Z1-PU7	WYDANIE N1

(*faculty stamp*)

COURSE DESCRIPTION

1. Course title: Data science in business and industrial applications	**2. Course code ML_C**
3. Validity of course description: 2018/2019	
4. Level of studies: MSc programme	
5. Mode of studies: intramural studies	
6. Field of study: CONTROL, ELECTRONIC AND INFORMATION ENGINEERING (MACRO)	(FACULTY SYMBOL) RAU-2
7. Profile of studies: ACADEMIC	
8. Programme: DATA SCIENCE	
9. Semester: 1	
10. Faculty teaching the course: Faculty of Automatic Control, Electronics and Computer Science	
11. Course instructors: mgr inż. Kamil Bolek, mgr inż. Damian Widera, mgr inż. Mateusz Ochmann, mgr inż. Tomasz Miler, mgr inż. Jarosław Tkocz	
12. Course classification: common courses	
13. Course status: ~~compulsory /~~elective	
14. Language of instruction: English	
15. Pre-requisite qualifications: Computer programming, programming in Java, Algorithms and data structures.	

16. Course objectives:

One of the aims of the course is making students familiar with classification algorithms. The students will learn how to apply the knowledge practically starting from data cleaning process, choose the right algorithm and evaluate it. Besides, students will be acquainted with the image recognition problem and will solve given laboratory tasks using the modern YOLO tool, which is based on neural network. The contents of the course will be presented in the aspect of wide spectrum of applications, in particular in engineering and information technologies (e.g. automatic object recognition systems). During the course, the emphasis will be also placed on how to forecast and predict data trends with the usage of the R environment.

17. Description of learning outcomes:

Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	Student understands how the YOLO works, has the knowledge about dependencies and possibility of use of this neural network.	Oral questions	Lecture	K2A_W04 K2A_W07
2.	Student is able to initialize YOLO network using pre-trained model and changing the output classes. Moreover the student is able to run YOLO on camera and detect object in real-time.	Laboratory tasks	Laboratory	K2A_U09 K2A_U11 K2A_U17
3.	Student understands how the classification algorithms works, has the knowledge about different aspects of the process of classification .	Oral questions	Lecture	K2A_W05 K2A_W07 K2A_W11
4.	Student is able to choose the proper algorithm for a given task, apply data cleansing methods and evaluate the results	Laboratory tasks	Laboratory	K2A_U09 K2A_U11
5.	Student has knowledge about data model and architecture of SAP e-commerce Cloud Platform System.	Oral questions	Lecture	K2A_W07

6.	Student has knowledge about basic methods of data preparing and processing, such as classification, regression, time series data and methods of forecasting.	Oral questions	Lecture	K2A_W07 K2A_W11
7.	Student is able to solve given business problem using statistical methods.	Laboratory tasks	Laboratory	K2A_U07 K2A_U09 K2A_U17 K2A_U19
8.	Student is able to create data model in e-commerce systems.	Laboratory tasks	Laboratory	K2A_U07 K2A_U09 K2A_U11 K2A_U17
9.				

18. Teaching modes and hours

Lecture 15 / ~~BA /MA Seminar / Class / Project~~ / Laboratory 15

19. Syllabus description:

Lecture:

1. Introductory information. What is and how the YOLO works? Object detection in business.
2. Comparisons between chosen object detection neural networks. How to use predefined model. How to modify outputs. Using various data sets.
3. Data classification algorithms and classification metrics.
4. Data processing and data science in commerce.
5. Forecasting and predictions using the R environment.

Laboratory:

1. Initialization of YOLO network using predefined model. Object detection on static pictures.
2. YOLO – object detection in real-time.
3. Data cleaning process as the first step of data classification. Classification evaluation.
4. SAP Cloud Platform for Data Science.
5. Forecasting and predictions using the R environment.

20. Examination: semester: NO

21. Primary sources:

1. (YOLO) Redmon, Joseph, and Ali Farhadi. "Yolov3: An incremental improvement." arXiv preprint arXiv:1804.02767 (2018).
2. (YOLO) Qu, Hongquan, et al. "A Pedestrian Detection Method Based on YOLOv3 Model and Image Enhanced by Retinex." 2018 11th International Congress on Image and Signal Processing, BioMedical Engineering and Informatics (CISP-BMEI), IEEE, 2018.
3. (Classification) Deepak Kumar Gupta, Shruti Goyal “Email Classification into Relevant Category Using Neural Networks”, https://arxiv.org/abs/1802.03971.
4. (Classification) Yang Lu, Yiu-ming Cheung, Yuan Yan Tang “Bayes Imbalance Impact Index: A Measure of Class Imbalanced Dataset for Classification Problem”, https://arxiv.org/abs/1901.10173.
5. (Classification) Vivek Kumar, Brojo Kumar Mishra, Manuel Mazzara, Abhishek Verma: “Prediction of Malignant & Benign Breast Cancer: A Data Mining Approach in Healthcare Applications”, https://arxiv.org/abs/1902.03825.
6. (SAP) Ilya Katsov: "Introduction to Algorithmic Marketing: Artificial Intelligence for Marketing", Grid Dynamics, 2017 r.

22. Secondary sources:

1. (YOLO) Laganière, Robert. OpenCV Computer Vision Application Programming Cookbook Second Edition. Packt Publishing Ltd, 2014.
2. (Classification) https://www.datasciencecentral.com/ - online reference
3. (Classification) http://www.kaggle.com – online reference
4. (SAP) Tutorials available on platformie SAP Cloud Platform.

23. Total workload required to achieve learning outcomes

Lp.	Teaching mode :	Contact hours / Student workload hours
1	Lecture	15/15
2	Classes	/
3	Laboratory	15/15
4	Project	/
5	BA/ MA Seminar	/
6	Other	/
	Total number of hours	30/30

24. Total hours: 60

25. Number of ECTS credits: 3

26. Number of ECTS credits allocated for contact hours: 1

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 1

26. Comments:

Approved:

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(date, Instructor's signature)

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(*date , the Director of the Faculty Unit signature)*