**Study programme(s): Applied Mathematics (MAP)**

**Course title: DATA VISUALIZATION (P114)**

**Lecturer(s): Milica Žigić**

**Course status: elective**

**ECTS points: 5**

**Requirements:**

**Learning Objectives**

The aim of this course is to teach students to use software packages for data visualization, but also to teach them the mathematical bases, principles, and algorithms that enable the presentation of high-dimensional data in a low-dimensional (2D, 3D) space.

**Learning Outcomes**

The student gains an understanding of mathematical principles, algorithms, and methods for data visualization, as well as knowledge and experience working in software packages for network visualization, high-dimensional data visualization, etc.

**Syllabus**

*Theoretical instructions*

Methods of graph theory in data visualization: algorithms for vector quantization (*Neural Gas Vector Quantization,* etc.) and topological representation of networks/graphs. Visualization of high-dimensional data: reduction of dimensionality by projection onto a manifold of lower dimensions, metric and topographic methods, visualization through t-SNE algorithms (*t-Stochastic Neighbor Embedding).* Introduction of data visualization software packages. Examples and implementation of concrete algorithms.

*Practical instructions*

Students will apply software libraries and learn to implement algorithms for visualization of high-dimensional data, complex networks, etc.

**Literature**


1. Vathy-Fogarassy, Ágnes, Abonyi, János, **Graph-Based Clustering and Data Visualization Algorithms,** Springer, 2013.
2. Post, Frits H., Nielson, Gregory, Bonneau, Georges-Pierre (Editors), **Data Visualization: The State of the Art**, Springer, 2003.


| **Number of active classes** | **Lectures: 2** | **Exercises: 2** |
|---|---|---|

**Teaching methods**

Lectures; repetition; active participation of students in problem solving. Knowledge tests and homework. Applications to problems related to real data.

**Grading (maximum number of points 100)**

| **Pre-exam obligations** | Points | **Final exam** | Points |
|---|---|---|---|
| Homework, mini project | **30** | Final exam | **70** |