Prof. Carlo Drago
Associate Professor
GSD: SECS-S/03 Economic Statistics
University of Rome Niccolò Cusano

Dates:

20 February 2026 2:00-5:00 pm

25 February 2026 2:00-5:00 pm

Room:

Room Eng. 3 (New Building)

University of Rome Niccolò Cusano

Statistical Learning

Statistical Learning has become a foundational methodological component of modern engineering, providing a rigorous theoretical framework and advanced analytical tools for extracting information from complex, high-dimensional data. This course offers a systematic treatment of the statistical principles underlying learning, with emphasis on probabilistic modeling, generalization theory, and inferential techniques that support the development of reliable, interpretable, and robust predictive models.

The course is rooted in the theoretical foundations and applications of learning. Both supervised and unsupervised learning methods will be introduced from a statistical perspective, with detailed discussion of model structure, the bias–variance trade-off, consistency conditions, and theoretical guarantees of performance.

Interconnections between statistical learning and modern machine learning will also be examined—particularly with regard to neural networks, ensemble methods, and complex probabilistic models—highlighting how statistical theory helps assess reliability, uncertainty, and interpretability.

Applications across key engineering areas will be discussed, illustrating how statistical learning supports structural health monitoring, optimization of electrical and communication systems, aerospace safety, modeling of mechanical processes, environmental analysis, and biomedical engineering. In each of these domains, statistical models play a central role in risk forecasting, early anomaly detection, uncertainty quantification, and the design of resilient systems.

The overarching goal of the course is to equip PhD students with the theoretical foundations and methodological tools required to construct learning models that achieve statistical rigor, interpretability, and predictive reliability, and that can be coherently integrated into contemporary engineering design and decision-making processes.