Karta (sylabus) modułu/przedmiotu
Kierunek studiów: INFORMATYKA
Studia stacjonarne II stopnia

Przedmiot:	**Artificial Intelligence Systems**
Rodzaj przedmiotu:	*Directional*
Kod przedmiotu:	I2S1.05
Rok:	1
Semestr:	I
Forma studiów:	**Full-time**
Rodzaj zajęć i liczba godzin w semestrze:	*60*
Wykład	*30*
Ćwiczenia	*0*
Laboratorium	*30*
Projekt	*0*
Liczba punktów ECTS:	*4*
Sposób zaliczenia:	*Exam*
Język wykładowy:	English

Goals	
C1	Familiarizing students with advanced models of artificial intelligence
C2	Acquisition by students of practical knowledge in the field of advanced methods of machine learning and artificial intelligence

Prerequisites for knowledge, skills and other competences	
1	Knowledge of basic machine learning models
2	Basic Python programming skills
3	Knowledge of linear algebra, mathematical analysis and statistics

Learning outcomes	
	In terms of knowledge:
EK 1	Has advanced knowledge of developing computational intelligence methods
EK 2	Has a thorough knowledge of the ownership and application of advanced artificial intelligence models depending on the application
	In terms of skills:
EK 3	Can program applications in Python in the range of a wide range of artificial intelligence models
EK 4	He/she can skillfully use machine learning libraries in order to effectively create programs depending on their purpose
	In terms of social competences:
EK 5	He/she is ready to cooperate with colleagues and teachers during laboratory classes
EK 6	Is ready to take on challenges related to the use of modern programming techniques and to critically evaluate these techniques

Course content	
Form of classes - lectures	
	Program content
W1	Review of classic machine learning models
W2	Fuzzy sets
W3	Fuzzy systems

W4	Biologically inspired evolutionary algorithms
W5	Anomaly detection
W6	Information aggregation and fusion. Models of multi-criteria decision making theory
W7	Grouping algorithms
W8	Neural networks models and deep neural networks
W9	Convolutional neural networks
W10	Autoencoders
W11	Recursive networks
W12	AI models in the analysis of images and recordings
W13	Natural language and speech processing
W14	DeepFake. Generative networks
W15	Overview of the latest intelligent models
Form of classes – computer laboratories	
	Program content
L1	Implementation of classic machine learning models
L2	Uncertainty modeling
L3	Applications of fuzzy systems
L4	Implementation of selected optimization algorithms
L5	Isolation forest and other PyCaret methods
L6	Implementation of aggregation methods
L7	Implementation of selected grouping algorithms
L8	Implementation of selected models of artificial neural networks in the form of a Python package to facilitate code reuse in subsequent projects
L9	Classification of images with the use of convolutional networks. Analysis of the influence of different network topologies on the quality of classification
L10	The use of autoencoders to detect data anomalies
L11	LSTM recursive networks for time series analysis
L12	Using libraries for image analysis on the example of OpenCV and YOLO
L13	Selected NLP techniques: sentiment analysis, the possibilities of the NLTK library and the Bag of Words method
L14	DeepFake detection methods

Teaching methods	
1	*Lecture with multimedia presentation*
2	*Laboratory exercises: Implementation of tasks with the use of known algorithms and data structures*
3	*Laboratory exercises: thematic discussion*

Assessment methods and criteria		
Assessment method symbol	**Description of the assessment method**	**Passing threshold**
O1	Lecture exam	51%
O2	Credit from the laboratory	51%

Basic literature	
1	Chollet F., Deep Learning. Praca z językiem Python i biblioteką Keras, Helion, Gliwice 2019
2	Raschka S., Mirjalili V., Python. Uczenie maszynowe. Wydanie II, Helion, Gliwice 2019
Supplementary literature	
1	Atienza R., Deep learning z TensorFlow 2 i Keras dla zaawansowanych. Sieci GAN i VAE,

	deep RL, uczenie nienadzorowane, wykrywanie i segmentacja obiektów i nie tylko. Wydanie II, Helion, Gliwice 2022
2	Bonaccorso G., Algorytmy uczenia maszynowego. Zaawansowane techniki implementacji, Helion, Gliwice 2019
3	Foster D., Deep learning i modelowanie generatywne. Jak nauczyć komputer malowania, pisania, komponowania i grania, Helion, Gliwice 2022
4	Géron A., Uczenie maszynowe z użyciem Scikit-Learn i TensorFlow, Helion, Gliwice 2018
5	Gift N., AI - podejście pragmatyczne. Wprowadzenie do uczenia maszynowego opartego na chmurze, Promise, Warszawa 2018
6	Goodfellow I., Bengio Y., Courville A., Deep Learning. Współczesne systemy uczące się, PWN, Warszawa 2018
7	Grus J., Data science od podstaw. Analiza danych w Pythonie, Helion, 2018
8	Hearty J., Zaawansowane uczenie maszynowe z językiem Python, Helion, Gliwice 2017
9	Karczmarek P., Selected Problems of Face Recognition and Decision-Making Theory, Wydawnictwo Politechniki Lubelskiej, Lublin 2018
10	Osinga D., Deep Learning. Receptury, Helion, Gliwice 2019
11	Patterson J., Gibson A., Deep Learning. Praktyczne wprowadzenie, Helion, Gliwice 2018
12	Rutkowski L., Metody i techniki sztucznej inteligencji, PWN, Warszawa 2012
13	Tadeusiewicz R., Sieci neuronowe, Akademicka Oficyna Wydawnicza, Warszawa 1993

Student workload	
Form of activity	**Average number of hours to complete the activity**
Contact hours with the lecturer, including:	60
participation in lectures	30
participation in laboratories	30
Student's own work, including:	40
preparation for the exam	20
preparation for the laboratory	20
Total student working time	100
The total number of ECTS points for the course	4

Matrix of learning outcomes					
Learning outcomes	**Learning outcome related to the defined field of study**	**Goals**	**Course content**	**Teaching methods**	**Assessment methods and criteria**
LO 1	I2A_W02 ++ I2A_W07 ++ I2A_W08 +++	*CO1*	*L1-L11*	*1*	**A1**
LO 2	I2A_W07 ++ I2A_W08 +++	*CO2*	*L1-L15*	*1*	**A1**
LO 3	I2A_U04 ++ I2A_U12 +++ I2A_U13 ++ I2A_U15 +++	*CO1, CO2*	*Lab1-Lab14*	*2,3*	***A2***
LO 4	I2A_U04 ++ I2A_U12 +++ I2A_U13 ++ I2A_U15 +++	*CO1, CO2*	*Lab1-Lab14*	*2,3*	***A2***
LO 5	I2A_K01 +	*CO2*	*Lab1-Lab14*	*2,3*	***A2***

	I2A_K02 +++ I2A_K03 +++				
LO 6	I2A_W02 ++ I2A_W07 ++ I2A_W08 +++	*CO2*	*Lab8-Lab14*	*2,3*	***A2***

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