UNIVERSITY
WARMIA AND MAZURY IN OLSZTYN

Faculty of Mathematics and Computer Science

Course title: **COMPUTER SCIENCE IN MEDICINE AND INDUSTRY**

ECTS credit allocation (and other scores): **5.00**

Semester: autumn

Level of study: ISCED-7 - second-cycle programmes (EQF-7)

Branch of science: Engineering and technology

Language: English

Number of hours per semester: 30 lectures + 30 classes = 60 hours

Course coordinator/ Department and e-mail: Andrzej Jankowski/ WMiI, erasmuswmii.uwm.edu.pl

Type of classes: classes and lectures

Substantive content

CLASSES:

Practical illustration of the issues discussed in the lecture.

LECTURES:

The concept of A/B testing: The universality of their applications - A/B testing in medicine: - Quality control of drug production - Assessment of treatment effectiveness - Selection of the most effective therapy - A/B testing in industry and e-commerce: - Marketing actions - Optimization of production and logistics processes - Basics Statistics for A/B testing: - Reminder of the basic concepts of classical statistics - Introduction to Bayesian statistics - Thompson Sampling Method: Application to multi-armed bandit models - A/B Testing and Machine Learning: - Reinforcement Learning: Definition and Applications - Integration of A/B tests with machine learning techniques

LEARNING PURPOSE

The course's objective is to introduce students to the methodology of A/B testing and its ubiquitously practical applications in medicine and industry. Within the realm of medicine, we will discuss topics such as drug production quality control, efficacy assessment, and the selection of the most effective therapy. In the context of industry and e-commerce, we will present the applications of A/B tests in marketing campaigns and the optimization of production and logistics processes. An essential component of the course will be a recap of fundamental concepts from traditional and Bayesian statistics. We will pay special attention to the Thompson sampling method and its application in multi-armed bandit models. The discussed concepts form the foundation of modern machine learning techniques, particularly Reinforcement Learning

On completion of the study programme the graduate will gain:

Knowledge:

Knowledge of mathematical methods describing basic physical phenomena utilized in medicine and industry

Skills:

Student is able to develop application which can be used in medicine and industry

Social Competencies:

He is aware of the responsibility for his own work and is ready to follow the rules of teamwork and take responsibility for jointly implemented tasks

BASIC LITERATURE

1. Therese M. Donovan, Ruth M. Mickey, *Bayesian Statistics for Beginners*, Wyd. Oxford University Press, R. 2019
2. Daniel J. Russo, Benjamin van Roy, Abbas Kazerouni, *A Tutorial on Thompson Sampling*, Wyd. Now Publishers Inc, R. 2019
3. Alex Philip Dombrowski, *Fundamentals of A/B Testing*, Wyd. Independent, R. 2020
4. Ron Kohavi, Diane Tang, Ya Xu, *Trustworthy Online Controlled Experiments: A Practical Guide to A/B Testing*, Wyd. Cambridge University Press, R. 2020
1. https://www.udemy.com/course/bayesian-machine-learning-in-python-ab-testing/?kw=a%2Fb=sac

SUPPLEMENTARY LITERATURE

1. Sheldon M Ross, *Introduction to Probability and Statistics for Engineers and Scientists*, Tom 1, Wyd. Imperial College Press, R. 1998, s. 1-85

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 2,6 ECTS points,

Student's independent work: 2.4 ECTS points,