

REQUIREMENTS

Semmelweis University, Faculty of General Medicine – single, long-cycle medical training programme

Name of the host institution (and any contributing institutions):

Department of Traumatology

Name of the subject: Mesterséges intelligencia a diagnosztikában és műtéti tervezésben

in English: Artificial Intelligence in Diagnostics and Surgery Planning

in German: Künstliche Intelligenz in der Diagnostik und Operationsplanung

Credit value: 1

Semester: I.

(as defined in the curriculum)

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| Total number of classes per week: | lectures: | practical lessons: | seminars: 1 x 45 mins |
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Type of subject: compulsory optional elective

(PLEASE UNDERLINE AS APPLICABLE)

Academic year: 2023/24

Language of instruction, for optional or elective subjects: English

Course code: AOSTRA882_1A

(In the case of a new subject, this cell is filled in by the Dean's Office, following approval)

Course coordinator: Prof. Dr. Hangody László

Place of work, phone number:

Semmelweis University Traumatology Department

Tel: 06 1 467 3851

Position: Head of department

Date and number of habilitation: May 24, 2003, 10/2003

Objectives of the course and its place in the medical curriculum:

To gain a user-level understanding of the technology of artificial intelligence, more specifically deep learning; its methods and areas of application in medical science and practice. The course is theoretical in nature, there will be no practical exercises.

Place of instruction (address of lecture hall or seminar room etc.):

Uzsoki Hospital, Department,
Conference room in Building C, ground floor)
1145 Budapest, Uzsoki street 29-41.

Competencies acquired through the completion of the course:

Student completing this course will gain an understanding of the working principles of artificial intelligence and perform as high-level professional users of medical equipment and assistive technology

utilizing such. The course can also serve as an entry point for students who might decide to delve deeper into this field later on.

Prerequisites for course registration and completion:

Successful completion of the courses “Biophysics II” and “Fundamentals of Biostatistics and Informatics”.

Conditions for concurrent course registration and permission thereof in the case of a multi-semester subject:

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Student headcount conditions for starting the course (minimum, maximum) and method of student selection:

Min: 10

Max: 120

Selection method: first come first served

Detailed course description:

(Theoretical and practical instruction must be broken down into lessons (weeks), numbered separately. Please provide the names of lecturers in both types of lessons, indicating guest lecturers. This information is not to be attached separately. CVs of guest lecturers, however, must be attached.)

- Week 1 The Concept of Artificial Intelligence and Examples of Medical Applications – Introductory Lecture; *Lecturer: Peter Szoldan*
- Week 2 Working Principles and Architecture of Neural Networks; *Lecturer: Peter Szoldan*
- Week 3 Challenges and Solutions of Training Neural Networks; *Lecturer: Peter Szoldan*
- Week 4 Similarities and Differences of Architectures and Operation of the Central Nervous System and Artificial Intelligence; *Lecturer: Balázs Szegedy, PhD, Research Mathematician of the Rényi Alfréd Mathematical Research Institute of the Hungarian Academy of Sciences, Fulkerson Prize recipient (2012), “Momentum” Research Fellowship recipient (2014)*
- Week 5 One-Dimensional Data Processing with Convolutional Neural Networks; Electrocardiogram, Audio, Speech, and Text with Artificial Intelligence; *Lecturer: Peter Szoldan*
- Week 6 Text Processing, Translation, Text Generation with Artificial Intelligence; Operating Principles of ChatGPT; Transformer Networks; Reinforcement Learning; *Lecturer: Peter Szoldan*
- Week 7 Two-Dimensional Image and Video Processing with Convolutional Neural Networks; *Lecturer: Peter Szoldan*
- Week 8 Three-Dimensional Image Processing with Convolutional Neural Networks; Structure of CT and MR Medical Images; Radiomics and Artificial Intelligence; *Lecturer: Peter Szoldan*
- Week 9 Artificial Intelligence in the Practice of Radiological Diagnostics; *Lecturer: Dr. Egged Zsófia PhD, Head of Radiology Department, Uzsoki Hospital*
- Week 10 Real-world Examples of Design and Execution of Therapy with Artificial Intelligence; Mistakes by Artificial Intelligence and their Reasons; Medical Practitioner’s Responsibility; *Lecturer: Peter Szoldan*
- Week 11 Operation Planning with Artificial Intelligence: Ultra-Fresh Osteochondral Allograft Donor Matching and Prosthetics Design; *Lecturers: Prof. Dr. László Hangody, Dr. György Hangody*

Week 12 Practical Challenges of Collecting a Training Set: Case Study of the Training of the Ultra-Fresh Osteochondral Allograft Donor Matching Artificial Intelligence;
Lecturer: Peter Szoldan
 Week 13 The Future of Artificial Intelligence in Medicine; *Lecturer: Peter Szoldan*
 Week 14 Exam Prep Q&A Session; *Lecturer: Peter Szoldan*
 Week 15 Written MCQ electronic exam; *Lecturer: Peter Szoldan*

Related subjects due to interdisciplinary fields (both compulsory and elective) and potential overlaps between subjects:

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Attendance requirements; conditions under which students can make up for absences and the method of absence justification:

Participation in at least 75% of the seminars is required.

Form of assessment in the study period:

(including the number, topics and scheduling of oral and written tests, their share in the overall evaluation, make-up tests and improvement tests)

No assessments during the study period.

Number and type of assignments for individual work and the deadline for submission:

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Requirements to obtain the teacher's signature:

Participation in at least 75% of the seminars and a successful completion of the end-term exam.

Type of assessment (*comprehensive examination, end-term examination, term-grade, term-grade on a three-grade rating scale, coursework project, no examination*)

Term-grade written MCQ electronic exam (single answer and multiple choice test), on Semmelweis University's E-learning portal (Moodle) at the Traumatology Department. 5 scale grading (1-5).

Possibility to retake the test: at least one more time, but maximum two times before the end of the semester.

Examination requirements:

(*list of examination topics, subject areas of tests / examinations, lists of mandatory parameters, figures, concepts and calculations, practical skills and the optional topics for exam-equivalent coursework projects, their criteria of completion and assessment*)

A satisfactory knowledge of the provided study material, contents of the electronically provided material and contents of the lectures.

Method and type of grading:

(*Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results of the end-of-term assessment. Possibilities of and conditions for offered grades.*)

The result of the end-term exam. Written MCQ electronic exam. 5 scale grading (1-5).

List of course books, textbooks, study aids and literature facilitating the acquisition of knowledge to complete the course and included in the assessment, precisely indicating which requirement each item is related to (e.g., topic by topic) as well as a list of important technical and other applicable study aids:

Internet

The lecture material can be downloaded from Semmelweis University's E-learning portal
<https://ite.semmelweis.hu/moodle/>

Signature of habilitated instructor (course coordinator) announcing the course:



Péter Szoldán

Signature of the director of the host institution:



Prof. Dr. László Hangody, M.D., Ph.D., D.Sc.
Member of the Hungarian Academy of Sciences
Head of Department
Semmelweis University, Department of Traumatology

Date of submission:

2023 - 08 - 07