Evaluating Performance of Indian Road Marking Detection Models

Khushi Agrawal, Jafri Syed Mujtaba, Samarth Prashant Bankar
Ahmedabad University
Team: CV PROJECT

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A. Progress Summary

1) Work Completed

- **Dataset Structure Analysis:** Extracted and analyzed the dataset, which consists of:
  - `images/` – Containing original road images.
  - `masks/` – Corresponding segmentation masks.
  - `train/`, `valid/`, `test/` splits for structured training.
- **Segmentation Mask Study:** Identified color-coded labels for various road markings:
  - Black (0,0,0) – Background.
  - White (255,255,255) – Lane markings and pedestrian crossings.
  - Brown – Lane dividers or boundaries.
  - Blue – Possible bike lanes or speed breakers.
- **Dataset Challenges Identified:**
  - Variation in road types (urban, rural, highways).
  - Weather and lighting conditions affecting visibility.
  - Occlusions from vehicles and pedestrians.
  - Faded and irregular road markings.
- **Preprocessing Implementation:**
  - Standardized image sizes to **512x512** pixels.

- Applied normalization and augmentation (rotation, flipping, brightness contrast adjustments).
- Implemented color mapping to Class IDs for segmentation masks.

B. Upcoming Tasks

1) Tasks Planned

- **Model Selection & Training:**
  - Utilize **DeepLabV3+** or **U-Net** as baseline models.
  - Implement **Dice Loss + Cross Entropy** to handle class imbalance.
  - Train the model on augmented dataset and fine-tune hyperparameters.
- **Performance Evaluation:**
  - Measure accuracy using **IoU (Intersection over Union)** and **F1-score**.
  - Compare performance across different road conditions.
- **Model Optimization:**
  - Implement multi-scale training.
  - Explore transformer-based models for better segmentation accuracy.