

## Reinforcement Learning

| Course Workload |       | Assessment form<br>(examination/ graded<br>test/ ungraded test) |
|-----------------|-------|-----------------------------------------------------------------|
| ECTS            | Hours |                                                                 |
| 6               | 216   | Exam                                                            |

The course allows students to become familiar with the basic concepts, methods, algorithms and technologies of reinforcement learning. The course includes both the theoretical foundations of algorithms and principles, as well as practical exercises on the implementation of the algorithms themselves and their application to various types of problems. The course also covers the most popular frameworks for working with reinforcement learning.

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### Course structure:

#### 1. Reinforcement Learning Basics

- 1.1. Basic definition and statement of the problem
- 1.2. Main cycle of work
- 1.3. Sample problems
- 1.4. Taxonomy of algorithms
- 1.5. Deep Q Network algorithm
- 1.6. Proximal Policy Optimization algorithm

#### 2. Reinforcement learning technologies

- 2.1. Preparing your Python environment for reinforcement learning
- 2.2. Stable-baselines3 framework
- 2.3. RLLib framework
- 2.4. Unity ML Agents framework
- 2.5. Saving and analyzing experimental results

#### 3. Existing Reinforcement Learning Problems

- 3.1. Classic reinforcement learning problems
- 3.2. Types and specifics of tasks
- 3.3. Современные популярные применения обучения с подкреплением

#### 4. Advanced reinforcement learning techniques

- 4.1. Award function design
- 4.2. Exploration against Exploitation
- 4.3. Intrinsic motivation of agents
- 4.4. Simulation training
- 4.5. Hierarchical methods