

Informatica Industriale e Process Analytics

Definizione preliminare degli obiettivi e dei contenuti – Marzo 2020

Course objective

The main objective of the course is to provide to students the competences in computer science technologies and tools for accessing, managing and analysing data for decision support. Foundation of Operational Intelligence (OI) for Business Process Management will be also provided. OI is a category of real-time dynamic, business analytics that delivers visibility and insight into process data, streaming events and business operations to support organizations in timely decision making, through manual or automated actions.

Course contents

The main content areas that the course will cover are:

- Syntax and semantics for programming languages that are particularly suited for data science, e.g., Python.
- Data manipulation approaches: import, combine, convert and make selection of data, handling missing values, discretisation and dimensionality reduction.
- Usage of supervised machine learning algorithms, e.g., naïve Bayes, decision trees, random forests.
- Usage of unsupervised machine learning algorithms, e.g., clustering of k-means.
- Visualisation and analysis of results of data analysis.
- Foundations of Operational Intelligence for managing business processes.
- Big data and Process Analytics
- Real-time monitoring and situation detection.
- Correlation of events and analysis of event chains
- Multidimensional analysis: Root cause analysis, Time Series and trend analysis

The main tools that the course will cover are:

- The Python programming language.
- Python data libraries: Numpy, Pandas, Scipy, Matplotlib.
- The Spark distributed data analytics engine
- Process Mining tools: PM for Py, Celonis,
- R, Matlab.

Technologies, tools and analysis of problems are shown using examples and case studies in practical sessions. A final project work will be also assessed.

Learning outcomes

Having passed the course, the student should be able to:

- discuss the application of i) technologies to convert data to appropriate format for data analysis, ii) algorithms to analyze data through supervised and unsupervised machine learning, iii) technologies and performance measurements for evaluation of data analysis results, as well as iv) analysis and mining of large data volumes, thus performing tasks that would not be feasible with traditional databases.

- implement and apply i) technologies to convert data to an appropriate format for data analysis, ii) algorithms for supervised and unsupervised machine learning, iii) technologies and performance measurements for evaluation of data analysis results, as well as (iv) analysis and mining of large data volumes, thus performing tasks that would not be feasible with traditional databases
- discuss the foundations and application of i) Operational Intelligence in the Business Process Management framework, ii) OI techniques for supporting real time monitoring and detection of business processes issues
- implement and apply the OI approach and related technique to real or simulated business cases.