

**Ph.D. in Information Technology  
Thesis Defense**

**January 13, 2023  
at 15:00  
Room 2A**

**Stefano RADRIZZANI – XXXV Cycle**

**DESIGN AND ANALYSIS OF ENERGY MANAGEMENT STRATEGIES FOR NON-STANDARD HYBRID ELECTRIC POWERTRAIN ARCHITECTURES**

Supervisor: Prof. **Giulio Panzani**

**Abstract:**

Environmental awareness is one of the most important factors leading the development and research of modern mobility. In this scenario, hybrid vehicles play an important role because they are able to merge the advantages of different powertrain solutions, representing an intermediate step towards the global vehicle electrification. Thanks to optimal management of the multiple power sources, it is possible to reduce consumption, improving the efficiency, and to also reduce the environmental impact of the vehicle.

In this research activity, energy management strategies for non-standard hybrid powertrain architectures are developed, considering: a hybrid electric tractor, a human-powered electric bicycle, and an electric racing car equipped with a hybrid energy storage system. With respect to traditional hybrid vehicles, the considered use cases introduce new challenges to deal with, such as the presence of the human as a non-controllable power source in bicycles, the interaction with native engine speed controllers in tractors, and the high-performance requirements of racing cars. All these factors motivated the study of non-standard hybrid powertrain architectures.

**PhD Committee**

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