# . - Digital Data Processing

## Prof. Andrea Bassani

***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

 The purpose of this course is to introduce the student to a proper theoretical knowledge of data mining and machine learning. This knowledge, combined with case studies and seminars, will allow the student to acquire the critical sense to evaluate potential applications in food sector of machine learning methodologies. The latter, in addition, will provide to the student a base to extrapolate information and/or predictive models from the large amount of data that companies have nowadays thanks to the high memory storage capacity and the innovative cloud technology. In summary, at the end of the course, the student should be able to:

1. Know the meaning and the theoretical basis of data mining and machine learning methodologies presented during the course such as regressions or neural networks.
2. Choose the appropriate data analysis methodology in order to extrapolate useful information from a huge amount of data.
3. Evaluate potential applications of these methodologies in the food sector.

***COURSE CONTENT***

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| --- | --- |
| - | ECTS |
| Introduction to machine learning and data mining.  | 1.0 |
| Regressions and outlier detection. | 1.0 |
| Neural Network. | 1.0 |
| Case studies: application of data mining and machine learning. | 1.0 |
| Tutorials and in-deep seminar. | 1.0 |

***READING LIST***

A.C. Faul, *A Concise Introduction to Machine Learning*, CRC Press, 2019.

J.Han-J. Pei-M. Kamber, *Data mining: concepts and techniques*, Elsevier, 2011.

M.Kubat, *An introduction to machine learning*, (Vol. 2), Cham, Switzerland: Springer International Publishing, 2017.

G.Buzzi-Ferraris-F. Manenti*, Interpolation and regression models for the chemical engineer: Solving numerical problems*, John Wiley & Sons, 2010.

I.H.Witten-E. Frank-A.H. Mark-J.P. Christopher, *Data Mining: Practical machine learning tools and techniques*, 2016.

***TEACHING METHOD***

* Lectures in which concepts and work methodologies are presented. These lectures are coupled with case studies.
* Numerical tutorials during which problems are solved with the methods seen during the lectures
* Different in-depth seminars held by experts from both industry and academia.
* The teaching materials used during the lessons will be available on the common platform for students (i.e. Blackboard). The course slides are to be considered an integral part of the reference bibliography.

***ASSESSMENT METHOD AND CRITERIA***

The student will be required to take a final oral exam consisting in an in-depth presentation and in 2 theoretical questions. The required presentation is based on an in-depth analysis of a scientific literature article, selected by the student, concerning the application of data analysis methodologies in the food sector. In this way, the student's critical capacity and his/her ability to process the knowledge learned will be evaluated. The presentation about the analysis made by the student on the scientific article will be evaluated up to a maximum of 14 points. On the other hand, the two theoretical questions will be evaluated up to a maximum of 8 points each and will relate to all the topics presented during the course.

***NOTES AND PREREQUISITES***

 Being an introductory course aimed at offering an introduction about data mining and machine learning and their potential application in the food sector, the course requires no prerequisites to its contents. However, a review of the fundamentals of statistics is recommended.

In case the current Covid-19 health emergency does not allow frontal teaching, remote teaching will be carried out through synchronous or asynchronous procedures that will be promptly notified to students.

***OFFICE HOURS FOR STUDENTS***

 Prof. Andrea Bassani is available for the students after the lectures helded in Cremona In addition he is avaible to receive students following specific appointment or through remote meetings. In any case, it is suggested to write an e-mail (andrea.bassani@unicatt.it) in order to agree on the day and time of reception.