MODULE DESCRIPTION CARD – SYLLABUS

This module is a part of the Intensive International Education Programs in the field of the Artificial Intelligence organised at Poznan University of Technology as part of the „IMPACT – Innowacyjne Międzynarodowe Programy w AI, Cyberbezpieczeństwie i Teleinformatyce" project implemented SPINAKER Program of the National Agency for Academic Exchange, financed by the European Social Development Fund 2021–2027 (ESDF).

Module name:	Number of hours:	Lecturer:
Data Mining	16	Mikołaj Morzy, Ph.D., D.Sc.

Module Descriptions:

The module introduces students to the foundations of data mining, focusing on finding meaningful information and hidden patterns within vast, complex datasets. It covers concepts related to unsupervised machine learning, where the goal is to discover the natural structure in raw, unlabeled data. The course will explore:

- Handling diverse data types, including numbers, complex networks, and sequences.
- Kernel methods, including working with high-dimensional data.
- Association rule mining to identify items that frequently appear together.
- Analysis of time series data to spot trends.
- Feature selection techniques to focus on the most important data aspects.
- Clustering methods for finding natural groups within data.

The course emphasizes a hands-on approach using intuitive no-code and low-code tools, allowing students to run algorithms and experiment without advanced programming.

Purpose of the support under Module:

The overall objective of the Innovative International Education Program in Artificial Intelligence within the IMPACT project is to raise the competencies of international students in key digital technologies and to support personalized, flexible, and modern education aligned with current global needs in the area of artificial intelligence and machine learning.

The specific purpose of this module is to equip students with essential competencies in data mining by teaching them to:

- identify and understand the real power and potential of discovering hidden stories and underlying structures within raw data,
- grasp the essence of data mining as a form of unsupervised machine learning,
- learn and apply powerful techniques for pattern discovery, such as association rule mining and clustering,
- acquire the skills to transform raw data into real knowledge and extract valuable insights from any encountered data,
- gain practical experience by demonstrating all topics using no-code and low-code tools.

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Method of support under Module:

Support within the module is provided with the participation of the instructor and divided into the following elements:

- 6-week self-study program using teaching materials provided by the instructor on the e-learning platform;
- 6 weeks of support from the instructor in the form of online consultations using tools that enable meetings to be held;
- online sessions presenting intuitive no-code and low-code tools.
- a test to verify the acquisition of competences.

Module-related learning outcomes:

Descriptions of the new competences:

Participants gain new skills in data mining and data analysis, including knowledge of how to handle different data types, apply sophisticated techniques like kernel methods, frequent pattern mining, sequential pattern mining, and clustering, all demonstrated through practical, no-code methods.

Knowledge:

1. Student has structured knowledge of key concepts in data mining, including its foundation as unsupervised machine learning.
2. Student understands how to approach and work with various data types, from simple numbers to complex networks and sequences.
3. Student understands the principles of kernel methods and their application in working with high-dimensional data.
4. Student understands the principles and main algorithms for frequent pattern discovery
5. Student understands the principles, algorithms, and metrics used in clustering.

Skills:

1. Student can critically evaluate and apply various data mining techniques to appropriately prepared datasets.
2. Student is able to utilize intuitive no-code and low-code tools to run data mining algorithms and experiment on datasets.

Social competences:

1. Student recognizes the importance of turning raw data into real knowledge and the potential of data mining for discovering hidden stories in data.
2. Student demonstrates readiness to be a data explorer and look beyond the surface of information.

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Criteria for verifying learning outcomes

Learning outcomes are verified through an online single-choice test assessing the student's knowledge of data processing, feature selection, frequent pattern analysis, and clustering. The test checks both theoretical understanding and the ability to solve real problems. A minimum of 51% of correct answers is required to pass.

Method of verification/validation of learning outcomes

Workload

40 h (including work with teaching materials provided by the lecturer, consultation, and the student's own work) – 2 ECTS point

Level of the European Qualifications Framework