COURSE DESCRIPTION CARD - SYLLABUS

Course name
Basics of artificial intelligence methods [S1IBio1E>PMSI]

Course

Field of study
Biomedical Engineering

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Skills: logical thinking, obtaining information from various sources from library or internet, programming in any programming language. Social competences: students should understand the need to learn and acquire new knowledge.

Course objective

The aim of the course is to familiarize students with the artificial intelligence methods, in particular artificial neural networks, their implementation in the Python / Matlab environment, as well as the applications of artificial intelligence in medicine and biomedical engineering.

Course-related learning outcomes

Knowledge:
1. The student should know the basic concepts related to the artificial intelligence methods.
2. The student should know the basic applications of artificial intelligence methods in medicine and biomedical engineering.

Skills:

1. The student is able to get information about artificial intelligence.
2. The student is able to use the selected method of artificial intelligence in the Python / Matlab environment.
3. The student is able to plan the application of a selected artificial intelligence method to a specific problem in the field of biomedical engineering or medicine.

Social competences:
1. The student is aware of the importance of non-technical aspects of engineering activities.
2. The student is able to set priorities for the implementation of specific tasks.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Completion of the lecture based on the points obtained on the test during the final classes.
Passing requires more than 50% of points:> 50% - dst,> 60% - dst plus,> 70% - db,> 80% - db plus,> 90% of points - very good.
Completed laboratories on the basis of the sum of points obtained during two tests conducted during the semester. Passing requires more than 50% of points:> 50% - dst,> 60% - dst plus,> 70% - db,> 80% - db plus,> 90% of points - very good.

Programme content

Basic information related to artificial intelligence techniques (especially artificial neural networks, genetic algorithms) - basic artificial intelligence models, implementation and examples of applications in biomedical engineering.

Course topics

Lecture:
1. Artificial intelligence - basics, definitions, methods, applications.
2. Artificial neural networks - basic structures.
3. Methods of learning and testing artificial neural networks.
4. Examples of applications of artificial neural networks in medicine and biomedical engineering.
5. Classification trees - basics and examples of applications in medicine and biomedical engineering.
6. Elements of fuzzy logic - basics and examples of applications in medicine and biomedical engineering.
7. Genetic and evolutionary algorithms - basics and examples of applications.Laboratory:
Laboratory:
1/2. Programming in Python / Matlab - rules important from the point of view of classes in the subject: Fundamentals of artificial intelligence methods.
3. Application of perceptrons in classification problems.
4. Testing of artificial neural networks.
5/6/7. Application of multilayer perceptrons in simple classification problems.
8. Test.
9/10. Genetic algorithms in selected optimization problems.
11/12. Application of classification trees on selected examples.
13/14. Application of fuzzy logic on selected examples.
15. Test.

Teaching methods

1. Lecture: multimedia presentation.
2. Laboratory: solving problems, programming in Matlab/Python environment, discussion.

Bibliography

Basic:
Andrzej Kisielewicz, Sztuczna inteligencja i logika, Wydawnictwo WNT, Warszawa 2014 [in Polish].
Paweł Wawrzyński, Podstawy sztucznej inteligencji, Oficyna wydawnicza Politechniki Warszawskiej, Warszawa 2019 [in Polish].
Mariusz Flawiński, Wstęp do sztucznej inteligencji, Wydawnictwo Naukowe PWN, Warszawa 2011 [in Polish].

Stanisław Osowski, Sieci neuronowe w ujęciu algorytmicznym, Wydawnictwa Naukowo-Techniczne, Warszawa 1996 [in Polish].
Leszek Rutkowski, Metody i techniki sztucznej inteligencji, Wydawnictwo Naukowe PWN, Warszawa 2012 [in Polish].
Katarzyna Stąpór, Metody klasyfikacji w wizji komputerowej, Wydawnictwo Naukowe PWN, Warszawa 2011 [in Polish].
David E. Goldberg, Algorytmy genetyczne i ich zastosowania, Wydawnictwa Naukowo-Techniczne, Warszawa 1995 [in Polish].
Jarosław Arabas, Wykłady z algorytmów ewolucyjnych, Wydawnictwa Naukowo-Techniczne, Warszawa 2004 [in Polish].

Additional:
Praca zbiorowa pod red. W. Duch, J. Korbicz, L. Rutkowski, R. Tadeusiewicz, Sieci neuronowe, tom 6 z serii Biocybernetyka i inżynieria biomedyczna 2000 (red. M. Nałęcz), Akademicka Oficyna Wydawnicza Exit, Warszawa 2000 [in Polish].
Praca zbiorowa pod red. R. Tadeusiewicz, J. Korbicz, L. Rutkowski, W. Duch, Sieci neuronowe w inżynierii biomedycznej, tom 9 z serii Inżynieria biomedyczna. Podstawy i zastosowania (red. W. Torbicz), Akademicka Oficyna Wydawnicza Exit, Warszawa 2013 [in Polish].

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00