SYLLABUS

Name: ***Data Analysis and Computational Intelligence (InfAAu>SI7DAaCI19)***
Name in Polish:
Name in English: ***Data Analysis and Computational Intelligence***

Information on course:

Course offered by department: Faculty of Automatic Control, Electronics and Computer Science
Course for department: Silesian University of Technology

Default type of course examination report:

ZAL

Language:

English

Course homepage:

https://platforma2.polsl.pl/rau2/course/view.php?id=1131

Short description:

The aim of the course is to efficiently familiarise students with basic algorithms and methodologies of data analysis and data mining. The subject considers basic analytical issues: classification, clustering, association analysis. A selection of these issues will be presented in the context of methods with symbolic representation (e.g. trees and rules), non-symbolic representation - having its genesis in computational intelligence, as well as ensemble approaches (e.g. boosting, bagging). New trends in data analysis such as automated machine learning, XAI (Explainable Artificial Intelligence) and language models will be presented.

Description:

ECTS: 4
Total worload: 100 hours (60 contact hours / 40 studnet's own work)
Lecture: 30h
Laboratory classes: 30h

Student's own work: preparation for course

During the lecture, definitions, block diagrams of data analysis algorithms and computational intelligence methods are given; all concepts are illustrated with examples. Students can follow the reasoning, ask questions, participate and interact in modifying the presented algorithms. The labs are mainly used for practical analytical tasks illustrating the possibilities and desirability of the methods presented in the lecture.

Lecture:
1. Introduction to the topics of data analysis and data mining
2. Introduction to the Python language in data analysis
3. Preliminary assessment of data quality. Preliminary data processing
4. Association analysis
5. Data clustering and quality assessment of the partitioning.
6. Predictive methods - symbolic, non-symbolic, classifier committees, classification quality assessment.
7. Time series analysis methods
8. XAI and AutoML
9. Language models
10. Neuro-fuzzy systems

Laboratory classes:
1. Data pre-processing
2. Data clustering
3. Creation and validation of classification models 1
4. Creation and validation of classification models 2
5. Language models

Bibliography:

1. Witten I.H., Frank E.: Data mining: practical machine learning tools and techniques. Morgan Kaufmann, 2011.
2. Han J., Kamber M.: Data Mining: Concepts and Techniques. Morgan Kaufmann Publishers, 2001.
3. M. North. Data Mining for the masses. A Global Text Project Book, 2012

Learning outcomes:

Course-specific learning outcomes: upon completion of the course, the student:
- knows and understands the issues in mathematics used in the field of data mining, including elements of discrete mathematics, probability calculus and mathematical statistics (test, final test) K1A_W02
- knows and understands methods of digital information representation and data structures used in data analysis, as well as operations performed on them (test, final test) K1A_W12
- is able to prepare a well-documented study on the realization of an engineering task including data analysis problems (test) K1A_U03
- is able to apply knowledge and mathematical tools to analyse experimental data, in particular is able to prepare data and use basic inference methods (test) K1A_U08
- is able to use experimental methods from data mining and machine learning when identifying and formulating specifications of engineering tasks and solving them (test) K1A_U14

Assessment methods and assessment criteria:

Credit for the course is based on the results of the laboratories and a written final test conducted after all laboratory classes and lectures.

The final test takes the form of a multiple choice test but may also include open questions. Marking an incorrect answer to a question may result in a lower score for that question.
In order to pass the course it is necessary to successfully pass each laboratory and to obtain at least 50% of the points from the final test.

Making up missed laboratory classes is possible after contacting the lecturer in advance.

The syllabus is valid from the academic year 2024/25 and its content is not subject to change during the semester.

Course credits in various terms:

Informatics, full-time first degree engineering studies 7 sem. (InfAAu-SI7)			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	4	2022/2023-Z	