



BIG DATA FOR SMART MANUFACTURING

ING-INF/05 - 6 CFU - 1° semestre

Docente titolare dell'insegnamento

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Orario ricevimento: Lunedì 9-13 e Venerdì 9-13

OBIETTIVI FORMATIVI

Knowledge and understanding. On completion of the course, the student shall 1) know the basic principles of the smart manufacturing according to the novel IC technologies adopted in the modern industry, and 2) understand methodologies and techniques used in industries to realise the “Failure Prediction and Predictive Maintenance” .

Applying knowledge and understanding. On completion of the course, the student will be able to select the appropriate technological solutions in predictive maintenance.

Making judgements. On completion of the course, the student will be able to choose a suitable data science model for each of the subjects treated inside the course.

Communication skills. On completion of the course, the student can communicate his conclusions and recommendations about data science applications in smart manufacturing with the argumentation of the knowledge and rationale underpinning these, to both specialist and non-specialist audiences clearly and unambiguously.

Learning skills. On completion, the student will be able to continue to study in a manner that may be largely selfdirected or autonomous.

MODALITÀ DI SVOLGIMENTO DELL'INSEGNAMENTO

The course is essentially based on lectures, which include the development of exercises by the teacher on a computer. The course also includes practical exercises carried out by the students; in this case, the teacher supervises the students' work by providing the explanations and teaching aids necessary to complete the assigned tasks. The teaching methods described above allow the achievement of the pre-established training objectives, which include the acquisition of knowledge and the ability to apply knowledge.

If the teaching is given in a mixed or remote way, the necessary changes with respect to what was

previously stated may be introduced, in order to respect the program envisaged and reported in the syllabus.

PREREQUISITI RICHIESTI

Basics of statistics, machine learning, optimization and linear programming.

FREQUENZA LEZIONI

Not mandatory, but strongly recommended.

CONTENUTI DEL CORSO

The aim of the course is to provide an in-depth introduction to i) the basic principles of the smart manufacturing; ii) basic principles on management problems of a production plants, with particular emphasis on failure management, predictive maintenance; iii) the most important methodologies and techniques used in industries to realise the "Failure Prediction and Predictive Maintenance".

Smart Manufacturing. Main problems in the management of a production plant. Data Science applications to smart manufacturing. Basic principles on failure detection and predictive maintenance.

Failure Detection and Predictive Maintenance. *Data Acquisition. Data Processing:* signal processing, feature extraction, and feature selection. *Data labelling techniques. Machine learning techniques* for failure type detection and predictive maintenance. *Performance Evaluation.* Real case studies using R language. Real case studies using Microsoft Azure Machine Learning Platform.

TESTI DI RIFERIMENTO

[1] - Patrick Jahnke, "Machine Learning Approaches for Failure Type Detection and Predictive Maintenance", Master Thesis, June 19, 2015. Available online.

[2] - Handouts available in the web site of the course (Studium platform <https://studium.unict.it>).

[3] - V.Fontama, R.Barga, H.Tok, "Predictive Analytics with Microsoft Azure Machine Learning", Apress.

ALTRO MATERIALE DIDATTICO

Handouts distributed through the Studium platform (<https://studium.unict.it>)

PROGRAMMAZIONE DEL CORSO

Argomenti

Riferimenti testi

1	Introduction to Smart Manufacturing in the modern Industry	[2]
2	Introduction to the Failure Prediction and Predictive Maintenance	[2]
3	Prognosis and Analysis Models	[1]
4	Data Acquisition	[1]
5	Feature Engineering	[1]
6	Data Labeling	[1]
7	Machine Learning Approaches	[1]
8	Evaluation Strategies	[1]
9	Case Studies of Predictive Maintenance in R Language	[2]
10	Microsoft Azure Machine Learning Platform	[3]
11	Case Studies of Predictive Maintenance on Microsoft Azure Machine Learning Platform	[3]

VERIFICA DELL'APPRENDIMENTO

MODALITÀ DI VERIFICA DELL'APPRENDIMENTO

The exam, aimed at evaluating the student's understanding of the topics of the course and the achievement of the learning objectives, is organized as an oral exam.

Verification of learning can also be carried out on-line, should the conditions require it.

ESEMPI DI DOMANDE E/O ESERCIZI FREQUENTI

It is possible to download examples of questions and / or exercises carried out at the portale studium at <http://studium.unict.it>
