



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Data science and machine learning for e-commerce

### Course

Field of study

Artificial Intelligence

Area of study (specialization)

Level of study

Second-cycle studies

Form of study  
full-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

English

Requirements

compulsory

### Number of hours

Lecture

20

Tutorials

Laboratory classes

20

Projects/seminars

Other (e.g. online)

### Number of credit points

2

### Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

### Prerequisites

A person starting this course should have basic knowledge of statistics, data science and machine learning as well as Python programming skills.

### Course objective

The aim of the course is to familiarize the student with selected problems of e-commerce - in particular those solvable by means of data science and supervised machine learning methods - and to provide basic skills of practical application of selected methods to solve exemplary problems.



## Course-related learning outcomes

### Knowledge

K2st\_W2: The student has a structured and theoretically founded general knowledge related to key issues in the field of data science and machine learning for e-commerce with the emphasis on the artificial intelligence solutions effectively applicable to selected important problems of e-commerce

K2st\_W3: The student has advanced detailed knowledge regarding selected issues in artificial intelligence for e-commerce

K2st\_W5: The student has advanced and detailed knowledge of the processes occurring in the life cycle of artificial intelligence systems for e-commerce

K2st\_W6: The student knows advanced methods, techniques and tools used to solve complex engineering tasks and conduct research in the field of artificial intelligence for e-commerce

### Skills

K2st\_U6: The student is able to assess the suitability and the possibility of using new achievements (methods and tools) and new IT products, in particular in the field of artificial intelligence for e-commerce

K2st\_U8: The student can carry out a critical analysis of existing solutions in the field of artificial intelligence for e-commerce and propose their improvements

K2st\_U9: The student is able to assess the usefulness of methods and tools for solving an engineering task, consisting in the construction or evaluation of an artificial intelligence for e-commerce system or its components, including the limitations of these methods and tools

K2st\_U10: The student is able - using conceptually new methods - to complete complex artificial intelligence for e-commerce tasks, including atypical tasks and tasks containing a research component

K2st\_U11: The student is able - in accordance with a given specification, taking into account non-technical aspects - to design a complex predictive system for e-commerce and implement it - at least in part - using appropriate methods, techniques and tools, including adapting to this purpose existing tools or developing new ones

### Social competences

K2st\_K1: The student understands that in the field of artificial intelligence for e-commerce, some elements of the knowledge and skills quickly become obsolete

K2st\_K2: The student understands the importance of using the latest knowledge in the field of artificial intelligence in solving research and practical problems of data science and machine learning for e-commerce

K2st\_K4: The student is aware of the need to develop professional achievements in the field of data science and machine learning for e-commerce and comply with the rules of professional ethics



## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Summative assessment:

a) lectures: assessment of the knowledge and skills demonstrated during the test consisting of several test questions or short tasks. Exceeding 50% of the points allows to obtain a positive grade.

b) laboratories: assessment of the results of laboratory exercises, written responses (saved as comments in Jupyter Notebook files) and reports prepared partly during the course, and partly after their completion (as the homework)

## Programme content

Basics of data science, data analytics and actionable machine learning predictions for e-commerce. Key Performance Indicators (KPIs) in e-commerce. Performance evaluation of KPI-targeting active algorithms based on traditional, passive machine learning predictions. A/B testing methodology in e-commerce. E-commerce KPI modelling for machine learning regression and direct KPI optimization. E-commerce analytics platforms (e.g., Google Analytics). E-commerce advertisement services (e.g., Google Ads, Google Shopping). E-commerce product data representation including Google Shopping product feed data format and Google Product Taxonomy. E-commerce advertisement platforms (e.g. Google Merchant Center). Integration of data from e-commerce analytics platforms and e-commerce advertisement platforms (e.g. Google Merchant Center). Application of machine learning (including deep learning) for prediction of the metrics and the Key Performance Indicators (KPIs) for e-commerce: Clickthrough Rate (CTR), Conversion Rate (CR), Return On Advertising Spend (ROAS). Machine learning e-commerce Customer Lifetime Value (CLV) prediction. Optimization of parameters of bidding-based e-commerce advertisement (e.g., bid optimisation). Machine learning pipelines for predictive e-commerce systems. Horizontal decomposition of predictive systems for Docker-based deployment in cloud environments. Algorithms for automation of machine learning pipelines optimisation for predictive e-commerce systems.

## Teaching methods

Lectures: multimedia presentation, illustrated with examples given on the blackboard.

Laboratory: presentation illustrated with examples given on the blackboard and carrying out the tasks given by the teacher - practical exercises.

## Bibliography

Basic

1. Turban, E., Whiteside, J., King, D., & Outland, J. (2017). Introduction to electronic commerce and social commerce. Springer,

[https://eprints.ukh.ac.id/id/eprint/260/1/2017\\_Book\\_IntroductionToElectronicCommer.pdf](https://eprints.ukh.ac.id/id/eprint/260/1/2017_Book_IntroductionToElectronicCommer.pdf)

2. Chopra, P., Dixon, E., Enos, E., & Brodmerkle, S. (2013). Practical Web Analytics for User Experience: How Analytics Can Help You Understand. Exchange,



[https://www.academia.edu/download/44998812/Practical\\_Web\\_Analytics\\_for\\_Use\\_-\\_Michael\\_Beasley.pdf](https://www.academia.edu/download/44998812/Practical_Web_Analytics_for_Use_-_Michael_Beasley.pdf)

3. Tallis, M., & Yadav, P. (2018, December). Reacting to variations in product demand: An application for conversion rate (cr) prediction in sponsored search. In 2018 IEEE International Conference on Big Data (Big Data) (pp. 1856-1864). IEEE, <https://arxiv.org/pdf/1806.08211>

Additional

1. Policarpo, L. M., da Silveira, D. E., da Rosa Righi, R., Stoffel, R. A., da Costa, C. A., Barbosa, J. L. V., ... & Arcot, T. (2021). Machine learning through the lens of e-commerce initiatives: An up-to-date systematic literature review. *Computer Science Review*, 41, 100414,

<https://www.sciencedirect.com/science/article/pii/S157401372100054X/pdf>

2. Hutter, F., Kotthoff, L., & Vanschoren, J. (2019). Automated machine learning: methods, systems, challenges (p. 219). Springer Nature, [https://www.automl.org/wp-content/uploads/2019/05/AutoML\\_Book.pdf](https://www.automl.org/wp-content/uploads/2019/05/AutoML_Book.pdf)

3. Shah, C. (2020). A hands-on introduction to data science. Cambridge University Press, [https://toc.library.ethz.ch/objects/pdf03/z01\\_1-108-47244-3\\_01.pdf](https://toc.library.ethz.ch/objects/pdf03/z01_1-108-47244-3_01.pdf)

4. Laura, I., & Santi, S. (2017). Introduction to Data Science: A Python Approach to Concepts, Techniques and Applications

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	40	1,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	<b>Błąd! Nie zdefiniowano zakładki.</b> 10	0,5

<sup>1</sup> delete or add other activities as appropriate