COURSE SYLLABUS AND COURSE REQUIREMENTS
2024/2025 ACADEMIC YEAR SPRING SEMESTER

Course title	Artificial Intelligence
Course Code	**MSM630AN**
Hours/Week: le/pr/lab	**2/0/2**
Credits	**4**
Degree Programme	**Biomedical Engineering MSc**
Study Mode	**full time**
Requirements	**midterm grade**
Teaching Period	**Spring / 4th**
Prerequisites	**-**
Department(s)	**Department of Technical Informatics**
Course Director	**Balázs Tukora dr.**
Teaching Staff	**Kisander Zsolt**

COURSE DESCRIPTION

A short description of the course (max. 10 sentences).
Neptun: Instruction/Subjects/Subject Details/Basic data/Subject description

In this course, you will delve into the core concepts of AI, including machine learning, deep learning, natural language processing, and computer vision. Through hands-on projects and practical exercises, you will gain proficiency in popular AI frameworks and tools, such as TensorFlow, PyTorch, and scikit-learn.

SYLLABUS

Neptun: Instruction/Subjects/Subject Details/Syllabus

1. GOALS AND OBJECTIVES

Goals, student learning outcome.
Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction

Key Course Highlights:

Understand the fundamentals of AI, including neural networks and algorithms.
Explore machine learning techniques for classification, regression, and clustering.
Dive deep into deep learning with convolutional and recurrent neural networks.
Master natural language processing for text analysis and sentiment analysis.
Gain proficiency in computer vision for image and video recognition.
Hands-on experience with real-world AI projects.
Learn how to deploy AI models to production and optimize for performance.
Stay up-to-date with the latest AI research and trends.

2. COURSE CONTENT

Neptun: Instruction/Subjects/Subject Details/Syllabus/Subject content

	TOPICS
LECTURE	1. *Orientation. Introduction of necessary hardware and software tools. Assessment of required prior professional knowledge. Presentation of the fields and developmental history of artificial intelligence.* 2. *Refreshing programming and other software fundamentals. Technical presentation of software frameworks used during the semester.* 3. *Overview of related mathematical and probability theory knowledge. Discussion of the mathematical foundations of machine learning.* 4. *Solving simple classification problems using machine learning tools.* 5. *Solving simple regression problems using machine learning tools.* 6. *Designing a data processing pipeline and its components. Data cleaning procedures.*

	Evaluation metrics. Visualisation tools. *7. Artificial neural networks and deep learning. Gradient descent algorithm and its variants.* *8. Convolutional neural networks. Signal- and image processing basics.* *9. Recurrent neural networks. Time-series and sequence analysis.* *10. State-of-art solutions and cloud AI services.* *11. Assisting or solving problems brought by students, such as thesis work, research, etc., using artificial intelligence tools.*
PRACTICE	-
laboratory practice	*The lab exercises follow the material covered in lectures and aid in understanding the lectures through programming examples.*

DETAILED SYLLABUS AND COURSE SCHEDULE

ACADEMIC HOLIDAYS INCLUDED

LECTURE				
week	**Topic**	**Compulsory reading; page number (from … to …)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
1.	Introduction of necessary hardware and software tools. Assessment of required prior professional knowledge. Presentation of the fields and developmental history of artificial intelligence.			
2.	Refreshing programming and other software fundamentals. Technical presentation of software frameworks used during the semester.			
3.	Overview of related mathematical and probability theory knowledge. Discussion of the mathematical foundations of machine learning.			
4.	Solving simple classification problems using machine learning tools.			
5.	Solving simple regression problems using machine learning tools.			
6.	Designing a data processing pipeline and its components. Data cleaning procedures. Evaluation metrics. Visualisation tools			
7.	Artificial neural networks and deep learning. Gradient descent algorithm and its variants.			
8.	Convolutional neural networks. Signal- and image processing basics.			
9.	Pollack Expo			
10.	Recurrent neural networks. Time-series and sequence analysis.			
11.	State-of-art solutions and cloud AI services.			
12.	Spring Break			
13.	Assisting or solving problems brought by students, such as thesis work, research, etc., using artificial intelligence tools.			
14.	Homework presentation.			

PRACTICE, LABORATORY PRACTICE				
week	**Topic**	**Compulsory reading; page number (from … to …)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**

1.	The lab exercises follow the material covered in lectures and aid in understanding the lectures through programming examples.			
2.	The lab exercises follow the material covered in lectures and aid in understanding the lectures through programming examples.			
3.	The lab exercises follow the material covered in lectures and aid in understanding the lectures through programming examples.			
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7.	The lab exercises follow the material covered in lectures and aid in understanding the lectures through programming examples.			
8.	The lab exercises follow the material covered in lectures and aid in understanding the lectures through programming examples.			
9.	Pollack Expo			
10.	The lab exercises follow the material covered in lectures and aid in understanding the lectures through programming examples.			
11.	Locsolóverseket tanulunk.			
12.	Spring Break			
13.	The lab exercises follow the material covered in lectures and aid in understanding the lectures through programming examples.			
14.	Homework presentation.			

3. ASSESSMENT AND EVALUATION

(Neptun: Instruction/Subjects/Subject Details/Syllabus/Examination and Evaluation System)

ATTENDANCE

In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a grade or qualification in the given full-time course if the number of class absences exceeds 30% of the contact hours stipulated in the course description.

Method for monitoring attendance *(e.g.: attendance sheet / online test/ register, etc.)*

attendance sheet

ASSESSMENT

Cells of the appropriate type of requirement is to be filled out (course-units resulting in mid-term grade or examination). Cells of the other type can be deleted.

Course resulting in mid-term grade *(PTE TVSz 40§(3))*

Mid-term assessments, performance evaluation and their ratio in the final grade *(The samples in the table to be deleted.)*

Type	Assessment	Ratio in the final grade
Attendance and active participation in the classes	*12 points*	*60 %*
Homework involving the development of an artificial intelligence application	*8 points*	*40 %*

Opportunity and procedure for re-takes (PTE TVSz 47§(4))

The specific regulations for improving grades and resitting tests must be read and applied according to the general Code of Studies and Examinations. E.g.: all tests and assessment tasks can be repeated/improved at least once every semester, and the tests and home assignments can be repeated/improved at least once in the first two weeks of the examination period.

The same midterm development homework assignment with a more detailed oral presentation and question-answer format.

Grade calculation as a percentage

based on the aggregate performance according to the following table

Course grade	Performance in %
excellent (5)	85 % …
good (4)	70 % ... 85 %
satisfactory (3)	55 % ... 70 %
pass (2)	40 % ... 55 %
fail (1)	below 40 %

The lower limit given at each grade belongs to that grade.

4. SPECIFIED LITERATURE

In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature)

COMPULSORY READING AND AVAILABILITY

[1.] https://scikit-learn.org/stable/user_guide.html
[2.] https://pytorch.org/docs/stable/index.html