UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Business Intelligence and Big Data Analytics

2526-2-FDS01Q037

Learning objectives

The course covers both methodological and technical aspects necessary to understand and implement Business Intelligence (BI) and Big Data Analytics (BDA) solutions in real-world contexts.
It addresses the evolution of BI architectures, decision models based on business functions, and Big Data architectures such as data lakes and lakehouses.
It also explores AI techniques for decision support, including Explainable AI (XAI) and Conversational AI using word embeddings and large language models (LLMs).
The course provides the foundations for understanding, evaluating, and implementing BI and BDA solutions, focusing on both outputs (e.g., dashboards, models) and outcomes (i.e., actual business impacts and decisions).

Contents

Expected Learning Outcomes (Dublin Descriptors)

1. Knowledge and understanding
   Understand the main concepts, methodologies, and architectures of Business Intelligence and Big Data Analytics, including AI techniques for decision support. Focus on both outputs and outcomes.
2. Applying knowledge and understanding
   Apply Business Intelligence tools, Big Data frameworks, and AI methods to analyze real-world data, supporting both operational and strategic decision-making.
3. Making judgements
   Critically evaluate the suitability of different BI and Big Data solutions for various decision-making scenarios, including the interpretation and assessment of analytical results and their actual outcomes.
4. Communication skills
   Effectively communicate analytical results, technical concepts, and project outcomes, clearly explaining the impact of the analyses on business decisions.
5. Learning skills

Develop the ability to autonomously deepen knowledge of state-of-the-art techniques in Business Intelligence, Big Data Analytics, and AI for decision-making, with particular attention to understanding both the tools and the business outcomes they generate.

Detailed program

1. Introduction to BI and Big Data Analytics
   • Goal and rationale of BI systems
   • The value of knowledge: digital economy and data-driven decision making
   • Structure and evolution of BI and Big Data Analytics systems
2. BI Architectures
   • Evolution of BI architectures (toward Big Data)
   • Decision models based on business functions and decision types
3. Big Data Analytics
   • Data lakes and lakehouses
   • Scalable Big Data architectures (e.g., PySpark)
4. AI for supporting decisions
   • Explainable and evaluative AI
   • Explanation tools (LIME, SHAP, Anchors, Counterfactuals, etc.)
   • Generative AI through word embeddings and LLMs (via Python)

Prerequisites

None

Teaching methods

The course includes:
• 28 hours of lectures (DE) in presence.
• 18 hours of exercises (DI) in presence.
Activities focus on lectures, hands-on sessions, and discussions of real-world cases.
All activities are delivered in presence.

Assessment methods

The exam consists of:
• Mandatory written exam with open and closed questions.
• Optional project (completed before the exam).
• Optional oral exam.
The project must be completed before the written exam and remains valid throughout the academic year.
Points from the project are added only if the written exam is passed (?18/30).
The oral exam can also be taken only after passing the written exam.

Textbooks and Reading Materials

Lectures with the support of slides, laboratory and real-life case studies. Scientific Papers and books indicated by the lecturer. The software used is either available as open-source

Semester

I semester

Teaching language

English

Sustainable Development Goals

INDUSTRY, INNOVATION AND INFRASTRUCTURE