Report

Environment Preprocessing

Purpose: Improve learning stability by reducing input noise and dimensionality.

Details:

- Frame resized to 84×84
- Done Grayscale conversion.
- Frame stacking: 4 consecutive frames to provide temporal information.
- Channel format: [C, H, W] for compatibility with PyTorch CNNs

Hyperparameters

I used stablebaselines3 library and inbuilt CNNPolicy, so hyperparameters used were default.

- learning_rate = 2.5e-4
- gamma = 0.99
- clip_epsilon = 0.2
- n_steps = 2048
- n_epochs = 10
- batch_size = 64

Training Strategy

- Total training steps: 100,000
- Save checkpoint and video every 2,000 steps
- After each checkpoint:
    - Save model weights
    - Evaluate and record one episode as .mp4

Evaluation and Video Generation

- Used .render() frame outputs
- Saved video with imageio.mimsave(...)
- FPS = 30

Observations and Challenges

Since I only trained for 100,000 episodes,

Challenges:

- Agent often spins or crashes early
- Doesn’t learn lane control robustly yet
- Sparse reward (no shaped signal)

Behavior:

- Starts with random drifting
- Performance improved slowly over checkpoints

Improvement that could be made:

Due to limited training duration, the agent shows emerging behavior but lacks consistent lane-following. Extending to 1M+ steps would significantly improve performance. But that require huge amount of computation.