ADVANCED ECONOMETRICS FOR BUSINESS STUDIES

Period: a.y. 2025/26 – II sem.

Class times: Room 4E4-SR01. 08:30-11:45

Instructors:

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Course description

This is the second course of the econometric sequence of Bocconi's PhD in Business Administration and Management. It develops advanced topics that build on the first course of the sequence and introduces students to the use of machine learning and AI-based econometrics.

Course Material

See below.

Classes/Topics

Class 1-2 (January 26 – 830:1145AM)

Staggered difference in difference: Classical approaches and new advances

- Callaway, B. and Sant'Anna, P. H. (2021) "Difference-in-Differences with Multiple Time Periods" *Journal of Econometrics* 225(2), 200-230.
- De Chaisemartin, C. and d'Haultfoeuille, X. (2020) "Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects" *American Economic Review* 110(9), 2964-2996.
- Favara, G. and Imbs, J. (2015) "Credit Supply and the Price of Housing" *American Economic Review* 105(3), 958-992.

Class 3-4 (February 2 – 830:1145AM)

Choice models: (theory)

- Class notes.

Choice models (applications)

- Greene, W. (2010) "Testing Hypotheses about Interaction Terms in Nonlinear Models" *Economics Letters* 107(2), 291-296.

Class 5-6 (February 9 – 830:1145AM)

Choice models (applications)

- Cassiman, B. and Veugelers, R. (2006) "In Search of Complementarity in Innovation Strategy: Internal R&D and External Knowledge Acquisition" *Management Science* 52(1), 68-82.
- Giuri, P. and Mariani, M. (2013) "When Distance Disappears: Inventors, Education, and the Locus of Knowledge Spillovers" *Review of Economics and Statistics* 95(2), 449-463.
- Parmigiani, A. (2007) "Why Do Firms Both Make and Buy? An Investigation of Concurrent Sourcing" *Strategic Management Journal* 28(3), 285-311.

Class 7-8 (February 16 – 830:1145AM)

Machine learning and algorithms: a primer

- Mullainathan, S. (2025) "Economics in an Age of Algorithms" *American Economic Review Papers & Proceedings* 115, 1-23

Regularization (lasso), cross-validation, random forests, post-double selection (PDS) lasso, double/debiased machine learning (DML)

- Athey, S. and Imbens. G. (2019) "Machine Learning Methods that Economists Should Know About" *Annual Review of Economics* 11, 685-725.
- Practical applications.

Class 9 (February 18 – 1015:1145AM)

Machine learning for prediction

- Kleinberg, J., Lakkaraju, H., Leskovec, J., Ludwig, J. and Mullainathan, S. (2018) "Human Decisions and Machine Predictions" *Quarterly Journal of Economics* 133 (1), 237-293.

Class 10 (February 20 – 1015:1145AM)

Machine learning for hypothesis generation

- Ludwig, J. and Mullainathan, S. (2024) "Machine Learning as a Tool for Hypothesis Generation" *Quarterly Journal of Economics* 139 (2), 751-827.

Class 11-12 (February 23 – 830:1145AM)

Large Language Models: Correct the Measurement Error

Ludwig, J., Mullainathan, S. and Rambachan, A. (2025) "Large Language Models: An Applied Econometric Framework" NBER WP 33344, www.nber.org/papers/w33344

Large Language Models: Reduce the Measurement Error

- Camuffo, A., Gambardella, A., Kazemi, S., Malachowski, J. and Pandey, A. (2026) "Variance-Aware LLM Annotation for Strategy Research: Sources, Diagnostics, and a Protocol for Reliable Measurement" https://arxiv.org/html/2601.02370v3
- Practical applications

Class 13-14 (February 27 – 830:1145AM)

From Text Analysis to Large Language Models

- K Gentzkow, M., Kelly, B. and Taddy, M. (2019) "Text as Data" *Journal of Economic Literature* 57 (3), 535-574.
- Asirvatham, H., Mokski, E. and Shleifer, A. (2026) "GPT as a Measurement Tool" NBER WP 34834, http://www.nber.org/papers/w34843. See also the blog and tutorial: https://openai.com/index/scaling-social-science-research/
- Practical applications

Class 15-16 (March 2 – 830:1145AM)

AI-agents

- Anthropic (2024), "Building Effective Agents" December 19, https://www.anthropic.com/engineering/building-effective-agents
- Camuffo, A., Gambardella, A., Kazemi, S. and Pandey, A. (2026) "Beyond Black Boxes: Designing and Testing Agentic AI Systems for Strategy" *Strategy Science* forthcoming, https://pubsonline.informs.org/doi/epdf/10.1287/stsc.2025.0432
- Open AI (2025) "Intro to Agent Builder on https://platform.openai.com/chat" https://www.youtube.com/watch?v=44eFf-tRiSg
- Practical applications

Class 17-18 (March 9 – 830:1145AM)

Deep Learning and Neural Networks

- Dell, M. (2025) "Deep Learning for Economists" *Journal of Economic Literature* 63 (1), 5-58.
- Practical applications

Assessment Methods

Take home exam scheduled from 9AM of March 17th to 11:59PM of March 18th The exam is open book and should be performed by each student individually without any external communication. Email your exam to luisa.gagliardi@unibocconi.it , alfonso.gambardella@unibocconi.it , and marialuisa.ambrosini@unibocconi.it.

Faculty Bio

Luisa Gagliardi is Assistant Professor at Bocconi University. Her website is https://mgmt-tech.unibocconi.eu/faculty/luisa-gagliardi

Alfonso Gambardella is Professor of Corporate Management at Bocconi University. His website is https://mgmt-tech.unibocconi.eu/people/alfonso-gambardella.