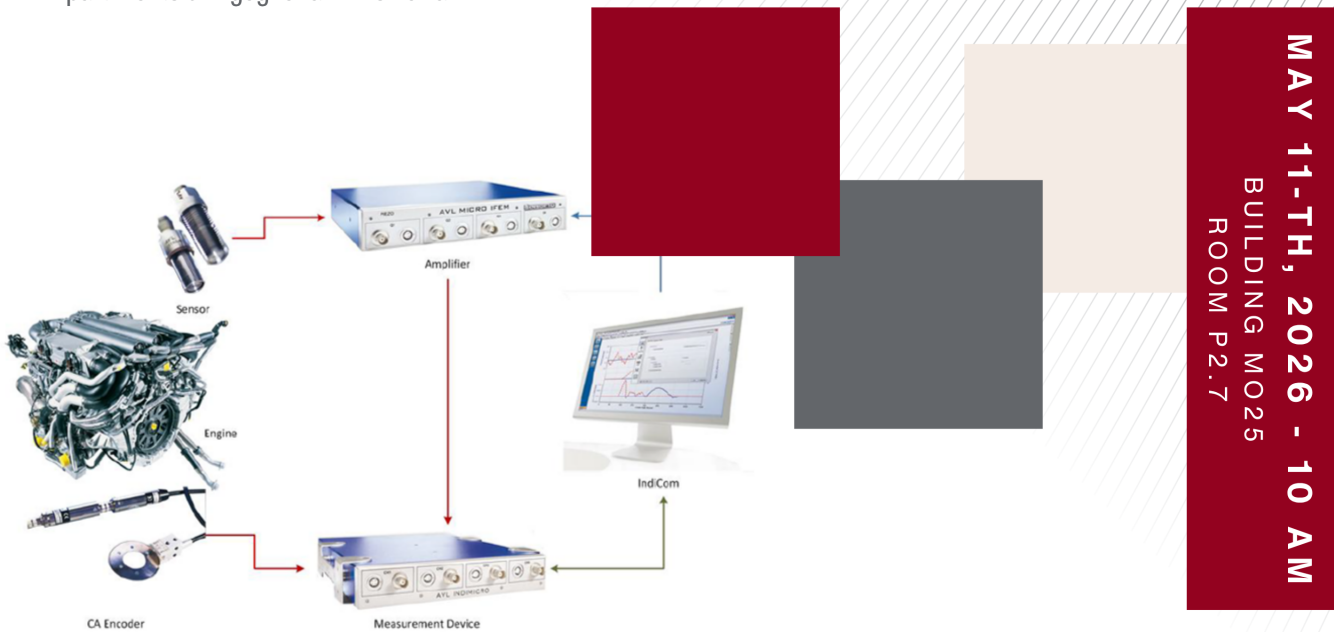




**UNIMORE**  
UNIVERSITÀ DEGLI STUDI DI  
MODENA E REGGIO EMILIA

Dipartimento di Ingegneria "Enzo Ferrari"



## Physics-Based Methods for Processing the Indicating Measurement Chain

### KEYWORDS:

- Internal Combustion Engine (ICE)
- Indicated Parameters
- In-Cylinder Pressure Signal
- Experimental Testing

This presentation explores both the theoretical and experimental aspects of high-performance internal combustion engines, highlighting key innovations in their performance characterization. The study focuses on the critical assessment of data processing methodologies applied to indicating data acquired from engine test benches, with the objective of enhancing the accuracy, reliability, and consistency of performance estimates for high specific-power single-cylinder engines derived from Formula 1 units. To achieve this, MATLAB-based tools and algorithms were developed to process data collected from test bench sensors. These were integrated with advanced methodologies and validated through experimental campaigns on an engine dynamometer, considering different configurations and operating conditions. The main contributions include compression ratio estimation through the Temperature–Entropy diagram, precise top dead center calibration, improved modeling of the specific heat ratio, and absolute referencing of in-cylinder combustion pressure. Overall, the proposed approach allows for more accurate performance characterization while significantly reducing both testing time and associated costs.