

## MVP Description – Real-Time Race Strategy Engine

The Real-Time Race Strategy Engine (MVP) is a lightweight, data-driven tool designed to simulate real-time race conditions and deliver instant strategic insights for drivers, engineers, and analysts. This minimal viable product focuses on the core functionality required to demonstrate the value of live racing analytics without additional complexity.

### What the MVP Does

The MVP streams race data lap-by-lap and provides three essential strategy insights:

#### 1. Live Lap Monitoring

- Continuously displays the current lap number
- Shows the real-time lap time
- Updates a simple lap-time trend graph

This simulates the live telemetry feed that engineers rely on during an actual race.

#### 2. Pit Window Recommendation

Using recent lap-time decay, the MVP determines whether:

- The driver should pit immediately,
- Pit soon, or
- Stay out.

This gives a basic but practical tire-degradation insight for strategy calls.

#### 3. Next-Lap Pace Prediction

The system predicts the next lap time using:

- Current lap performance
- Tire age effects

This helps anticipate pace changes and plan push/conservative strategies.

#### 4. Performance Anomaly Detection

The MVP triggers an alert when the driver's pace suddenly drops compared to previous laps. This can indicate:

- Tire overheating
- Driver error
- Mechanical issue
- Loss of grip or track incident

### How the MVP Works

- The user uploads a CSV dataset with at least a lap\_time column.
- The tool simulates a real-time race by processing one lap at a time.
- Strategy calculations and predictions update every "lap" in sync with the simulated stream.
- Results display in an intuitive dashboard view.

### Why This MVP Matters

This MVP demonstrates the core value of real-time racing analytics:

- As laps progress, insights evolve.
- Teams can quickly understand pace behavior.
- Simple models still reveal meaningful strategy opportunities.

It serves as the foundation for more advanced features such as:

- Full machine-learning prediction engines
- Tire wear modelling
- Caution-flag strategy simulations
- Multi-driver comparisons
- Race replay analytics

### Summary (One Sentence)

This MVP is a simplified real-time race analysis tool that streams lap data, predicts pit windows, forecasts next-lap performance, and detects anomalies to support rapid race-day decision-making.