UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Indicators for Social Risk Analysis

2526-2-F8803N009

Learning objectives

The course has a practical-applicative main focus and the following objectives:

Knowledge and understanding: To introduce and level students to statistical reasoning and basic statistical methods for collecting data and transforming them into useful information for decision-making and producing empirical evidence to support social risk analysis and security issues in urban and territorial contexts.

Ability to apply knowledge and understanding: Introduction to both theoretical and applicative aspects of statistical models (and computational models) for social risk and insecurity issues prediction.

At the end of the course, students will be able to select reliable data sources, create their own data set and apply basic statistical methods for the analysis and prediction of social risk phenomena. In addition, they will be able to assess accuracy of statistical results, and effectively interpret and disseminate them. In particular, students will know how to:

- Download and build datasets autonomously
- Knowingly select and use reliable data sources
- Transforming data into information
- Recognize and thoughtfully treat survey data, with awarness of sampling error and bias, sampling design and methodological note
- Use theoretical and methodological statistical knowledge to build social risk indicators
- Develop skills to apply social risk indicators to the analysis of real case studies
- Promote the ability to use social risk indicators to support policies and risk prevention

Contents

The course aims to deliver essential knowledge, both methodological and applied, in the field of data collection and analysis for quantitative research.
Applicative aspects are addressed through practical exercises and case studies integrated into the course. Online tools and opportunities for independent practice are made available on the e-learning page during teaching (see the "Teaching methods" section).
In particular, statistical and computerised tools are provided to produce empirical evidence and data-driven decisions focused on analyzing social risk in urban spaces.
The course consists of two parts:
Part 1 equivalent to 2 CFU - 14h frontal lessons:
with an introductory, leveling didactical purpose. Contents are element of statistical reasoning and essential statistical methods.
Part 2 equivalent to 6 CFU - 42h frontal lessons:
With practical, applied purposes and problem solving approach, with the use of R as a computational software for the analysis.
The content focuses on the construction of databases and the application of statistical tools to analyse social risk (statistical methods and tools presented in Part 1 and further developed in Part 2), on the interpretation and dissemination of the results.

Detailed program

Part 1 2 CFU, 14h: Statistical reasoning and statistical methods

- Overview of basic statistical concepts and tools
- Objectives and functions of Statistics: descriptive, inferential, control and management of uncertainty/statistical error and estimation/mis-information/integration of data from different sources
- Data: nature of the data, sample data & Big Data, sample design (overview)
- Sources (overview databases & official surveys ISTAT, UN,UNSD,SHARE,DHS), quality vs quantity
- Transforming data into information: statistical indicators & etimates (proportions, ratios and average values, deviations and variability)
- Normalisation to evaluate vs standardisation to compare
- Statistical models for prediction: objectives and overview
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Part 2 6 CFU, 42h: Databases and Statistical Analysis for managing and prevention of risks and security issues in urban and territorial contexts

- Introduction to R and RStudio
- Official Statistics data sources
- Survey data: methodological note, sample design and weighting, design weights and (notes to corrections: missing & calibration)
- Construction, application, analysis and visualization of social risk indicators (selection criteria, examples of socio-demographic, exclusion and social cohesion and urban security indicators)
- Case studies: application, evaluation and prevention of social risk indicators
- Introduction of statistical models for social risk prediction:
    - Logistic regression, fitting & reliability measurement
    - Decision trees: fitting & reliability measurement
- Introduction to Machine Learning:
    - Random Forrest (case study)

Prerequisites

Basic mathematical and computational competencies.
Basic competencies of quantitative research methodology.

Teaching methods

Part 1: 100% lecture-based teaching with frontal lessons and use of slides
Part 2: 30% lecture-based teaching with frontal lessons and use of slides,
70% interactive teaching with computer exercises, case studies, project development, construction of data sets and statistical analysis in preparation for the exam

During the course, the elearning page https://elearning.unimib.it is regularly updated with further teaching material, including:

- Slides of the completed lessons
- Q&A Forum and online board (anonymous) for questions/doubts/comments posting

Assessment methods

Preparation and delivery of a report (written paper) to be presented orally on a chosen project, either individually or as a group. For group projects, each member will present their specific contributions individually.

Further information will be provided during the course and posted on the e-learning page.

Textbooks and Reading Materials

Lecture slides, handouts and other teaching/reading material will be made available on the e-learning page and integrated during classes.

Useful reference texts:

- F. Mecatti “Statistica di Base. Come, Quando e Perchè”. McGraw Hill, III Edizione 2022 (Parte 1)
- B.S. Baumer, D.T. Kaplan, N.J. Horton (2021). Modern data science with R (2nd Edition). Chapman and Hall/CRC (Parte 2)

James G., Witten D., Hastie T., Tibshirani R. (2021). An Introduction to Statistical Learning: with Applications in R, Springer Publishing Company. (Chapters 4 and 8 - Parte 2)

P.Giudici, S.Figini (2009) Applied Data Mining for Business and Industry Second Edition Wiley (Capitoli 4.4 - 4.5 - 4.12 Parte 2)

M. Gnaldi, B. Ponti, F. Angeli (2018) Misurare la corruzione oggi Obiettivi, metodi, esperienze (Parte 2)

Sustainable Development Goals

NO POVERTY | INDUSTRY, INNOVATION AND INFRASTRUCTURE | REDUCED INEQUALITIES | SUSTAINABLE CITIES AND COMMUNITIES | PEACE, JUSTICE AND STRONG INSTITUTIONS