School of Engineering and Natural Sciences / Industrial Engineering (English)

2023 - 2024 Academic Year

ARTIFICIAL NEURAL NETWORKS

Syllabus

Course Description					
Name	**Code**	**Semester**	**T+A Hour**	**Credit**	**ECTS**
ARTIFICIAL NEURAL NETWORKS	IND3168050	Fall Semester	3+0	3	6

Prerequisites Courses	PROGRAMLAMAYA GİRİŞ; LİNEER CEBİR VE DİFERANSİYEL DENKLEMLER; LİNEER CEBİR; DİFERANSİYEL DENKLEMLER
Recommended Elective Courses	
Language of Instruction	English
Course Level	First Cycle (Bachelor's Degree)
Course Type	Elective
Course Coordinator	Assist.Prof. Mehmet KOCATÜRK
Name of Lecturer(s)	Assist.Prof. Mehmet KOCATÜRK
Assistant(s)	
Aim	The aim of the course is to evaluate the use of the computational models of the neurons in machine learning and the modeling of the components of the nervous system.
Course Content	This course contains; The Nervous System: Microscopic View,The Nervous System: Macroscopic View,Machine Learning,Perceptron,Multilayer Perceptron,Supervised Learning,Backpropogation Algorithm,Online Learning,Batch Learning,Overfitting,Neural Networks for Pattern Classification,Neural Networks in Regression,Neuromodulation,Reinforcement Learning.

Course Learning Outcomes	Teaching Methods	Assessment Methods
Designs single layer perceptron.	10, 14, 16, 19, 2, 21, 3, 6, 8, 9	A, E, F
Implements the online learning algorithm.	10, 14, 16, 19, 2, 21, 3, 6, 8, 9	A, E, F
Develops classifiers using multilayer perceptrons.	10, 14, 16, 19, 2, 21, 3, 6, 8, 9	A, E, F
Designs multilayer perceptron for regression.	10, 14, 16, 19, 2, 21, 3, 6, 8, 9	A, E, F

Teaching Methods	10: Discussion Method, 14: Self Study Method, 16: Question - Answer Technique, 19: Brainstorming Technique, 2: Project Based Learning Model, 21: Simulation Technique, 3: Problem Baded Learning Model, 6: Experiential Learning, 8: Flipped Classroom Learning, 9: Lecture Method
Assessment Methods	A: Traditional Written Exam, E: Homework, F: Project Task

Lecture Schedule

Sequence	Topics	Preliminary Preparation
1	The Nervous System: Microscopic View	
2	The Nervous System: Macroscopic View	
3	Machine Learning	
4	Perceptron	
5	Multilayer Perceptron	
6	Supervised Learning	
7	Backpropogation Algorithm	
8	Online Learning	
9	Batch Learning	
10	Overfitting	
11	Neural Networks for Pattern Classification	
12	Neural Networks in Regression	
13	Neuromodulation	
14	Reinforcement Learning	

Evaluation Methods	Weight(%)
Midterm Exam	30
General Exam	70

Resources

Alpaydin, E., (2010) Introduction to machine learning, MIT Press,Cambridge.
Kandel, E. R., Schwartz, J. H., Jessell, T. M., Siegelbaum, S. A., Hudspeth, A. J. , (2012) Principles of neural science, McGraw-Hill, New York.
Lytton, W. W., (2002) From computer to brain : foundations of computational neuroscience, Springer, New York.
Dayan, P., Abbott, L. F., (2001) Theoretical neuroscience: Computational and mathematical modeling of neural systems, MIT Press, Cambridge.
Izhikevich, E.M., (2007) Dynamical systems in neuroscience: The geometry of excitability and bursting, MIT Press, Cambridge.