



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Advanced Data Management and Decision Support Systems

2223-1-F9102Q008

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#### Aims

##### Module Data Management

The aim of the data management module is to introduce the main conceptual and theoretical tools to manage data beyond the relational model. Students will learn the most important noSQL paradigms adopted in both research and industry and the basic concepts of large-scale data set processing. The management of "data in motion" will complete the contents foreseen in the module

##### Module Decision Support Systems

The aim of the course is twofold: on one hand, to introduce students to the main conceptual and theoretical tools to model rational choices in decision making; on the other hand, provide students with models and tools to design usable (i.e., effective, efficient and easy-to-use) decision support systems and evaluate them in the real world.

At the end of the course, students should have acquired and should be able to prove sufficient knowledge in the above mentioned topics, should have acquired the ability to solve problems and apply the taught notions in practical contexts, and should have reached a sufficient maturity enabling them to autonomously understand up-to-date development in related disciplines.

#### Contents

##### Module Data Management

NoSQL models, Large scale data management , data integration,

##### Module Decision Support Systems

Models and definitions of decisions and decision making.

Rationality. Elements of formal decision theory: single agent, multi-agent (game theory).

Automation of decision making processes: usability and user acceptance, trust, dependence, compliance, reliance, biases.

## Detailed program

### Module Data Management

Data Management module

NoSQL Models

- key-value,
  - column based,
  - document,
  - graph
- Large scale data management
- hadoop,
  - map reduce,
  - spark
- Time series db
- introduction to TSDBMS
  - models for TSDBMS
  - architecture
  - query language

### Module Decision Support Systems

Models and definitions of decisions and decision making

Decision as inference and preference

Naturalistic decision making

Heuristic decision making

Rationality and rational decision making

Definitions of rational decision

Normative models

Descriptive models

Elements of formal decision theory

Single-agent decision theory (decision under ignorance and under risk)

Non-cooperative game theory

Coalitional game theory

Social choice theory

Automation of decision making processes

Levels and stages of automation

Trust in, dependence on automation

Models of user acceptance, trust, dependence, compliance (TAM, UTAUT)

Decision Biases due to automation

## Prerequisites

### Module Data Management

Basic notion of the relational model, SQL query language

### Module Decision Support Systems

Basic notions of probability theory and artificial intelligence, mathematical maturity

## Teaching form

### Module Data Management

Class-room taught classes, computer-based programming exercises. Lessons will be held in presence, unless further COVID-19 related restrictions are imposed.

### Module Decision Support Systems

Class-room taught classes, computer-based programming exercises. Lessons will be held in presence, unless further COVID-19 related restrictions are imposed.

## Textbook and teaching resource

### Module Data Management

Slides presented by the teachers.

Textbooks

Guy Harrison. Next Generation Databases: NoSQL and Big Data. Apress.

Additional materials, readings and resources will be available on the e-learning platform.

### Module Decision Support Systems

Slides presented by the teachers.

Textbooks

An introduction to Decision Theory (Second Edition). Martin Peterson. Cambridge University Press

Alternative: Multiagent Systems. Algorithmic, Game-Theoretic, and Logical Foundations. Yoav Shoham, Kevin Leyton-Brown. Cambridge University Press

Suggested Readings

Katsikopoulos, K., Simsek, O., Buckmann, M., & Gigerenzer, G. (2020). Classification in the wild. MIT Press

Klein, G. (2022) Snapshots of the Mind. MIT Press

Engineering Psychology and Human Performance, Christopher D. Wickens, Justin G. Hollands, Simon Banbury, Raja Parasuraman. Psychology Press

Additional materials, readings and resources will be available on the e-learning platform.

## Semester

2<sup>nd</sup> semester

## Assessment method

### Module Data Management

Written exam (open questions) to ascertain understanding of the basic concepts taught in class and their relationships or a project related to one of the topics of the module.

### Module Decision Support Systems

Written exam (closed and open questions) to ascertain understanding of the basic concepts taught in class and their relationships (max. grade mark 27), optional original essay for students with a written exam grade  $\geq 25$  (max. additional 4 points)

## Office hours

### **Module Data Management**

Available by appointment.

### **Module Decision Support Systems**

Available by appointment.

## Sustainable Development Goals

QUALITY EDUCATION

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