

Development of Data-Driven Model Predictive Control for Energy Management in Hybrid Electric Vehicles

- Supporting companies: **GammaTech Engineering (GTE)** | **Gamma Technologies (GT)**
- Start date: September/October 2026
- Project duration: 6÷8 months
- Site:
 - GTE's Offices in Turin
- Compensations: Meals, travel expenses
- Motivations and Project Scope:
 - **Hybrid Electric Vehicles (HEVs) require advanced Energy Management Strategies (EMS)** to optimally balance power flows. In such a field, the **ability to predict future operating conditions** can be **key to reducing fuel consumption and emissions**. Simultaneously, **Neural Networks (NN) are becoming increasingly adopted in automotive sector** to capture nonlinear behavior and enable efficient predictive models for advanced controls.
 - The scope is to **analyze and develop a NN-based Model Predictive Control (MPC) framework for HEV energy management in GT-SUITE**. The objective is to exploit predictive capabilities to optimize powertrain energy usage under real-world constraints, improving overall consumption.
- Thesis proposal:
 - **Review and analyze the advantages and limitations of current EMS** implemented in real-world HEVs. Investigate the use of MPC frameworks and develop NN-based predictive models to support control decisions and improve the energy consumption of vehicle models.
 - **Compare and evaluate the proposed methods against state-of-the-art control strategies** and **explore their applicability across a wider range of HEV architectures** and operating conditions.

