

POLIMI

MOTORCYCLE FACTORY



Polimi Motorcycle Factory is a sports team of Politecnico di Milano, which participates in the international MotoStudent competition.

Here, the best universities from around the world **compete by racing their prototypes, entirely designed and built by students.**

2018



Petrol World Champions

2021

First electric prototype

2023



Electric Vice-World Champions



What is MotoStudent?

MotoStudent is an **international competition** in which teams of university students have the opportunity to put their knowledge into practice and **design a prototype racing motorcycle** in the Petrol and Electric categories.

MS1

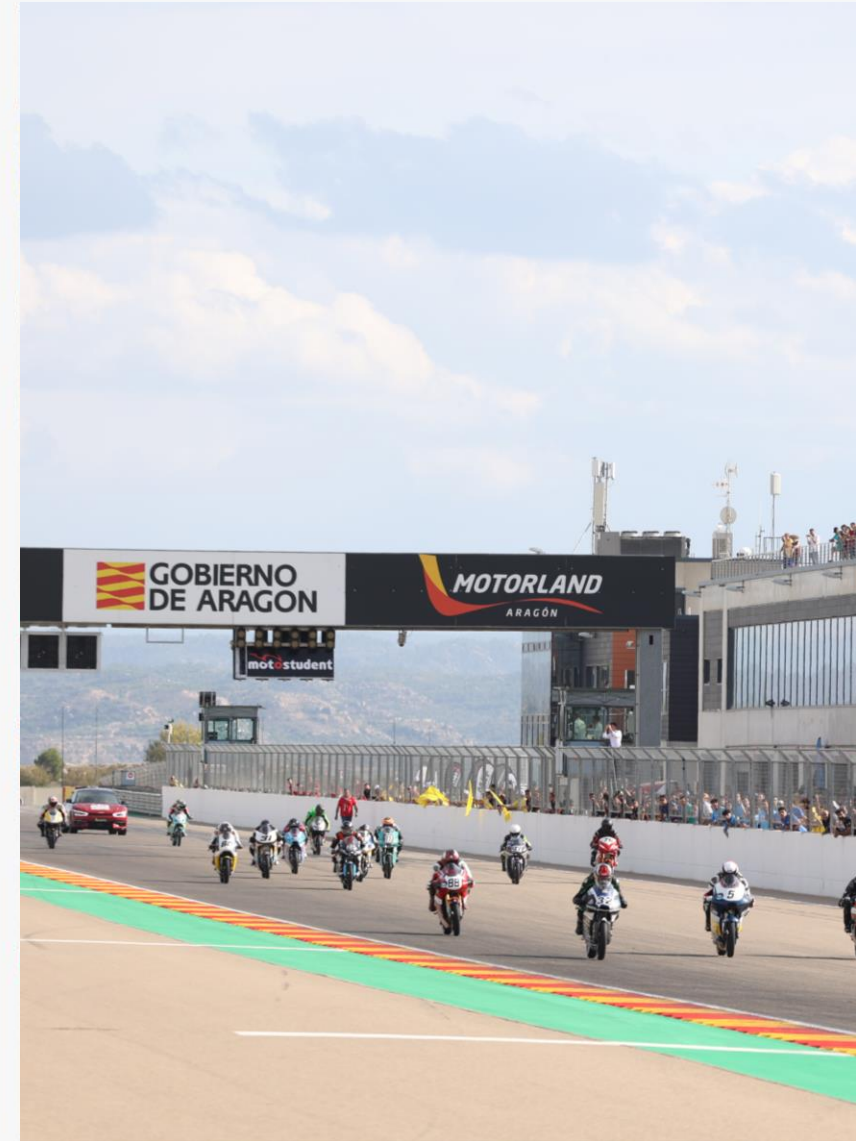
Evaluation of

- Industrial design
- Business plan

MS2

Evaluation of

- Prototype's performance in static and dynamic tests
- Race weekend at the MotorLand Aragón international circuit

petrol
motostudentelectric
motostudent

2023 PROTOTYPES



S.T.U.K.A.

STATIC



Design

DYNAMIC



Acceleration
(6,54" / 150m)



Gymkhana
(32,917")

TATANKA

STATIC

- Industrial Project
- Innovation

DYNAMIC

- Regularity (00,003")
- Top Speed (202,6 km/h)
- Acceleration (6,317" / 150m)

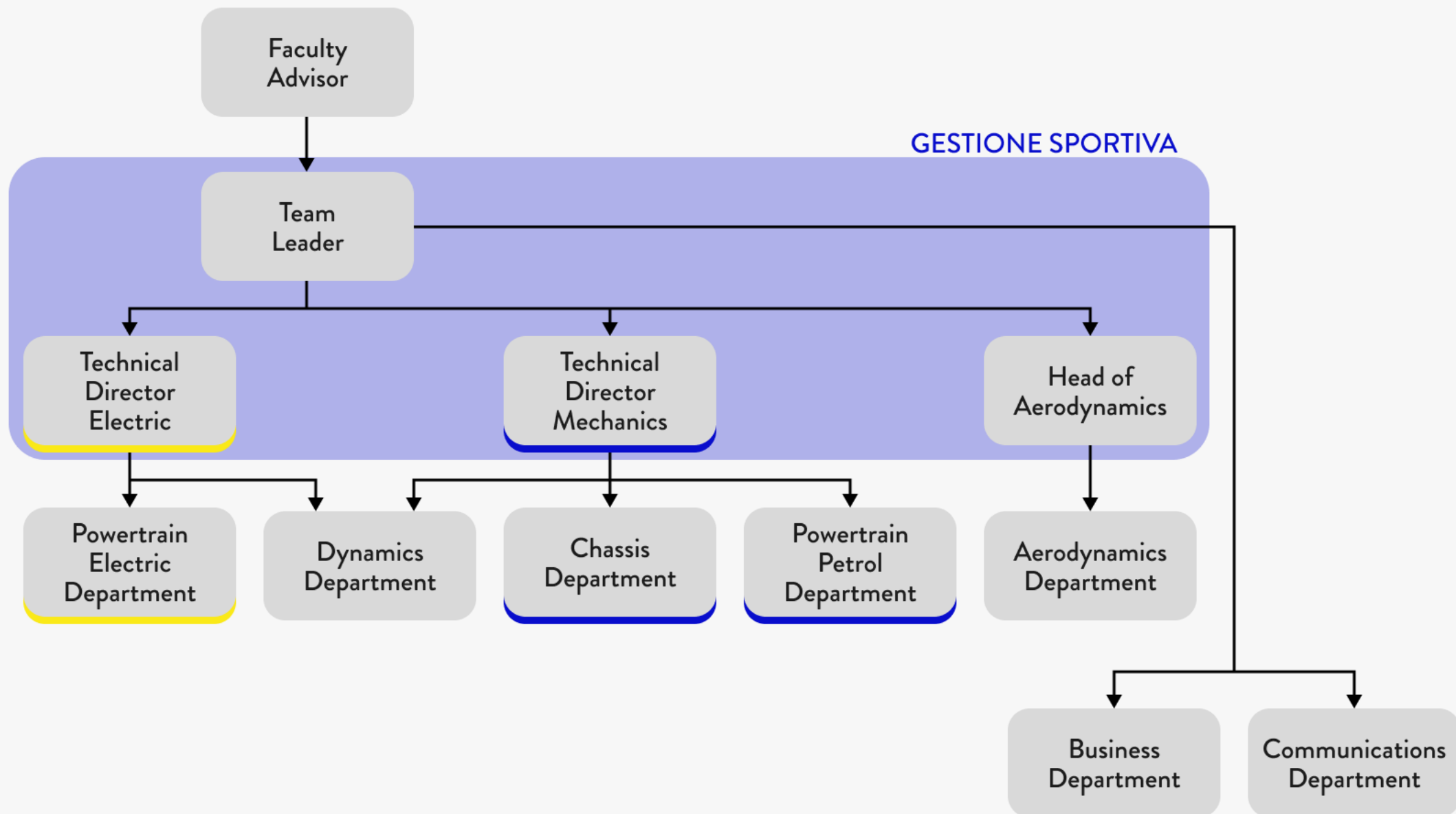


**VICE-WORLD
CHAMPION**



1. Aluminum alloy chassis.
2. Carbon swingarm.
3. **Custom** designed and tuned titanium alloy **exhaust**.
4. **Airbox with dynamic intake** and carbon fiber intake pipe.
5. **Custom-designed battery pack** with a capacity of 9.7 kWh, managed by an internally engineered BMS.
6. **Dashboard with integrated data acquisition system**, designed and programmed in house.
7. **Two active aerodynamics systems** (DRS-like and Aerobrake) to control and improve turning and braking performance.





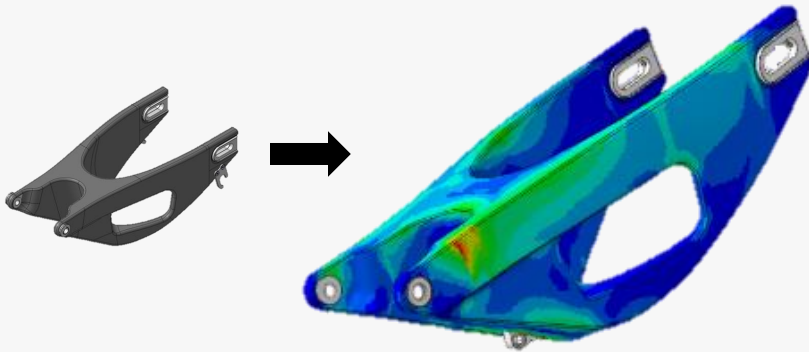
VI-Grade within our work



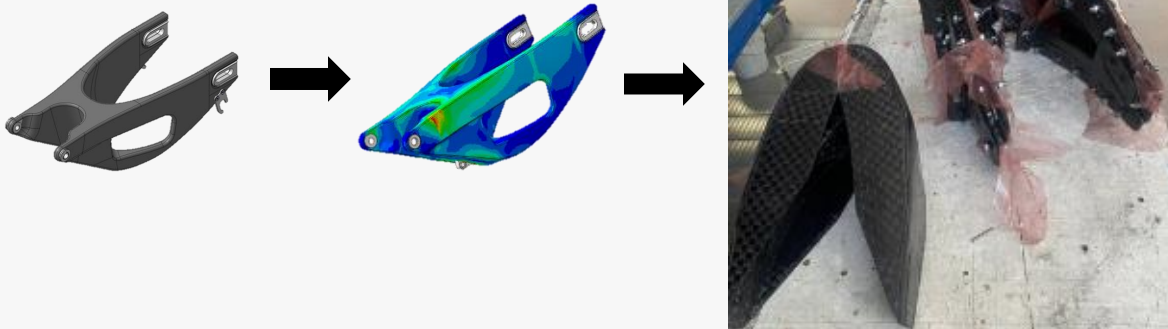
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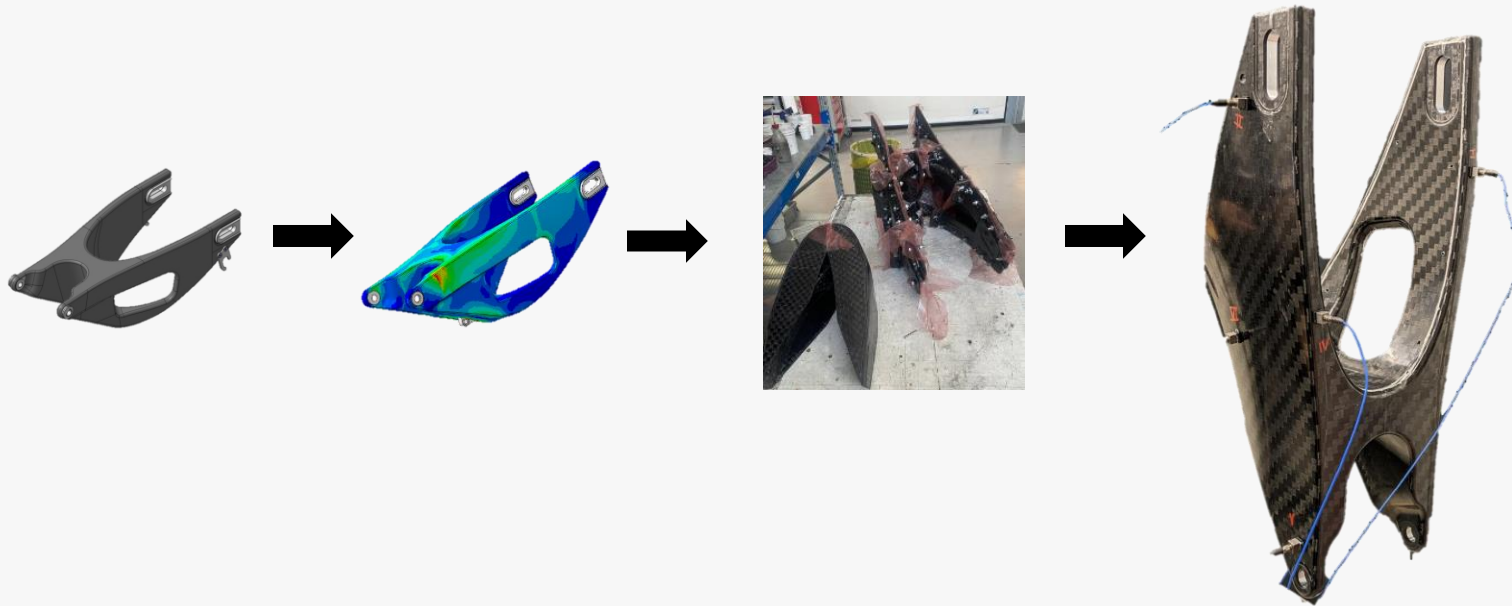
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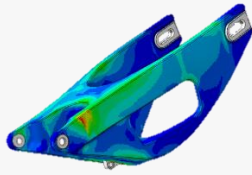
VI-Grade within our work



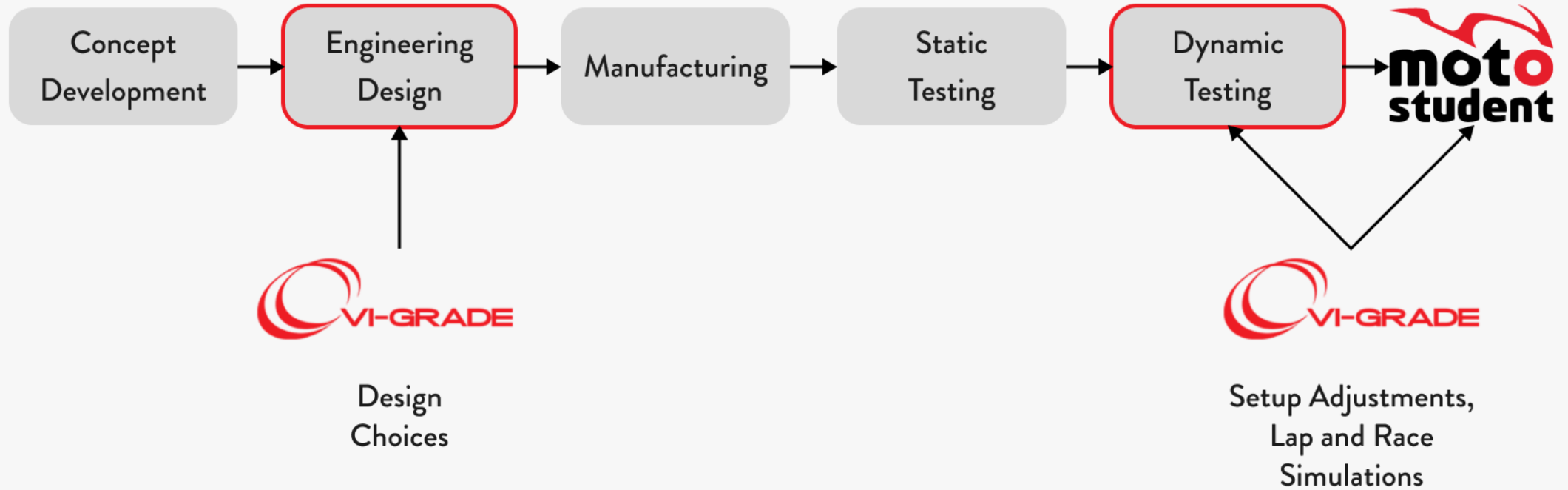
VI-Grade within our work



VI-Grade within our work



VI-Grade within our work



Within the VI Grade Suite
we can use several
applications:

- VI-Road
- VI-BikeRealTime
- VI-Animator
- VI-EventBuilder
- VI-TireLimits



Features

Comparative and Performance Analysis

- Build a reliable model
- Choose configurations to compare

Loads Estimation

- Evaluating dynamic loads
- Use the loads to size components

Simulink Model

- Create a custom model of our motorcycle
- Run faster and iterative analysis

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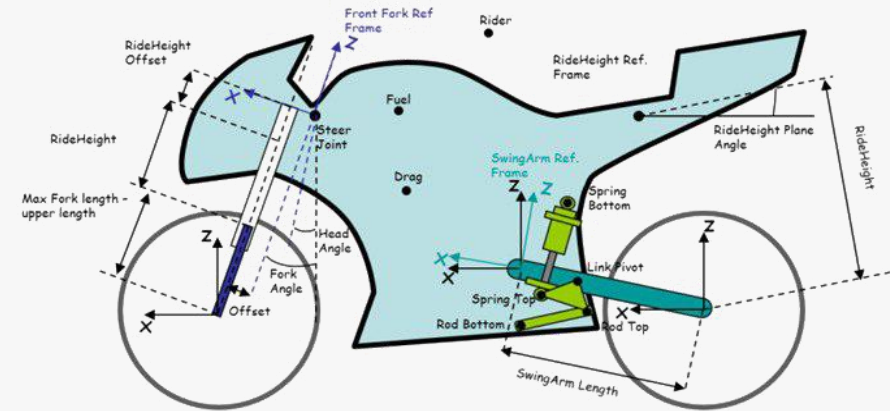
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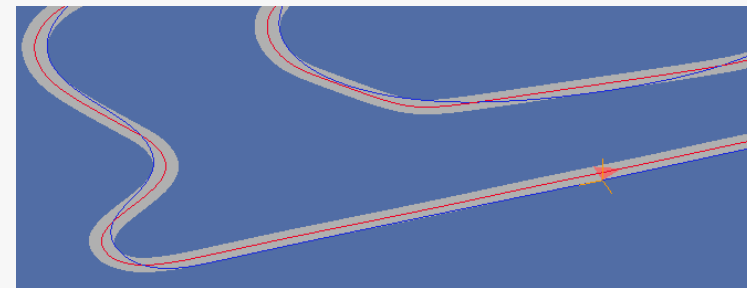
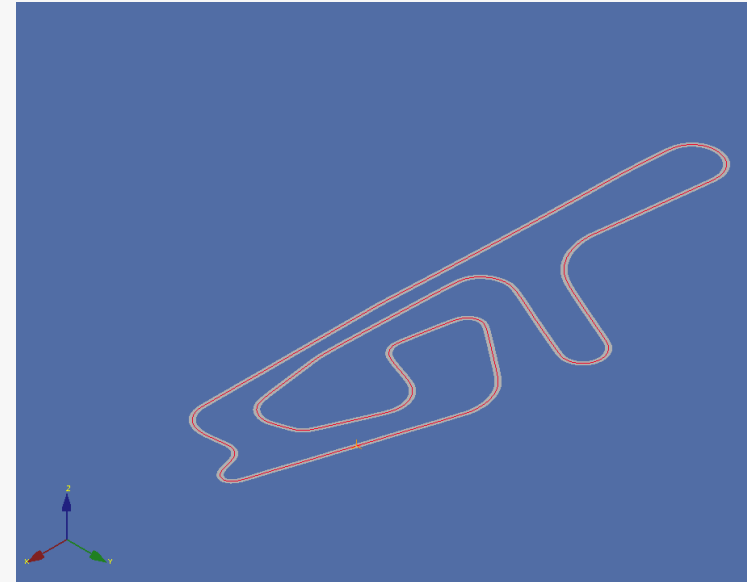
Analysis Workflow 1/4

1. Generate a bike model with VI-BRT
2. Generate a circuit with VI-ROAD
3. Perform dynamic analyses
4. Validate the model comparing our
Telemetry data with the simulation output
5. Iterate to build a reliable model



Analysis Workflow 2/4

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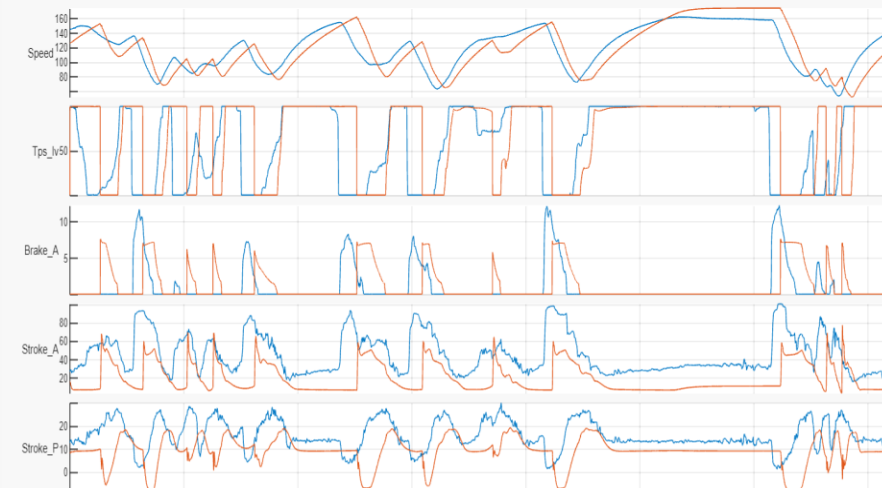
Analysis Workflow 3/4

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Analysis Workflow 4/4

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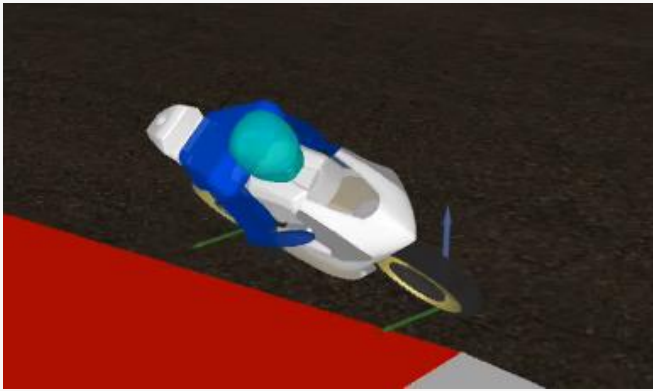
Configuration Comparison

Studying and comparing different configurations is crucial to find the best setting to test eventually on the track.



Dynamic Loads – Front-end FEM simulation

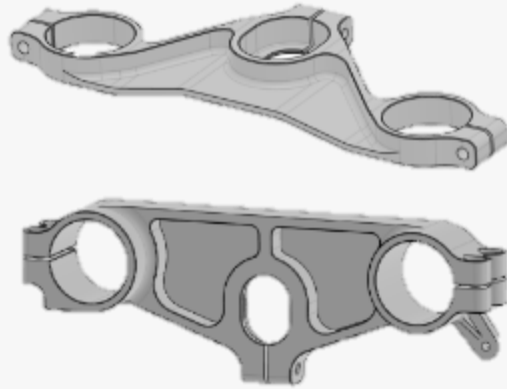
Mechanical components are designed to be as safe and light as possible. The motorcycle must resist demanding dynamic loads as well as a few static loads mandated by the regulations.



VI-Grade can be used to extract many forces such as the tire contact forces.

Dynamic Loads – Front-end FEM simulation

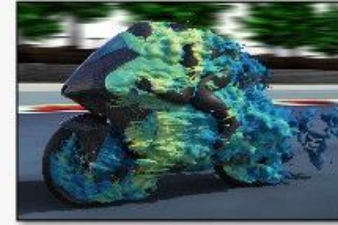
Our chassis department takes these loads as inputs for FEM simulations of various components such as the front-end.



Create a Custom Model of our Motorcycle



Monitors



Aerodynamic forces



Front Suspension



MotorCycle



Rear Suspension



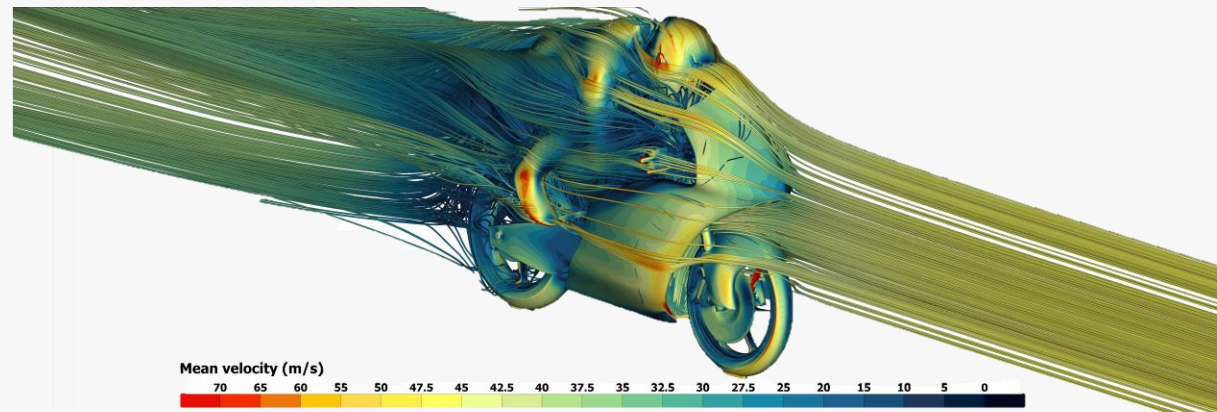
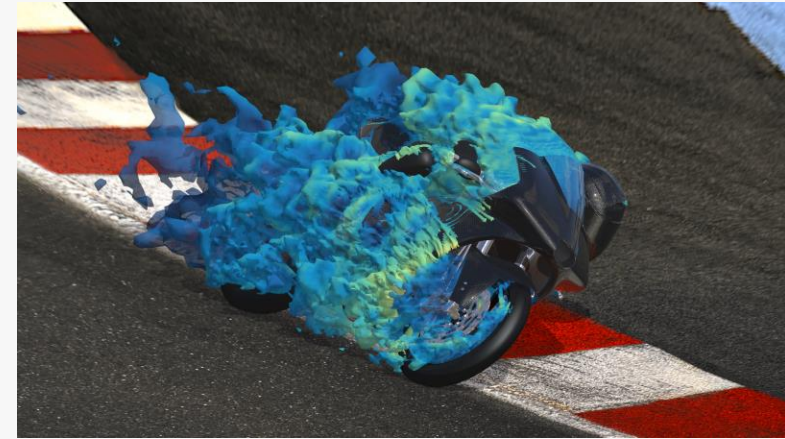
Transmission



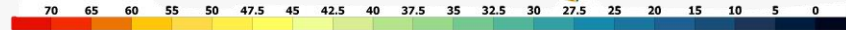
Motor

Case Study: Aerodynamics

Aerodynamics has been studied thoroughly.
We take advantage of CFD simulations to test
several solutions.

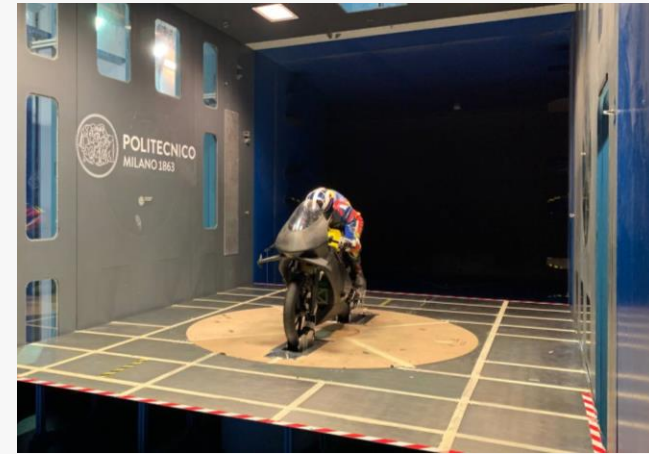


Mean velocity (m/s)

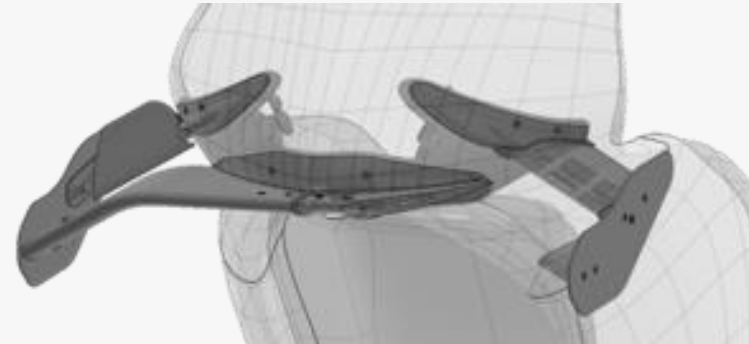


Case Study: Aerodynamics

Validation of the numerical model is carried out both through Wind tunnel testing and afterwards through on-track testing. This will be done in the future thanks to pressure scanners.



The team has developed a tool to integrate the findings of our experimental studies in the Simulink model. Specifically adding the lift component.



THANK YOU



mecc

POLIMI
7F
MOTORCYCLE
FACTORY



POLITECNICO
MILANO 1863