Approach.md

Technical Approach (AlexNet-Based Model)

This page summarizes the technical pipeline and method used to train and eval
uate the traffic sign detection model.

Dataset Preparation
- Used the German Traffic Sign Detection Benchmark (GTSDB).
- Images were resized to **224x224** for AlexNet.
- Normalized using ImageNet mean and std.
- Split into training, validation, and test sets.

Model: AlexNet
I implemented a modified AlexNet architecture:
- 5 Convolutional layers
- ReLU activation
- MaxPooling layers
- Fully connected classifier head
- Softmax for final predictions

Training Pipeline
- Loss Function: CrossEntropyLoss
- Optimizer: Adam
- Learning Rate: 0.0001
- Epochs: 20–30
- Augmentation: RandomRotation, RandomCrop, ColorJitter

Code Overview (Google Colab)
Scripts included:
- train.py – trains AlexNet on GTSDB
- predict.py – performs inference and generates bounding box outputs
- visualize.py– plots confusion matrix & sample predictions

Infrastructure
- Platform: Google Colab GPU
- Deep Learning Framework: PyTorch
- Visualization: Matplotlib, Seaborn