

DEPARTMENT OF ROBOTICS AND INTELLIGENT SYSTEMS ENGINEERING
COURSE SYLLABUS

Course Details				
Code	Academic Year			Semester
RIS511	1			1
Title	T	A	L	ECTS
Machine Learning	2	2	0	7
Language	English			
Level	Undergraduate		Graduate	X
Department / Program	Robotics and Intelligent Systems			
Forms of Teaching and Learning	Face-to-Face, Group Study, Individual Study, programming.			
Course Type	Compulsory		Elective	X
Objectives	The course will give the student the basic ideas and intuition behind modern machine learning methods as well as a formal understanding of how, why, and when they work; and gain the ability to use this knowledge in the development of various learning models.			
Content	<ul style="list-style-type: none"> - Perceptron, Convergence, Generalization - Linear Regression, Bias and Variance - Logistic Regression - Over- and Underfitting, Regularisation - Maximum Margin Classification, Support Vector Machines (SVM) - Non-linear Predictions, Kernels - Neural Networks, Multilayer Perceptron, Backpropagation, Intro to Deep Learning - Unsupervised Learning, K-Means Algorithm - Principal Component Analysis (PCA) - Model selection, model selection criteria 			
Prerequisites				
Coordinator	DI Dr. Canan Yıldız			
Lecturer(s)	DI Dr. Canan Yıldız			
Assistant(s)				
Work Placement				
Recommended or Required Reading				
Books / Lecture Notes	<ul style="list-style-type: none"> - Machine Learning, Tom Mitchell, McGraw-Hill, 1997. - Artificial Intelligence: A Modern Approach, S. Russel und P. Norvig, Prentice Hall, Englewood Cliffs, 2003. 			
Other Sources	<ul style="list-style-type: none"> - Hands-on machine learning with Scikit-Learn, Keras and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Aurélien Géron, O'Reilly Media, 2019. 			
Additional Course Material				
Documents	-			
Assignments	-			
Exams	-			

DEPARTMENT OF ROBOTICS AND INTELLIGENT SYSTEMS ENGINEERING
COURSE SYLLABUS

Course Composition			
Mathematics und Basic Sciences	20		%
Engineering			%
Engineering Design			%
Social Sciences			%
Educational Sciences			%
Natural Sciences			%
Health Sciences			%
Expert Knowledge	80		%
Assessment			
Activity	Count		Percentage (%)
Midterm Exam	1		40
Quiz			
Assignments	1		10
Attendance			
Recitations			
Projects			
Final Exam	1		50
		Total	100
ECTS Points and Work Load			
Activity	Count	Duration	Work Load (Hours)
Lectures	14	2	28
Self-Study	1	94	98
Assignments	9	4	36
Presentation / Seminar Preparation			
Midterm Exam	1	3	3
Recitations	14	2	28
Laboratory			
Projects			
Final Exam	1	3	3
		Total Work Load	196
		ECTS Points (Total Work Load / 28)	7
Learning Outcomes			
1	Understand the complexity of Machine Learning algorithms (regression, classification, clustering, and dimensionality reduction) and their limitations.		

**DEPARTMENT OF ROBOTICS AND INTELLIGENT SYSTEMS ENGINEERING
COURSE SYLLABUS**

2	Select the appropriate machine learning algorithms for real-life applications.
3	Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own.
4	Be capable of performing experiments in Machine Learning using real-world data.
5	Assess the model quality in terms of relevant performance/error metrics for each application.

Weekly Content

1	Introduction, supervised and unsupervised learning, model representation, cost function
2	Gradient Descent, Gradient Descent for Linear Regression
3	Multiple Variables, Feature Scaling, Learning Rate, Polynomial Regression
4	Classification, Logistic Regression
5	Decision Boundary, Multiclass Prediction, One-vs-All
6	Neural Networks, Model Representation
7	Cost Function and Backpropagation, Gradient Checking, Random Initialization
8	Evaluating Learning Algorithms, Train/Validation/Test Sets, Bias and Variance, Learning Curves
9	Midterm Exams
10	Large Margin Classification, Optimization Objective, Intuition
11	Kernels, Support Vector Machines
12	Unsupervised Learning, K-Means Algorithm
13	Dimensionality Reduction, Data Compression, Principal Component Analysis
14	Principal Component Analysis (cont.)
15	Summary, Recitation

Contribution of Learning Outcomes to Program Objectives (1-5)

	P1	P2	P3
1	5	5	4
2	5	5	4
3	5	5	4
4	5	5	4
5	5	5	4

Contribution Level 1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High

Compiled by: DI Dr. Canan Yıldız

Date of Compilation: 26.05.2021s



TRK-ALMAN NİVERSİTESİ
TRKİSCH-DEUTSCHE UNIVERSITT

FEN BİLİMLERİ ENSTİTS
INSTITUT FR INGENIEUR- UND NATURWISSENSCHAFTEN

**DEPARTMENT OF ROBOTICS AND INTELLIGENT SYSTEMS ENGINEERING
COURSE SYLLABUS**