POZNAN UNIVERSITY OF TECHNOLOGY

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Neuro-symbolic integration

Course

Field of study	Year/Semester
Artificial intelligence	2/3
Area of study (specialization)	Profile of study
	general academic
Level of study	Course offered in
Second-cycle studies	English
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15		
Tutorials	Projects/seminars	
	30	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

dr inż. Jędrzej Potoniec
email: jedrzej.potoniec@cs.put.poznan.pl
Faculty of Computing and Telecommunications
address: Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

The student knows the issues related to machine learning and deep learning, as well as first-order logic. The student is able to implement a learning algorithm on the basis of the provided description using selected tools and conduct its experimental evaluation. They should also have the ability to obtain information from the indicated sources and have a willingness to cooperate as part of a team.

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EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

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Course objective

The purpose of the course is to familiarize students with the problems of neuro-symbolic integration and the techniques used to build systems that use both paradigms together.

Course-related learning outcomes

Knowledge

K2st_W3 has advanced detailed knowledge regarding selected issues in neuro-symbolic integration

K2st_W4 has knowledge about development trends and the most important cutting edge achievements in computer science, artificial intelligence in the area of neuro-symbolic-integration

K2st_W6 knows advanced methods, techniques and tools derived from neuro-symbolic integration that are used to solve complex engineering tasks and conduct research in the field of artificial intelligence and related fields

Skills

K2st_U1 is able to obtain information from literature, integrate them, interpret and critically evaluate them, draw conclusions and formulate and fully justify opinions

K2st_U13 is able to prepare and present a scientific study in English, presenting the results of a replication experiment and oral presentation on specific issues in the field of neuro-symbolic integration

K2st_U15 is able to interact in a team, taking various roles in it

Social competences

K2st_K1 understands that in the field of IT with particular emphasis on the neuro-symbolic integration, the knowledge and skills quickly become obsolete

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

In terms of lecture: online tests after each lecture (7 tests of 10 points each), preparation of a presentation on the topic pursued in the project (30 points). The tests consist of multiple-choice questions, differently scored. As part of the presentation, its correctness and precision are evaluated. Receiving a passing grade requires exceeding the threshold of 50% of the maximum number of points.

In terms of the project: students are assessed in teams for preparing the project (20 points), defending it in the form of a presentation (30 points) and writing a report (50 points). Receiving a passing grade requires exceeding the threshold of 50% of the maximum number of points.

Programme content

As part of the project, students in pairs reproduce experimental results presented in papers on neuro-symbolic integration published in the last two years. In addition to the experiments themselves, each pair is tasked with giving a 15-20 minute presentation summarizing the results and writing a report in English, with particular emphasis on the difficulties encountered in trying to reproduce the results. At the end of the semester, the reports are combined into a single document and published on arXiv.

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The following content is presented in the lecture:

1. Introduction to the problem of neuro-symbolic integration: goals, difficulties, challenges.

2. Neuro-symbolic inference in logic.

3. Automated planning using neuro-symbolic methods.

4. DeepProbLog: probabilistic programming in logic with neural networks

5-7. Lectures for presentations of articles that form the basis of the project.

Teaching methods

Lecture: multimedia presentation

Project: project method, multimedia presentation.

Bibliography

Basic

Additional

Pascal Hitzler, Md. Kamruzzaman Sarker (eds): Neuro-Symbolic Artificial Intelligence: The State of the Art. Frontiers in Artificial Intelligence and Applications 342, IOS Press 2021, ISBN 978-1-64368-244-0

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	45	1,5
Student's own work (literature studies, preparation of presentation, development of project, preparation of report) [1]	5	0,5

1 delete or add other activities as appropriate