

October 12, 10:30-12:30

Pisa, School of Engineering, Aula Magna Pacinotti



Learning-based Methods for Model Predictive Control

by *Alberto Bemporad*

IMT School for Advanced Studies Lucca, Italy

Machine learning has gained immense popularity in various fields, including control, due to its ability to extract mathematical models from data. In my talk, I will present different machine learning techniques that can aid in designing and calibrating model predictive control (MPC) laws. I will emphasize the use of offline and online methods for learning piecewise affine and recurrent neural network prediction models. Moreover, I will present global and preference-based optimization techniques that rely on surrogate functions to actively learn the optimal MPC parameters and to identify critical scenarios from closed-loop experiments.



Set-Based Computing in Robust Control: A Polytopical Approach

by *Mario Eduardo Villanueva*

IMT School for Advanced Studies Lucca, Italy

Set-based computing methods are the foundation of a variety of problems and tasks such as validated arithmetic (reliable computing), uncertainty propagation, set-invariance, robust control, analysis of hybrid systems, and safe learning among many others. This talk presents recent breakthroughs in the field of set-based computing. In particular, the focus is on a novel class of configuration-constrained polytopes that admit a joint affine parameterization of their vertices and facets.

This parameterization can be used to optimize the location and geometric shapes of potentially high dimensional polytopes with millions of facets and vertices by relying on a large-scale linear program (LP) solver. The second part of the talk focuses on an application of such configuration constraint polytopes in the context of set-invariance and robust model predictive control.

