Course title:	Fundamentals of Artificial Intelligence in Civil Engineering
Course title in Polish:	Podstawy Sztucznej Inteligencji w Inżynierii Lądowej
Course for discipline:	Civil Engineering, Geodesy and Transport

Semester:	4	**Status of course:**	faculty	**Language:**	english
Academic year:		**Catalog number:**			

Coordinator of course:	Dr hab. Roman Tracz prof. SGGW
Lecturer od course:	Dr hab. Roman Tracz prof. SGGW, dr inż. Justyna Dzięcioł
Executing unit:	Institute of Civil Engineering
Ordering unit:	Doctoral School SGGW
Assumptions, goals and description of the course:	The subject "Fundamentals of Artificial Intelligence" aims to learn the basics of artificial intelligence and understand the main approaches used to create its systems. The role of data and knowledge in artificial intelligence is examined, as well as the specifics of their acquisition, preparation and presentation using various AI tools. Modern approaches to creating artificial intelligence systems are being considered - the use of artificial neural networks, machine learning and deep learning. Subject objectives: - familiarizing students with the theoretical foundations and practical knowledge necessary to use the most common artificial intelligence tools; - development of skills in searching, preparing data, transforming it into knowledge and creating knowledge representation models for machine processing; - developing the ability to independently apply elements of artificial intelligence.
Didactic form, number of hours:	Lectures – 5 Classes – 5
Teaching methods:	Lecture combined with a multimedia presentation, discussion of problems and discussion. Use of modern artificial intelligence and machine learning frameworks: Google Collaboratory, TensorFlow, Gemini, PyTorch, CNTK (Microsoft Cognitive Toolkit), OrangeDataMining, DialogFlow to analyze and solve issues. The classes will combine the necessary aspects of theoretical knowledge with an emphasis on practical application addressed to a wide audience. This will enable you to use the acquired knowledge and skills.
Limit of people in the group:	15

Learning outcomes

KNOWLEDGE - the graduate knows and understands:	**SKILLS - the graduate is able to:**	**COMPETENCES - the graduate is ready to:**
To the extent enabling to revise the existing pradigms in the field/discipline - the world achievments, gathering theoretical background as well as general and selected detailed issues	Carry out critical assessment of the scientific research findings and expert activities and their contribution to the knowledge development in the field/discipline	Critically evaluate the achievments in the field/discipline represented
Major general development trends in the field/discipline		Recognise knowledge in solving cognitive and practical problems characteristic for the area of research (field/discipline) and in an interdisciplinary aspect
		Support the ethos of scientific circles and conduct independent research

The method of verification of learning outcomes:	Lectures – online test Classes – completing individual tasks
Form of documentation of achieved learning outcomes:	Computer test Individual tasks
Elements and weights of the final grade:	Lectures – 25% Classes – 75%
Place of the course:	MS Teams/computer room

Basic and supplementary literature

1. Theobald, Oliver - Machine Learning for Absolute Beginners (Third Edition) - Scatterplot Press (2020)
2. OrangeDataMining documentation: https://orangedatamining.com/docs/
3. Ajay Thampi - Interpretable AI, Building explainable machine learning systems - Manning Publications (2022)
4. James-A. Goulet - Probabilistic Machine Learning for Civil Engineers - The MIT Press (2020)

Comments:	

Estimated number of hours of work of the doctoral student necessary to achieve the assumed learning outcomes:	70

Leraning outcomes reference to the second degree characteristics of the National Qualification Framework (level 8) covering doctoral competences:

Symbol:	**Learning outcomes:**	**8 level NQF**
SD1_KW01	To the extent enabling to revise the existing pradigms in the field/discipline - the world achievments, gathering theoretical background as well as general and selected detailed issues	P8S_WG
SD1_KW02	Major general development trends in the field/discipline	P8S_WG
SD1_KU05	Carry out critical assessment of the scientific research findings and expert activities and their contribution to the knowledge development in the field/discipline	P8S_UW
SD1_KK01	Critically evaluate the achievments in the field/discipline represented	P8S_KK

SD1_KK03	Recognise knowledge in solving cognitive and practical problems characteristic for the area of research (field/discipline) and in an interdisciplinary aspect	P8S_KK
SD1_KK08	Support the ethos of scientific circles and conduct independent research	P8S_KR