Foundation of Analytic Information Theory, Machine Learning, and AI

Course description

Basic information

Field of study : Analytical Computer Science

Path : -

Organizational unit : Faculty of Mathematics and Computer Science

Level of education : first-cycle studies

Form of studies : full-time studies

Study profile : general academic

Mandatory status : optional

Education cycle : 2022/23

Course code : N/A

Languages of instruction : English

Disciplines : Computer Science

ISCED classification : N/A

USOS code : WMI.TCS.FAITML.S

Course coordinator

Wojciech Szpankowski

Course instructor

Wojciech Szpankowski

Period Semester 5	Form of verification of learning outcomes graded credit Form of teaching and hours lecture with elements of a discussion class: 60	Number of ECTS credits 6.0

Extended information

This course will be run as a research seminar with several talks in the first two weeks followed by students presenting their research. The talks will be based on previous research presentations delivered over the last 5

years in various venues by me and my collaborators. In short, at the beginning I will cover information theory starting with some philosophical discussion on "what is information" and then moving to analytic information theory. Then we discuss structural and temporal information and finally connect analytic information theory and analytic learning theory. In the next week, together with my postdoc we present elements of machine learning and AI. We focus on online learning in the first four lectures with the last on large language models of AI.

At the end of the course (November 4-8) students will be asked to give presentations on their favorite research topics. The grade will be based on participations and the final presentations.

This will be a join seminar with Center for Science of Information (CSoI)

The talks will be given in English and will be recorded.

Approximate Plan of Talks:

1. Organizational Meeting
2. What is Information?
3. Analytic Information Theory I & II
4. Structural and Temporal Information
5. From Analytic Information Theory to Analytic Learning Theory.
6. Learning from Expert Advice
7. Minimax Regret in Online Learning
8. Special Losses
9. Computational Efficiency, Hybrid Settings, and Randomization
10. Introduction to Large Language Models