Wrocław University of Science and Technology
Doctoral School

COURSE CARD

1. Basic information

Course name in English:	Interdisciplinary applications of artificial intelligence not requiring a computer science background	
Course name in Polish:	Interdyscyplinarne zastosowania sztucznej inteligencji niewymagające wykształcenia informatycznego	
Number of hours:	15	
Type of course:	Elective course	
Form of course:	mixed forms (combination of lecture, seminar and laboratory)	
Code of course:		
Course leader:	Paweł Zyblewski	
Faculty of the course leader:	W4 Faculty of Information and Communication Technology	
Email address of the course leader:	pawel.zyblewski@pwr.edu.pl	
Scientific discipline(s) assigned to the course (doctoral students representing the marked disciplines can participate in the course):	Architecture and urban planning	☒
	Automation, electronic, electrical engineering and space technologies	☒
	Information and communication technology	☐
	Biomedical engineering	☒
	Chemical engineering	☒
	Civil engineering, geodesy and transport	☒
	Materials engineering	☒
	Mechanical engineering	☒
	Environmental engineering, mining, and energy	☒
	Mathematics	☒
	Chemical sciences	☒
	Physical sciences	☒
	Management and quality studies	☒

2. Objectives

The course is dedicated to PhD students from outside the discipline of information and communication technology. The course is intended to provide doctoral students without a computer science background with necessary knowledge of the possibilities of using artificial intelligence

methods (in particular – machine learning) in research projects relating to their individual research areas. Students, with the help of the instructor, will develop a research plan combining artificial intelligence with a scientific issue of their interest, conduct preliminary experiments within it and present their results on the forum.

3. Content

Detailed information about the course content, including topics and form of classes.

No.	Topic	Number of hours	Form of classes
1	Basic introduction into the artificial intelligence – machine learning, data structures and primitive concepts	3	lecture
2	Review of exemplary interdisciplinary machine learning applications in science	2	lecture
3	Laboratory on data acquisition and representation description	2	laboratory
4	Asking research questions and the significance of scientific impact	2	laboratory
5	Laboratory on scientific AI tools accessible for non-programmers – Machine Learning Kindergarten	3	laboratory
6	Laboratory on making educated guesses on achieved results	1	laboratory
7	Final seminar on Lessons Learned	2	seminar

4. Prerequisites

List of prerequisites relating to knowledge, skills and other competences for course participants.

The course requires no prerequisites above overall understanding of using a personal computer for work (skills), an honest interest in the topic of artificial intelligence as a science

(knowledge) and at least average personal culture (other competences). Recommended to use your own computer for easier integration into the work procedures.

5. Learning outcomes

List of learning outcomes at level 8 of the Polish Qualifications Framework assigned to the course (mark the learning outcomes in the last column).

Symbol	Learning outcome	
	KNOWLEDGE. Doctoral student knows and understands:	
SzD_W3	the main trends in the development of the scientific or artistic disciplines covered in the curricula;	☒
SzD_W4	research methodology;	☒
SzD_W5	the rules for the dissemination of scientific results, including in open access mode;	☐
SzD_W6	the fundamental dilemmas of modern civilization;	☐
SzD_W7	the legal and ethical conditions of scientific activity;	☒
SzD_W8	the economic and other relevant conditions of scientific activity;	☐
SzD_W9	basic principles of knowledge transfer to the economic and social spheres and commercialisation of results of scientific activity and know-how related to these results.	☐
	SKILLS. Doctoral student is able to:	
SzD_U2	use knowledge from different fields of science or art to creatively identify, formulate and innovatively solve complex problems or perform research tasks, in particular: - define the purpose and subject of scientific research, formulate a research hypothesis, - develop research methods, techniques and tools, and use them creatively, - draw conclusions on the basis of scientific research; critically analyse and evaluate the results of scientific research, expertise and other creative work and their contribution to knowledge development; transfer the results of scientific activities to the economic and social spheres;	☒
SzD_U3	communicate on specialised topics to the extent that they enable an active participation in the international scientific community;	☒
SzD_U4	disseminate research results, including in popular forms;	☒
SzD_U5	initiate debates and participate in a scientific discourse;	☒
SzD_U6	be able to speak a foreign language at B2 level of the Common European Framework of Reference for Languages to a level that enables them to participate in the international scientific and professional environment;	☐

SzD_U7	plan and implement an individual or collective research or creative activity, including in an international environment;	☒
SzD_U8	independently plan and act for one's own development and inspire and organize the development of others;	☐
SzD_U9	plan classes or groups of classes and implement them using modern methods and tools.	☐
	SOCIAL COMPETENCES. Doctoral student is ready to:	
SzD_K3	fulfilling the social obligations of researchers and creators, initiate public interest activities, thinking and acting in an entrepreneurial way;	☐
SzD_K4	maintaining and developing the ethos of research and creative environments, including: - carrying out scientific activities in an independent manner, - respecting the principle of public ownership of research results, taking into account the principles of intellectual property protection.	☒

6. Evaluation

Short description of the method(s) used to evaluate the learning outcomes assigned to the course, e.g., exam, test, report, presentation, etc.

The evaluation of learning outcomes will be based on two equal factors: the assessment of the quality of work during laboratory classes and the assessment of the final seminar presentation.

7. Teaching methods

Short description of the teaching methods used during the course, e.g., multimedia presentation, discussion, literature studies, developing written documents, own work, etc.

Multimedia presentations, discussion, consultations during laboratory classes, own work, development of a project description.

8. Literature

List of primary and secondary literature used to prepare the course and including additional knowledge for participants, e.g., books, textbooks, research papers, standards, web pages, etc.

[1] Michalski, Ryszard S., Jaime G. Carbonell, and Tom M. Mitchell. Machine Learning: An Artificial Intelligence Approach (Volume I). Vol. 1. Elsevier, 2014.
[2] Duda, Richard O., and Peter E. Hart. Pattern classification. John Wiley & Sons, 2006.

[3] LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton. "Deep learning." nature 521.7553 (2015): 436-444.
[4] Minsky, Marvin. Society of mind. Simon and Schuster, 1988.

9. Other remarks

Additional remarks, comments, (e.g., language of the course)

The default language of the course is English. If the entire class group consists of students who know a language other than English as their main communication tool, the lecturer may consent to conducting classes in this language, provided that he knows it in a way that allows for effective transfer of knowledge.