Thank you again for working with me on this task. I’d like to emphasize that our main focus is on dispositional trust, the baseline level of trust a person has in automated systems, shaped by their personal traits and previous experience with technology.

Our goal is to explore how deep reinforcement learning (DRL) can personalize the behavior of an autonomous vehicle based on this dispositional trust. Specifically, the algorithms should respond dynamically to simulated trust levels, like manual interventions, and adapt driving behavior accordingly.

Objective:

Conduct a comparative study of RL algorithms by testing their ability to adjust vehicle behavior in CARLA based on dispositional trust feedback.

- Example:

  - If the driver shows low dispositional trust (frequent manual overrides or hesitation to engage), the algorithm should shift to a conservative driving style (e.g., reduced speed, more frequent notifications).

  - When trust increases, the system can adopt a more efficient and less intrusive driving style.

Scope of Work:

RL Algorithms to Implement:

- Proximal Policy Optimization (PPO)
- Deep Q-Network (DQN)
- Deep Deterministic Policy Gradient (DDPG)
- Soft Actor-Critic (SAC)

Scenario Development in CARLA:

- Simulate common driving situations, such as:
  - Lane-switching, obstacle avoidance, roundabouts, and urban traffic.
  - Each scenario will have dynamic components (vehicles, pedestrians) to mimic real-world conditions.

Trust Feedback Mechanism:

- Use manual interventions (like braking or steering) as a proxy for low trust.
- Track:
  - Hesitation to engage the system (simulated delays in decision-making).
  - Trust shifts through multiple interactions.

- Adaptive Behavior:
  - In low trust situations, the vehicle drives more conservatively.
  - In high trust conditions, driving becomes more fluid with fewer notifications.

Data Collection & Metrics:

1. Trust Calibration Metrics:

- Frequency of manual overrides and system engagement.
- Response time for behavioral adjustments based on trust changes.

2. Performance Metrics:

- Cumulative reward for efficient driving behavior.
- Crash frequency and compliance with traffic rules.
- Smoothness in acceleration and braking patterns.

Comparative Analysis:

- Compare how each algorithm adapts to trust feedback and influences driving behavior.

- Analyze reward accumulation, intervention rates, and safety metrics across algorithms.

Deliverables:

- Code Implementation of the RL algorithms.
- Performance Logs: Capture intervention data, behavior changes, and metrics.
- Summary Report: Detailed analysis of each algorithm's adaptation to dispositional trust.