## Course Description – Academic Year 2018/2019

<table>
<thead>
<tr>
<th>Course title</th>
<th>Data Visualization and Exploration</th>
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<tbody>
<tr>
<td>Course code</td>
<td>73001</td>
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<tr>
<td>Scientific sector</td>
<td>INF/01</td>
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<tr>
<td>Degree</td>
<td>Master in Computational Data Science (LM-18)</td>
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<tr>
<td>Semester</td>
<td>1</td>
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<tr>
<td>Year</td>
<td>1</td>
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<tr>
<td>Credits</td>
<td>6</td>
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<tr>
<td>Modular</td>
<td>No</td>
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| Total lecturing hours        | 40                                 |
| Total lab hours              | 20                                 |

**Attendance**
Not compulsory. Non attending students have to agree with the lecturer on the modalities of independent study at the beginning of the course.

**Prerequisites**

**Course page**
https://ole.unibz.it/

### Specific educational objectives
The course belongs to the type "caratterizzanti – discipline informatiche" in the curriculum "Data Analytics".

The course is designed to acquire professional skills and knowledge useful when exploring datasets. In particular, the student will be able to visualize datasets choosing the most appropriate technique for the data at hand, and will be able to get insights from the data supported by the visualizations, using basic statistical tools. The student will also learn to avoid the common pitfalls in visualization that can mislead the analysis. Visualization and data handling are done using the R programming language, following the best practices of reproducible research.

### Lecturer
Matteo Ceccarello

### Contact
Piazza Domenicani 3, Room 1.17, matteo.ceccarello@unibz.it

### Scientific sector of lecturer
INF/01

### Teaching language
English

### Office hours
Arranged beforehand by email

### Lecturing Assistant (If any)
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### Contact LA
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### Office hours LA
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### List of topics
- Human psychology and perception
- Data and image models
- Visualization software and tools
- Visual Diagnostics
- Exploratory data analytics
- Discovery methods

### Teaching format
Frontal lectures, lab assignments, project.

### Learning outcomes
Knowledge and understanding:
- D1.1 - Knowledge of the key concepts and technologies of data science disciplines
- D1.2 - Understanding of the skills, tools and techniques required for an effective use of data science
- D1.3 - Knowledge of principles, methods and techniques for processing data in order to make them usable for practical purposes, and understanding of the challenges in this field
- D1.9 - Knowledge of the challenges in the field of man-machine interface and of the methods and techniques for overcoming these challenges

Applying knowledge and understanding:
- D2.1 - Practical application and evaluation of tools and techniques in the field of data science
- D2.9 - Design, application and evaluation of technologies and tools for human-machine interaction, data exploration and data visualization

Making judgments
- D3.2 - Ability to autonomously select the documentation (in the form of books, web, magazines, etc.) needed to keep up to date in a given sector.

Communication skills
- D4.1 - Ability to use English at an advanced level with particular reference to disciplinary terminology
- D4.2 - Ability to present one's work in a clear and comprehensible way in front of an audience, including non-specialists
- D4.3 - Ability to structure and draft scientific and technical documentation

| Assessment | Project work in groups and final computer-based exam |
| Assessment language | English |
| Assessment Typology | Monocratic |
| Evaluation criteria and criteria for awarding marks | 30% group project work, 70% computer-based exam

- Relevant for project work: ability to work in team, clarity of presentation, ability to gain useful and novel insights from data, creativity, critical thinking, ability to adhere to reproducible research best practices
- Relevant for written assessment: ability to use R software to perform basic data preparation tasks, ability to properly use R plotting facilities, ability to summarize the concepts of the Grammar of Graphics and of human perception, ability to choose the best type of graphical representation for different types of data, correct usage of basic statistical tools

Non attending students take the same exam as all the other students.

Required readings
- The following required readings are all available online for free
  - Data Visualization. A practical introduction. Haley. [Available online](#)
<table>
<thead>
<tr>
<th>Subject Librarian: David Gebhardi, <a href="mailto:David.Gebhardi@unibz.it">David.Gebhardi@unibz.it</a></th>
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<tbody>
<tr>
<td>Supplementary readings</td>
</tr>
<tr>
<td>• Fundamentals of Data Visualization. Wilke, Available online</td>
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<tr>
<td>• Visualization Analysis and Design. Munzer, Amazon</td>
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<tr>
<td>• Data Visualization: Charts, Maps, and Interactive Graphics. Grant, Amazon</td>
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<tr>
<td>Software used</td>
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<tr>
<td>Rstudio <a href="https://www.rstudio.com/">https://www.rstudio.com/</a></td>
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