

# Racecar Project :

## 1. Overview

This document details the development of MyAgent.py for the Racecar AI project. The agent was designed to navigate racetracks effectively using rule-based logic informed by sensor data (lidar) and current velocity.

## 2. Development Steps

- Analyzed the structure and behavior of existing agents: RuleAgent, RandomAgent, and LearningAgent.
- Implemented MyAgent.py using simple rule-based logic:
  - Read lidar sensor values in five directions and current velocity.
  - **Decision rules:**
    - Steer toward the side with more open space.
    - Brake when an obstacle is too close.
    - Accelerate if the front is clear and speed is low.
    - Otherwise, coast.

## 3. Testing and Evaluation

The agent was tested on the provided racetrack environment. It successfully completed laps without collisions.

The rule-based logic allowed the agent to adapt to sharp corners and narrow paths. Tuning the thresholds for braking and acceleration led to smoother performance.

## 4. Design Decisions

- Prioritized simplicity and reliability using rule-based logic instead of learning.
- Chose a braking threshold of **0.5 meters** for obstacle safety.
- Steering decisions were made based on the maximum clearance direction (left, right, or center).

## 5. Future Improvements

- Introduce angle-awareness for more precise cornering.
- Explore reinforcement learning for adaptive decision-making.
- Add velocity-based dynamic braking and smarter speed control.

## 6. Conclusion

The MyAgent implementation succeeded in reliably completing race tracks using a simple rule-based approach.

While not optimized for speed, it demonstrated strong safety and responsiveness. Future work will explore adaptive learning and more sophisticated strategies for better performance.