

Course syllabus Multilevel 1: Introduction to multilevel models

Week 2 (regular course)

Duration: 12 hours/ 3 days (regular course)

Format: In person and online

Instructors: Leonardo Grilli and Carla Rampichini

Course Description:

The course introduces the concepts of multilevel analysis, whose main aim is to model the relationships between and within groups. Typical situations include individuals clustered into families, schools, firms, and geographical areas. The course focuses on the two-level linear model as a template to illustrate specification, estimation and inference issues. The main ideas are illustrated through case studies concerning typical fields of application, such as education (assessing the role of student and school factors on student achievement) and cross-country research (evaluating how individual and country-specific characteristics affect the behaviour of citizens across different countries). The case studies are worked out with Stata. Moreover, each lesson includes guided exercises using Stata. Special attention is devoted to critical and controversial issues, such as group-mean centering of the covariates, sample size requirements, choosing between fixed and random effects, and using sampling weights.

Learning Schedule:

Day 1	9:00 - 10:45	Basics of multilevel analysis: theory
	10:45 - 11:15	Break
	11:15 - 13:00	Basics of multilevel analysis: case study 1
Day 2	9:00 - 10:45	Model specification, estimation and inference: theory
	10:45 - 11:15	Break
	11:15 - 13:00	Model specification, estimation and inference: case study 2
Day 3	9:00 - 10:45	Fixed and random effects, complex structures, weighting
	10:45 - 11:15	Break
	11:15 - 13:00	Review and further examples

Prerequisites:

Basic knowledge of statistical inference and linear regression. Knowledge of Stata is helpful but not necessary (files with commands are always provided).

Software:

Stata (the current version will be used, but older versions are usually fine)

References:

- Grilli L., Rampichini C. (2018). A handful of critical choices in multilevel modelling. *Boletín de Estadística e Investigación Operativa*, 34 (1).
- Hox J.J., Moerbeek M. and van de Schoot R. (2017). *Multilevel Analysis: Techniques and Applications*, Third edition, Routledge
- Rabe-Hesketh S. and Skrondal A. (2022). *Multilevel and longitudinal modeling using Stata*, Fourth edition, Stata Corp.
- Snijders T.A.B. and Bosker R.J. (2012). *Multilevel Analysis: An introduction to basic and advanced multilevel modeling*, Second edition, Sage.

Instructors short bio



Leonardo Grilli, PhD, is Full Professor of Statistics at the University of Florence. He is a member of the board of the Doctoral Program in Development Economics and Local Systems at the University of Florence. His teaching activity focuses on introductory statistics and statistical modelling, including generalized linear models and multilevel models. His research mainly concerns random effects models for multilevel analysis, with methodological advances in the specification and estimation of models in complex frameworks such as duration data, multivariate qualitative responses, informative sampling designs, and sample selection bias. He also gave contributions regarding causal inference in the potential outcomes framework, IRT models, latent growth curve models, mixture models, and quantile regression. The methodological work is driven by applications on real data in different fields mainly in the social sciences, but also in demography and medicine.



Carla Rampichini, PhD, is Full Professor of Statistics. She is Head of the Department of Statistics, Computer science, Applications of the University of Florence. She is a member of the board of the Doctoral Program in Development Economics and Local Systems at the University of Florence.

Her teaching activity focuses on introductory statistics, multivariate analysis and statistical modelling, including generalized linear models and multilevel models. Her research interests relate to random effects models for multilevel analysis, program evaluation, and causal inference. Her methodological work is joined with applications on real data, often concerning the effectiveness of universities. She is a member of the Royal Statistical Society and of the Italian Statistical Society.