Prof. dr. Mirjana Kljajić Borštnar
University of Maribor, Faculty of Organizational Sciences

Course title: Basics of Data Analytics and Visualization

This course introduces students to the world of data analytics and visualization, emphasizing its essential role in data analysis and decision support within organizations. Students will learn how to present data in a clear, comprehensible, and visually engaging way to effectively communicate key insights.

The course covers the theoretical foundations of data visualization, including cognitive aspects of perception, the use of color and symbols, and the interpretation of complex data patterns. Students will explore various types of visualizations, techniques for presenting large datasets, data storytelling using graphs, and the application of descriptive statistics to enhance data understanding.

In addition, the course introduces key data mining concepts as a core component of data analytics. Students will learn fundamental techniques such as clustering, classification, association rule mining, and anomaly detection. Emphasis will be placed on how these techniques uncover hidden patterns, relationships, and trends in large datasets, which can then be translated into meaningful visual representations.

Throughout the course, students will gain hands-on experience with visualization and data mining tools and software, and will develop the ability to critically assess the effectiveness of visual and analytical outputs.

This course is designed for anyone interested in developing skills in data visualization and data mining, and applying them in business environments, scientific research, or complex information systems.

To ensure a hands-on learning experience, this course will provide opportunities to apply the concepts and techniques through practical exercises and projects. You will work with real-world datasets, implement algorithms, and analyze the results to gain a deeper understanding of the principles and challenges of data analytics and effective visualizations. We will use several software: open source software for data mining will be used: Orange datamining (https://orangedatamining.com/) and Tableau. Previous knowledge of programming is not required.

By the end of this course, you will be equipped with a solid foundation in data analytics and visualizations, enabling you to start working on your own data analytics projects.

Proposed content:
- Introduction to data analytics and visualization
- Place and role of visualization in data analytics- understanding the problem and context
- Use of visualization in organization and complex systems decision support
- Theoretical basics of visualization (presentation of information, colors, symbols, cognitive load, perception)
- Static and interactive data visualization methods, visualization of big data
- Storytelling with visualization and data analytics
- Data pre-processing

- Descriptive statistics use in data understanding
- Visualization and data types
- Choosing the effective visualization
- Critical evaluation of data visualization
- Cases of effective and ineffective visualizations

Methods of teaching: lectures, use cases, individual hands-on training, project work in teams.