Syllabus

Descrizione corso

Titolo insegnamento	Machine Learning for Econometric Applications
Codice insegnamento	29123
Titolo aggiuntivo	
Settore Scientifico-Disciplinare	NN
Lingua	Inglese
Corso di Studio	Corso di Dottorato di ricerca in Economics and Finance
Altri Corsi di Studio (mutuati)	
Docenti	prof. Davide Ferrari, Davide.Ferrari2@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/39001
Assistente	
Semestre	Primo semestre
Anno/i di corso	2026/27
CFU	2
Ore didattica frontale	10
Ore di laboratorio	0
Ore di studio individuale	0
Ore di ricevimento previste	0
Sintesi contenuti	The course begins with the foundations of machine learning in economics, proceeds to modern statistical learning methods for high-dimensional and nonlinear models, and concludes with applied case studies in causal inference, forecasting, and text analysis. Practical implementation will be carried out in R
Argomenti dell'insegnamento	Part 1: Introduction to machine learning for economists (3 hours): Statistical tools for high-dimensional problems, causal inference framework, post-selection inference. Part 2: High-dimensional econometrics (4 hours): Endogeneity in

	high dimensions and sparse IV methods; extensions to complex models, inference on heterogeneous treatment effects, optimal policy learning with machine learning estimators. Part 3: Applications (3 hours): Synthetic control for policy evaluation; forecasting in high-dimensional macroeco nomic and financial settings; text analysis in economics, from bag-of-words to embeddings and modern language models
Parole chiave	High-Dimensional Statistics; Econometric; Causal Machine Learning; Sparse Estimation; Post-Selection Inference
Prerequisiti	
Insegnamenti propedeutici	
Modalità di insegnamento	Lectures with methodological examples, guided discussion of econometric applications, and short hands-on demonstrations using the statistical software R.
Obbligo di frequenza	Required
Obiettivi formativi specifici e risultati di apprendimento attesi	The courses aim to train researchers with strong quantitative and theoretical skills, capable of analyzing economic and financial phenomena. Candidates' dissertations are expected to adhere to the highest standards of scientific rigor and to demonstrate innovative features that make them suitable for publication in leading international peer-reviewed journals. The programme therefore seeks to contribute to the international scientific debate in economics and finance. To this end, candidates will be encouraged to employ state-of-the-art methodologies and to adopt a multidisciplinary approach. The advanced training provided by the programme, together with the research methods required to complete the dissertation, prepares candidates both for an academic career and for high-level professional positions involving policy analysis and policymaking.
Obiettivi formativi specifici e risultati di apprendimento attesi (ulteriori info.)	Upon completion of this course, students should be able to: • Understand the role of machine learning in modern econometrics and distinguish between predictive and causal approaches. • Apply high-dimensional regression, variable selection, and nonlinear ML methods to economic data.

	• Conduct valid inference and policy evaluation in high-dimensional settings, including causal and heterogeneous treatment effects. • Implement methods in R and interpret empirical results from macroeconomics, finance, and text-based applications.
Modalità di esame	- Written Assignments (2 short problem sets after Modules 1 and 3): 40% - Written Project (empirical application after Module 3): 50% - Active Participation: 10%
Criteri di valutazione	The two written assignments will be evaluated on the basis of the correctness of the proposed solutions, the rigor of the analytical reasoning, the appropriate use of methods, and the clarity with which results are explained and interpreted. The written project will consist of an empirical application of one or more methods covered in the course. It will be assessed according to the relevance and appropriateness of the chosen methodology, the quality of the empirical implementation, the interpretation of the results, and the student's ability to discuss the advantages and limitations of the adopted approach. Particular attention will be given to the coherence of the research question, the transparency of the analysis, and the overall clarity and organization of the written report. Active participation, will be evaluated on the basis of students' engagement during lectures and applied sessions. This includes attendance, contributions to class discussions, participation in practical exercises, and the ability to critically engage with methodological and empirical issues discussed during the course.
Bibliografia obbligatoria	• Gaillac, C., & L'Hour, J. (2025). Machine Learning for Econometrics. Oxford University Press.
Bibliografia facoltativa	
Altre informazioni	
Obiettivi di Sviluppo Sostenibile (SDGs)	Sconfiggere la povertà, Partnership per gli obiettivi, Buona salute, Istruzione di qualità, Parità di genere, Acqua pulita e servizi igenico-sanitari, Energia rinnovabile e accessibile, Buona occupazione e crescita economica, Innovazione e infrastrutture, Ridurre le disuguaglianze, Città e comunità sostenibili, Utilizzo responsabile delle risorse, Lotta contro il cambiamento climatico, Utilizzo sostenibile del mare, Utilizzo sostenibile della terra, Pace e giustizia, Sconfiggere la fame