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Automotive LLM Model

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OBJECTIVES

An AI solution for precise POST-SESSION ANALYSIS to enhance racing performance

A Large Language Model (LLM) that efficiently processes telemetry data for RAPID INSIGHTS

TIME-SAVING support for telemetrists with EFFICIENT data analysis

VALUE PROPOSITION

Anticipate the Unseen: DETECT anomalies in order to PREDICT future failures before they become setbacks.

Optimize Potential: SIMULATE, SHAPE, and REFINE the perfect lap by uncovering deeper insights to COMPARE and EVOLVE strategies for continuous improvement.

Our project aligns with SDG 9 by leveraging advanced AI to drive innovation, improve efficiency, and support SUSTAINABLE practices in modernizing motorsport performance and infrastructure.

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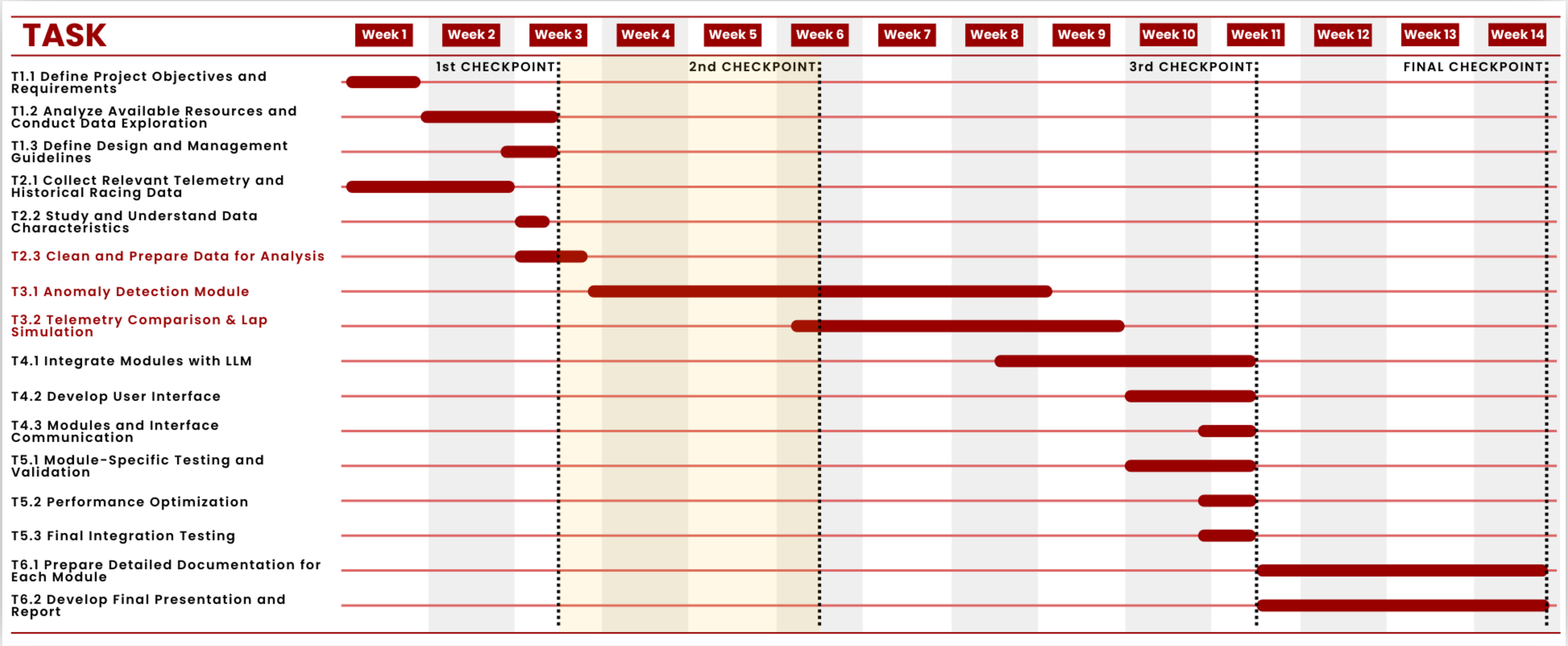
UPDATED GANTT



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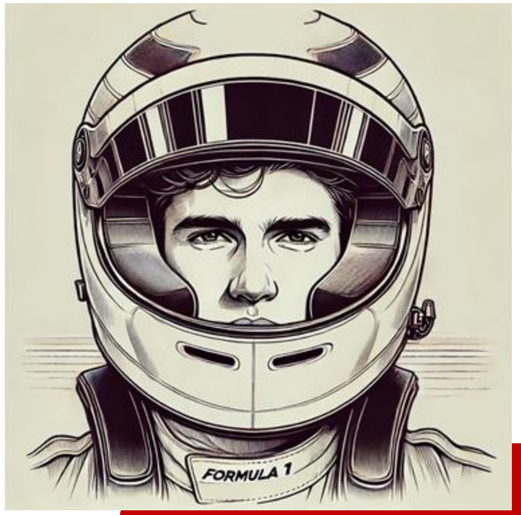
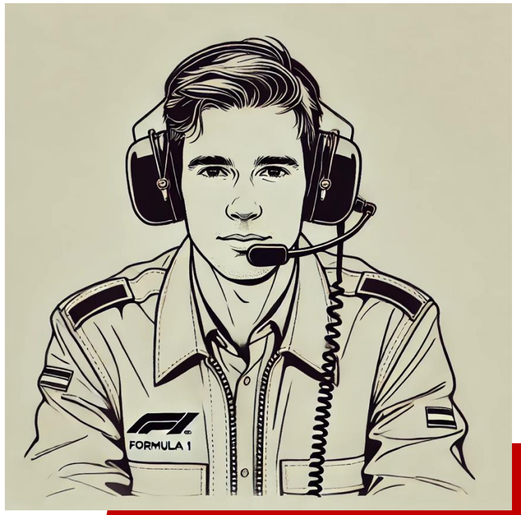
TARGET AUDIENCE



Charles
DRIVER

Finds technical data hard to translate into improvements on the track



Alex
TELEMETRIST

Overwhelmed by data volume, making real-time issue detection difficult.

Giusy
COACH

Lacks actionable data directly supporting psychological and physical coaching

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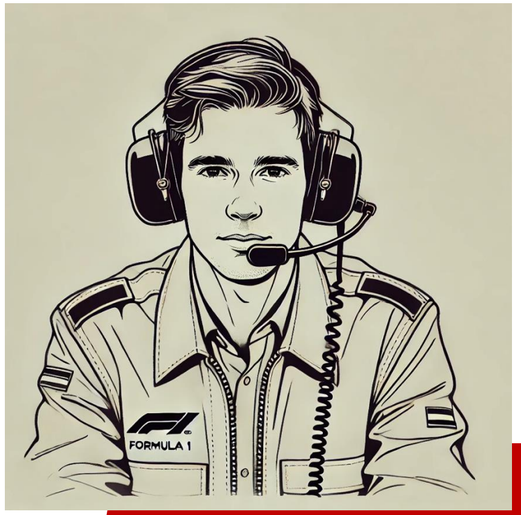

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DATASET

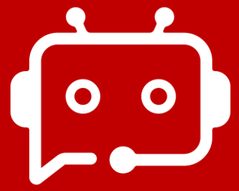
FASTF1

KEY FEATURES

- SESSION DATA
- TELEMETRY AND CAR DATA
- VISUALIZATION
- TRACK & WEATHER CONDITIONS

TABULAR DATA

MODULES



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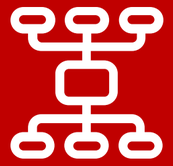
MODULES

ANOMALY DETECTION

LAP SIMULATION



TELEMETRY COMPARISON

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ANOMALY DETECTION

HYPOTHESIS & DEVELOPMENT CHOISES

1 DETECTION

2 CLASSIFICATION

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ANOMALY DETECTION

HYPOTHESIS & DEVELOPMENT CHOISES

1 DETECTION

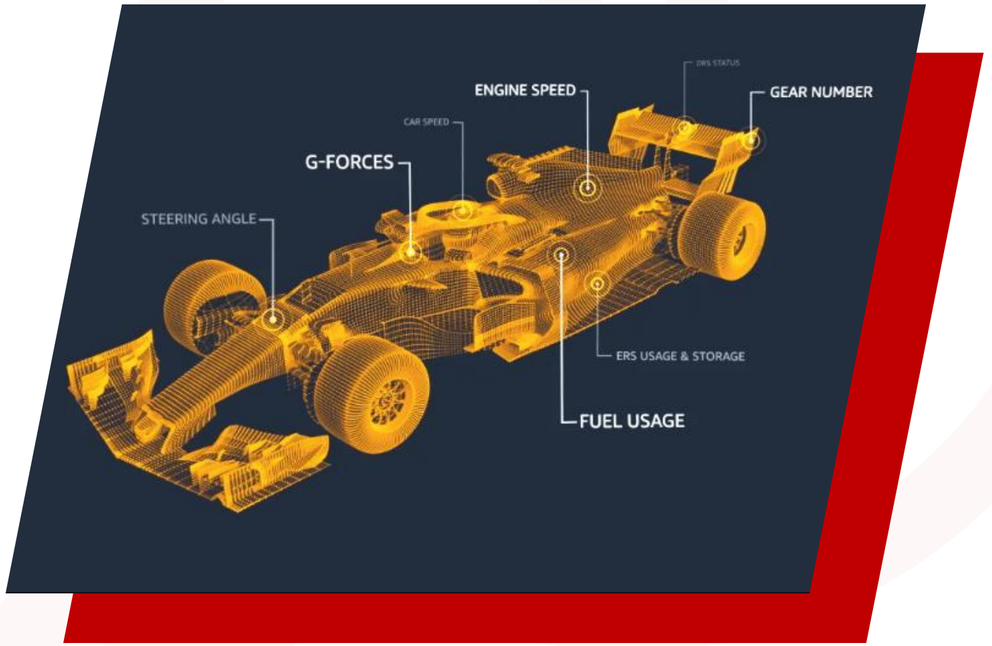
UNSUPERVISED anomaly detection model to find TELEMETRY IRREGULARITIES

Telemetry data* includes:

CAR DATA (e.g. speed, throttle, tyre pressure, brake)

WEATHER DATA (e.g. temperature, humidity)

*For each year, event and driver



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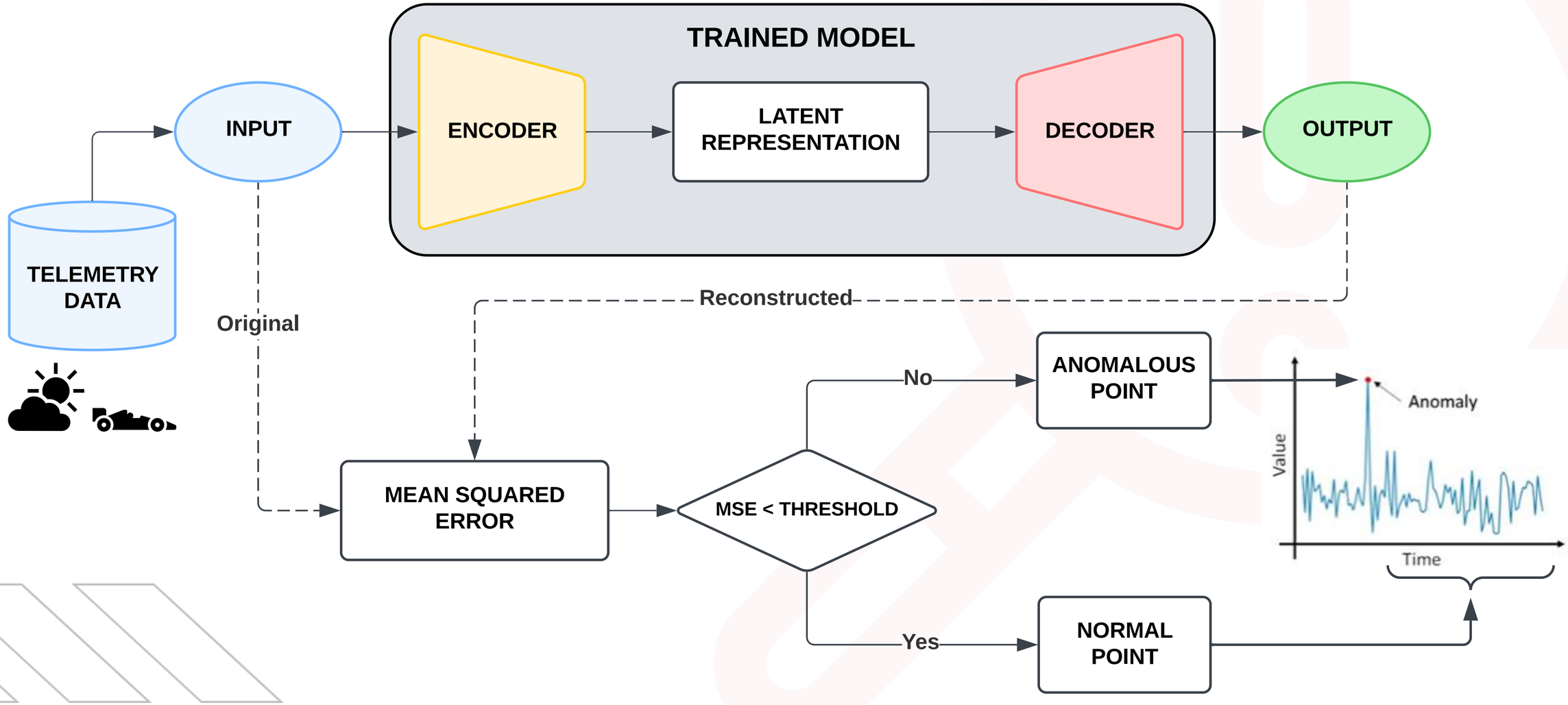
AUTOENCODER



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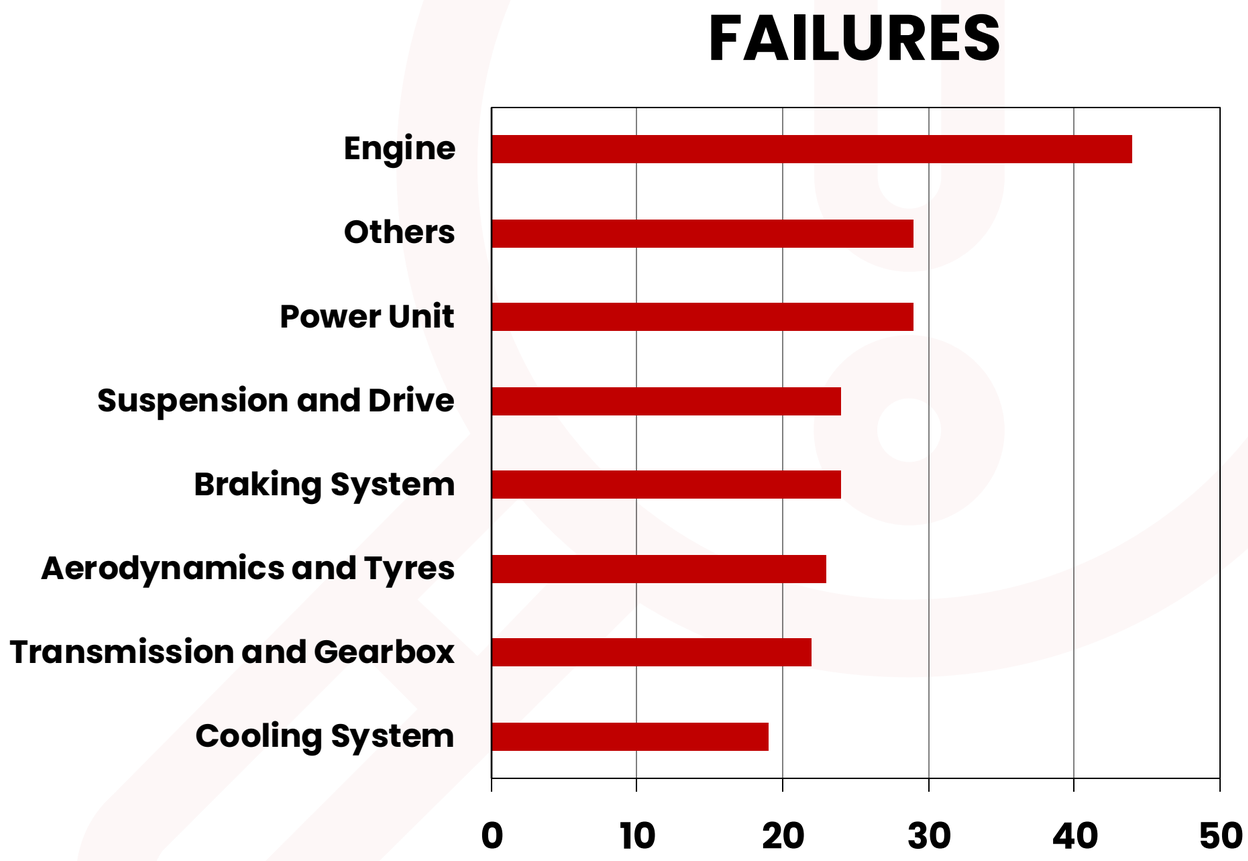
ANOMALY DETECTION

HYPOTHESIS & DEVELOPMENT CHOISES

2 CLASSIFICATION

Propose a FAILURE CATEGORY that can be identified and CLASSIFIED based on the anomalies DETECTED in the data

45 different anomalies → **8** failure groups



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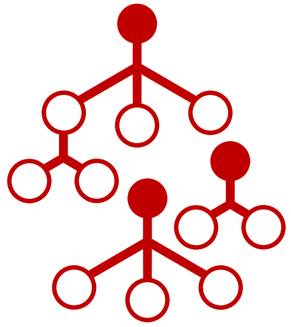
CLASSIFICATION MODEL

HYPOTHESIS & DEVELOPMENT CHOISES

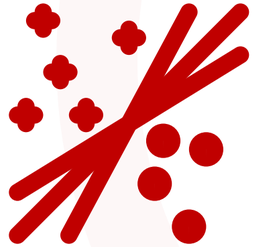
RANDOM FOREST

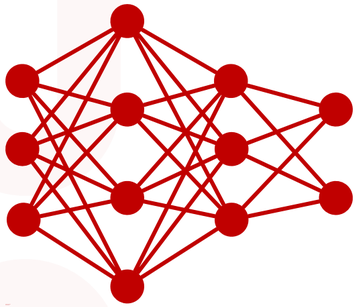


PROS:
- **EASY** to implement
- **INTERPRETABLE**
- Can be used as a **BASELINE**

CONS:
- **LIMITED** for sequential data
- **LOW PERFORMANCE**
- **IGNORES** feature intercorrelations

SVM and NEURAL NETWORK





PROS:
- Powerful for **COMPLEX PATTERNS**
- Adaptable to **HIGH-DIMENSIONAL** data
- Considers feature **INTERACTIONS**

CONS:
- Computationally **EXPENSIVE**
- **LESS INTERPRETABLE**
- **DIFFICULT** to tune

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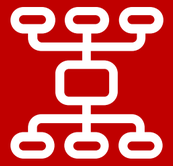
MODULES

ANOMALY DETECTION

LAP SIMULATION



TELEMETRY COMPARISON

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MODULES

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LAP SIMULATION & TELEMETRY COMPARISON

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HYPOTHESIS & DEVELOPMENT CHOISES

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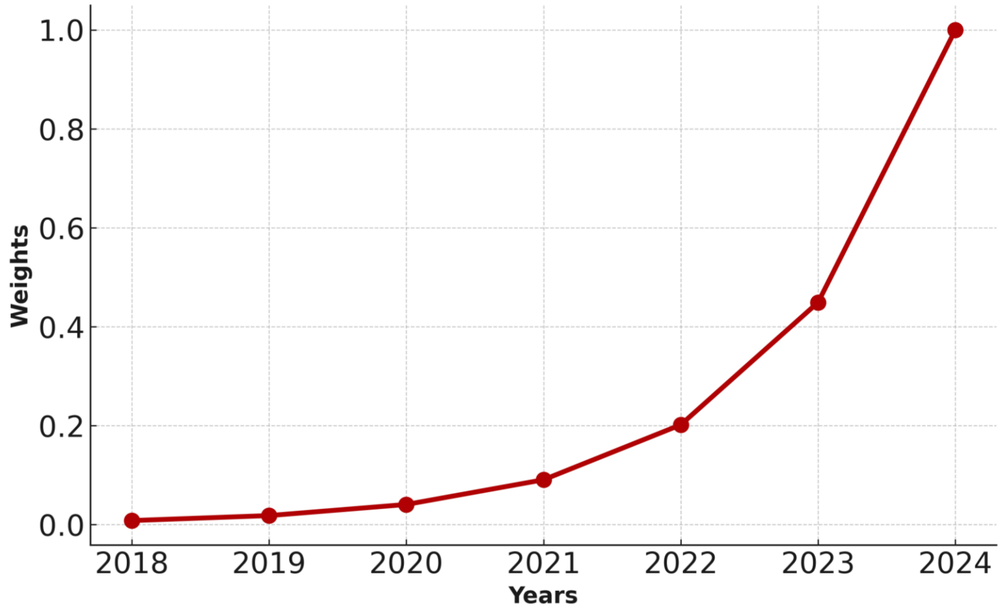
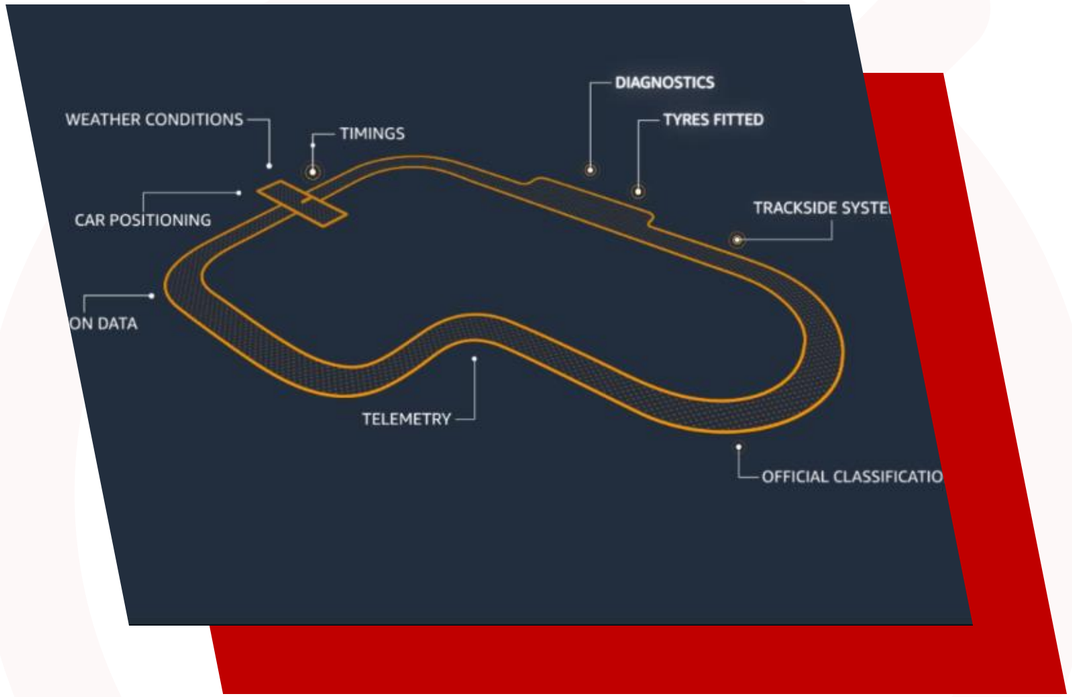
LAP SIMULATION & TELEMETRY COMPARISON

HYPOTHESIS & DEVELOPMENT CHOISES

1 LAP SIMULATION

Analyzing historical qualifying data to predict CAR PERFORMANCE





Greater emphasis on RECENT results weighted EXPONENTIALLY to capture CONTEMPORARY trends.

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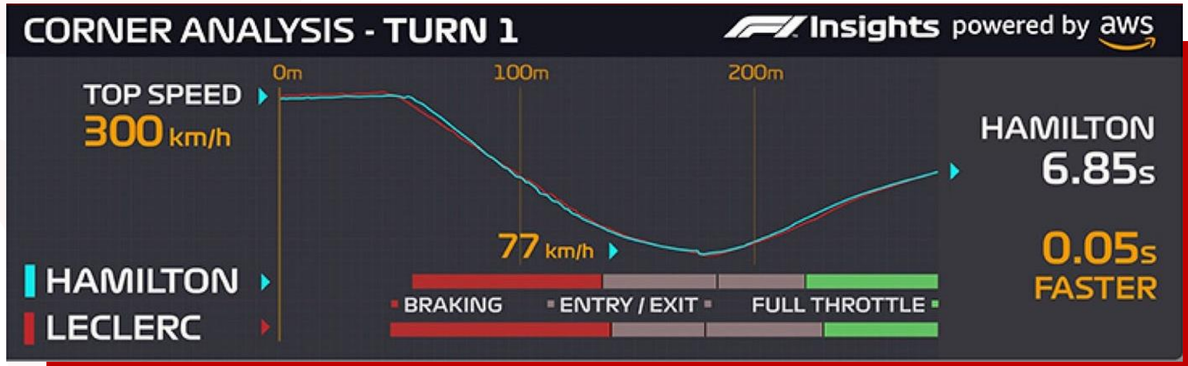
LAP SIMULATION & TELEMETRY COMPARISON

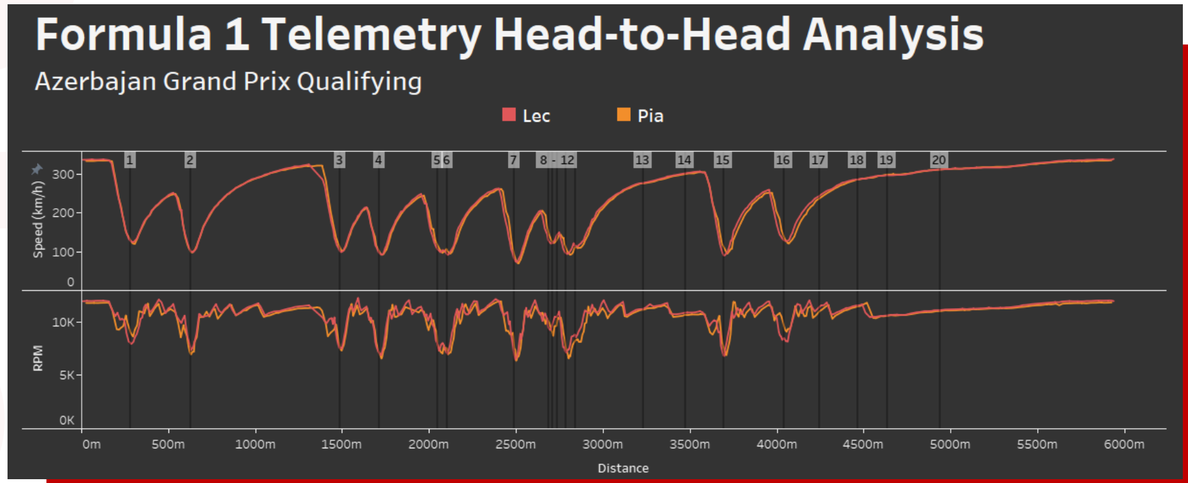
HYPOTHESIS & DEVELOPMENT CHOISES

2 TELEMETRY COMPARISON

Evaluation through TEAMMATE PERFORMANCE analysis
Comparison with FASTER DRIVERS

OBJECTIVE: give to driver some KEY ADJUSTMENTS on his guidance





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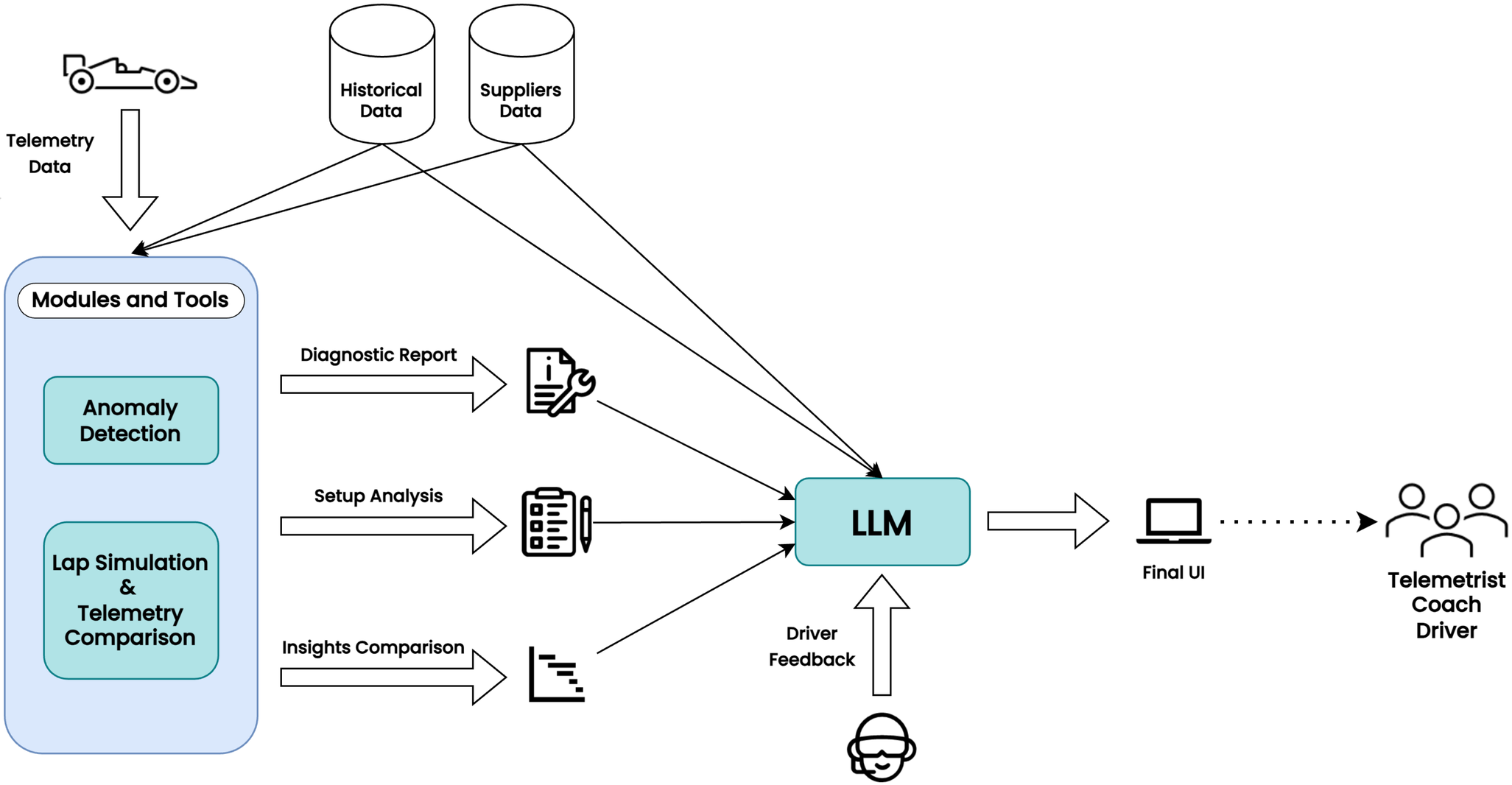
UPDATED FUNCTIONAL DIAGRAM



THANK YOU

FOR YOUR ATTENTION

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