

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

2022 - 2023 Academic Year

INTRODUCTION to DEEP LEARNING

Syllabus

Course Description					
Name	Code	Semester	T+A Hour	Credit	ECTS
INTRODUCTION to DEEP LEARNING	IND3268010	Spring Semester	3+0	3	6
Prerequisites Courses	PROGRAMLAMAYA GİRİŞ; OLASILIK VE RASSAL DEĞİŞKENLER				
Recommended Elective Courses	Calculus, Linear algebra, Probability, Introductory knowledge in Python programming.				
Language of Instruction	English				
Course Level	First Cycle (Bachelor's Degree)				
Course Type	Elective				
Course Coordinator	Prof.Dr. Bahadır Kürşat GÜNTÜRK				
Name of Lecturer(s)	Prof.Dr. Bahadır Kürşat GÜNTÜRK				
Assistant(s)					
Aim	This course is an introduction to deep learning, a branch of machine learning concerned with the development and application of modern neural networks. We will cover a range of topics from basic neural networks, convolutional and recurrent network structures, deep unsupervised learning, and applications to problem domains like computer vision, image processing and natural language processing. The course will introduce training and optimization strategies in deep networks both for supervised and unsupervised learning tasks.				
Course Content	This course contains; Introduction to Machine Learning and Neural Networks, Training Neural Networks, Convolutional Neural Networks (CNNs) , Network Layers in CNNs , Deep Learning Hardware and Software, Deep Network Architectures, Deep Learning Strategies, Midterm, Computer Vision and Deep Learning , Image processing and Deep Learning, Natural Language Processing with Deep Learning, Recurrent Neural Networks and LSTMs, Unsupervised Learning and Generative Modeling, Advanced Applications of Deep Learning .				
Course Learning Outcomes		Teaching Methods		Assessment Methods	
Design convolutional neural networks for supervised/unsupervised learning		1, 16, 4, 9		A, C, D	
Analyze the effects of hyper-parameters on learning performance		1, 15, 16, 4, 9		A, C, D	
Apply learning techniques for training deep networks		1, 15, 16, 4, 9		A, C, D	
Recognize the applications of deep networks in computer vision, image processing and natural language processing		1, 16, 4, 9		C, D	
Use current software and hardware tools for deep learning		1, 16, 4, 9		C, D	
Teaching Methods	1: Lecture, 15: Problem solving, 16: Project Based Learning, 4: Exercise, Practice, 9: Simulation				
Assessment Methods	A: Written Exam, C: Homework, D: Project / Design				
Lecture Schedule					
Sequence	Topics	Preliminary Preparation			
1	Introduction to Machine Learning and Neural Networks				
2	Training Neural Networks				
3	Convolutional Neural Networks (CNNs)				
4	Network Layers in CNNs				
5	Deep Learning Hardware and Software				
6	Deep Network Architectures				
7	Deep Learning Strategies				
8	Midterm				
9	Computer Vision and Deep Learning				
10	Image processing and Deep Learning				
11	Natural Language Processing with Deep Learning				
12	Recurrent Neural Networks and LSTMs				
13	Unsupervised Learning and Generative Modeling				
14	Advanced Applications of Deep Learning				
Evaluation Methods		Weight(%)			
Midterm Exam		30			
General Exam		70			

Resources
Deep Learning, I. Goodfellow, Y. Bengio and A. Courville , MIT Press, http://www.deeplearningbook.org , 2016. Machine Learning Yearning, Andrew Ng, http://www.mlyearning.org/ , Intel® AI Academy Deep Learning 501 https://software.intel.com/en-us/ai-academy/students/kits/deep-learning-501