## COURSE DESCRIPTION – ACADEMIC YEAR 2019/2020

<table>
<thead>
<tr>
<th><strong>Course title</strong></th>
<th>Advanced Topics in Machine Learning</th>
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</thead>
<tbody>
<tr>
<td><strong>Course code</strong></td>
<td>73021</td>
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<tr>
<td><strong>Scientific sector</strong></td>
<td>ING-INF/05</td>
</tr>
<tr>
<td><strong>Degree</strong></td>
<td>Master in Computational Data Science (LM-18)</td>
</tr>
<tr>
<td><strong>Semester</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Year</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>Credits</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>Modular</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Total lecturing hours</strong></td>
<td>40</td>
</tr>
<tr>
<td><strong>Total lab hours</strong></td>
<td>20</td>
</tr>
<tr>
<td><strong>Attendance</strong></td>
<td>It is highly recommended to attend the Lab sessions.</td>
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<tr>
<td><strong>Prerequisites</strong></td>
<td></td>
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<tr>
<td><strong>Course page</strong></td>
<td><a href="https://ole.unibz.it/">https://ole.unibz.it/</a></td>
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### Specific educational objectives

The course belongs to the type "caratterizzanti – discipline informative" in the curricula “Data Analytics” and “Data Management”.

In this course, students will learn the fundamentals of deep learning with a special focus on image-related applications. Moreover, students will learn how to implement, train, and validate a Convolutional Neural Network, and they will improve their understanding of the ongoing research in the field of image processing and computer vision.

### Lecuturer

**Tammam TILLO**

**Contact**

POS 1.17, ttilo@unibz.it, +39 0471 016026

### Office hours

- Tuesday 15:00-17:00, faculty of computer science, Piazza Domenicani 3, Office 1.17.
- It is recommended to make an appointment beforehand by email.

### List of topics

- Computer vision
- Image classification
- Convolutional Neural Networks (CNN)
- Training Neural Networks
- Understanding and visualizing Convolutional Neural Networks
- Deep Reinforcement Learning

### Teaching format

This course will be delivered through a combination of formal lectures and lab sessions.

### Learning outcomes

Knowledge and understanding:
- D1.1 - Knowledge of the key concepts and technologies of data science disciplines
### Assessment

- Lab exercises
- Final exam (written)

The written exam will consist of a set of verification questions, transfer of knowledge questions and exercises.

### Assessment language

**English**

### Assessment Typology

**Monocratic**

### Evaluation criteria and criteria for awarding marks

Marks are distributed as follows:
1. 30% for lab exercises
2. 70% for final exam

The aim of the written exam is to assess to which degree students have achieved the following learning outcomes: 1) knowledge and understanding, 2) applying knowledge and understanding, 3) making judgment.

The laboratory exercises are designed to assess students' ability to design solutions for practical problems.

### Required readings

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Subject Librarian: David Gebhardi, [David.Gebhardi@unibz.it](mailto:David.Gebhardi@unibz.it)

### Supplementary readings

Suggested book:
- Title: Pattern Recognition and Machine Learning;  
  Author: Chris Bishop;
<table>
<thead>
<tr>
<th>Software used</th>
<th>The lab experiments will be performed using MATLAB or PYTHON or other software tools.</th>
</tr>
</thead>
</table>

- **Title**: Deep Learning  
  **Authors**: Ian Goodfellow, Yoshua Bengio and Aaron Courville