areas for improvement. Assume you will be presenting this report to a non-technical audience.

Submission Guidelines:

- Submit your code along with comments explaining each step.
- Include a written report detailing your approach, results, and any challenges faced.

Note:

- You can use any deep learning framework you are comfortable with (e.g., TensorFlow, PyTorch).
- Feel free to make any reasonable assumptions if certain details are not provided.