#### card of course

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| Subject name | Implementation of AI models using cloud technologies. Part 1 - laboratory |

1. The placement of the subject in the study system

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| 1.1. Field of study | Computer science |
| 1.2. Form and path of study | Full-time/Part-time |
| 1.3. Level of education | First-cycle studies |
| 1.4. Study profile | Practical |

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| 1. 5. Specialty | Artificial intelligence |
| 1.6. Subject Coordinator | Dr Rafał Stęgierski |

2. General characteristics of the subject

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| 2.1. Belonging to a subject group | Optional/practical |
| 2.2. Number of ECTS | 2 |
| 2.3. Language of lectures | English |
| 2.4. Semesters in which the subject is taught | IV |
| 2.5.Criteria for selecting course participants | For specialization: Artificial Intelligence |

1. Learning outcomes and course delivery
   1. Subject Objectives

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| No. | Subject Objectives |
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| C1 | Familiarization with cloud technologies for AI, learning basic cloud tools and services supporting the implementation of artificial intelligence models. |
| C2 | Developing skills for deploying AI models in the cloud, learning how to create, test, and deploy AI models using popular cloud platforms. |
| C3 | Practical application of AI models in cloud environments, solving problems using AI models deployed on cloud platforms. |

* 1. Subject-specific learning outcomes, divided into knowledge , skills and competences , with reference to the directional learning outcomes

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| No. | Description of subject  learning outcomes | Reference to  directional effects  learning (symbols) | Method of implementation (mark "X") | | | |
| ST | | NST | |
| Classes at the University | Activities on  the platform | Classes at the University | Activities on  the platform |
| After passing the course, the student knows and understands **the knowledge** | | | | | | |
| W1 | Knows the basic concepts related to cloud technologies such as IaaS, PaaS, SaaS. | INF\_W05  INF\_W10  INF\_W12 INF\_W19 | X |  | X |  |
| W2 | Understands the capabilities and limitations of cloud platforms in the context of implementing AI models. | X |  | X |  |
| W3 | Knows data and model management tools on platforms such as AWS, Google Cloud Platform, Azure. | X |  | X |  |
| W4 | Has knowledge of methods for implementing AI models in cloud environments. | X |  | X |  |
| W5 | Understands the importance of security and scalability in the context of implementing AI in the cloud. | X |  | X |  |
| After passing the course, the student is **able** to: | | | | | | |
| U1 | Can implement a simple AI model and deploy it on the selected cloud platform. | INF\_U12  INF\_U13  INF\_U19  INF\_U21 | X |  | X |  |
| U2 | Is able to use cloud services to manage data and the model training process. | X |  | X |  |
| U3 | It can monitor the operation of an AI model deployed in the cloud and analyze its performance. | X |  | X |  |
| U4 | Is able to apply basic methods of scaling AI models in cloud environments. | X |  | X |  |
| U5 | Can prepare and secure the cloud environment for implemented models. | X |  | X |  |
| After completing the course, the student is ready to take part in **social competences.** | | | | | | |
| K1 | Understands the importance of effective and responsible use of cloud technologies in AI projects. | INF\_K02  INF\_K05 | X |  | X |  |
| K2 | Is aware of the ethical and social challenges associated with implementing AI in cloud environments | X |  | X |  |

3.3. Forms of teaching and their number of hours - Full-time studies (ST), Part-time studies (NST)

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| Path | Lecture | Exercises | Design | Workshop | Laboratory | Seminar | Lecturer | Classes conducted using distance learning methods and techniques in the form of ………………. | Other | **ECTS points** |
| **ST** |  |  |  |  | 20 |  |  |  |  | 2 |
| **NST** |  |  |  |  | 10 |  |  |  |  | 2 |

3.4 . Content of education (separately for each form of classes: (W, ĆW, PROJ, WAR, LAB, LEK, OTHER). It should be marked (X) how the given content will be implemented (classes at the university or classes on the e-learning platform conducted using distance learning methods and techniques)

TYPE OF CLASS: LABORATORY

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| No. | Content of the course | Reference to subject-specific learning outcomes | Method of implementation (mark "X") | | | |
| ST | | NST | |
| **Classes at the University** | **Activities on  the platform** | **Classes at the University** | **Activities on  the platform** |
| 1. | Introduction to cloud technologies for AI , basic concepts, overview of cloud platforms. | W1 | X |  | X |  |
| 2. | Preparing data and models to work in the cloud , data management tools and their integration with AI models. | W3, U2 | X |  | X |  |
| 3. | Deploying simple AI models in the cloud,  AWS SageMaker, Google AI Platform, Azure ML. | W4, U1 | X |  | X |  |
| 4. | Scalability and security of models in the cloud, methods for scaling and securing environments. | W5, U4, U5, K1 | X |  | X |  |
| 5. | Practical applications of AI models in cloud environments, solving problems in various fields. | W2, U1, K1, K2 | X |  | X |  |
| 6. | Summary of classes and discussion of grades |  | X |  | X |  |

3.5. Methods of verifying learning outcomes (indication and description of methods of conducting classes and verification of achievement of learning outcomes and method of documentation)

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| Subject Effects | Teaching methods | Methods of verifying learning outcomes | Documentation methods |
| KNOWLEDGE | | | |
| W1-W5 | Knowledge provided during the laboratory | Term project: Implementing an AI model on a cloud platform  Description:  Students are asked to implement a simple AI model (e.g. an image classifier) and deploy it on a selected cloud platform. | The project was placed on the platform |
| SKILLS | | | |
| U1-U5 | Practical classes performed at computer stations | Term project: Implementing an AI model on a cloud platform  Description:  Students are asked to implement a simple AI model (e.g. an image classifier) and deploy it on a selected cloud platform. | The project was placed on the platform |
| SOCIAL COMPETENCES | | | |
| K1-K2 | Practical classes performed at computer stations | Term project: Implementing an AI model on a cloud platform  Description:  Students are asked to implement a simple AI model (e.g. an image classifier) and deploy it on a selected cloud platform. | The project was placed on the platform |

3.6. Assessment criteria for the achieved learning outcomes

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| Learning effect | For a grade of 3 or "pass."  the student knows and understands/is able to/is ready to | For a grade of 3.5, the student knows and understands/is able to/is ready to | For a grade of 4, the student knows and understands/is able to/is ready to | For a grade of 4.5, the student knows and understands/is able to/is ready to | For a grade of 5, the student knows and understands/is able to/is ready to |
| W | 51-60% of knowledge indicated in learning outcomes | 61-70% of knowledge indicated in learning outcomes | 71-80% of knowledge indicated in learning outcomes | 81-90% of knowledge indicated in learning outcomes | 91-100% of knowledge indicated in learning outcomes |
| U | 51-60% of skills indicated in learning outcomes | 61-70% of skills indicated in learning outcomes | 71-80% of skills indicated in learning outcomes | 81-90% of skills indicated in learning outcomes | 91-100% of skills indicated in learning outcomes |
| K | 51-60% of skills indicated in learning outcomes | 61-70% of skills indicated in learning outcomes | 71-80% of skills indicated in learning outcomes | 81-90% of skills indicated in learning outcomes | 91-100% of skills indicated in learning outcomes |

3.7. Literature

**Basic**

Ameisen E., Building Machine Learning Powered Applications", O’Reilly Media, 2020.

Géron A., "Uczenie maszynowe z użyciem Scikit-Learn i TensorFlow. Helion, 2020

**Supplementary**

1. Dotson C. „Bezpieczeństwo w chmurze”, Helion 2020.

4. Student workload - ECTS points balance

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| **Types of student activity** | **Student Load** | |
| **ST** | **NST** |
| **Classes requiring direct contact between the student and the academic teacher at the university premises** | **20** | **10** |
| Classes included in the study plan | 20 | 10 |
| **Student's own work** | **30** | **40** |
| Ongoing preparation for classes, preparation of project work/presentations/etc. | 15 | 20 |
| Preparation for passing classes | 15 | 20 |
| **TOTAL STUDENT HOURLY LOAD** | **50** | **50** |
| **Number of ECTS points** | **2** | **2** |

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| Last change date | 30/09/2024 |
| The changes were introduced | INF Education Quality Team |
| The changes were approved | Arkadiusz Gwarda, M.A. |