

ROBOTICS AND INTELLIGENT SYSTEMS MASTER PROGRAM
COURSE SYLLABUS

Course Details				
Code		Academic Year		Semester
RIS502		1		2
Title		T	A	L
Intelligent Systems		2	2	0
Language	English			
Level	Undergraduate	Graduate	X	Postgraduate
Department / Program	Robotics and Intelligent Systems			
Forms of Teaching and Learning				
Course Type	Compulsory	Elective	X	
Objectives	The course will give the student the basic ideas and intuition behind a wide range of modern AI systems as well as a formal understanding of how, why, and when they work. The student will gain the ability to use this knowledge in the development of various intelligent systems in the areas of vision, natural language processing and robotics.			
Content	Artificial Neural Networks, Deep Learning, Reinforcement Learning			
Prerequisites				
Coordinator	Dr. techn. Canan YILDIZ			
Lecturer(s)	Dr. techn. Canan YILDIZ			
Assistant(s)				
Work Placement				
Recommended or Required Reading				
Books / Lecture Notes	<ul style="list-style-type: none"> - Reinforcement Learning, an Introduction, Richard S Sutton, Andrew G. Barto, MIT Press, 2014. - Hands-on machine learning with Scikit-Learn, Keras and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Aurélien Géron, O'Reilly Media, 2019. - Deep Learning for NLP and Speech Recognition, Uday Kamath, John Liu, James Whitaker, Springer, 2019. - Deep Reinforcement Learning Hands-On , Maxim Lapan, Packt Publishing, 2020. 			
Other Sources	<ul style="list-style-type: none"> - Artificial Intelligence: A Modern Approach, S. Russel und P. Norvig, Prentice Hall, Englewood Cliffs, 2003. - Maschine Learning, Tom Mitchell, McGraw-Hill, 1997. - Deep Learning with TensorFlow 2 and Keras: Regression, ConvNets, GANs, RNNs, NLP, and more with TensorFlow 2 and the Keras API, Antonio Gulli, Amita Kapoor, Sujit Pal, Packt Publishing, 2019. - https://www.davidsilver.uk/teaching/ 			
Additional Course Material				
Documents				
Assignments				

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Exams			
Course Composition			
Mathematics und Basic Sciences			%20
Engineering			%60
Engineering Design			%20
Social Sciences			%
Educational Sciences			%
Natural Sciences			%
Health Sciences			%
Expert Knowledge			%
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	14	8	112
Assignments	10	5	50
Presentation / Seminar Preparation			
Midterm Exam	1	3	3
Recitations	14	2	28
Laboratory			
Projects			
Final Exam	1	3	3
		Total Work Load	224
		ECTS Points (Total Work Load / Hour)	8
Learning Outcomes			
1	Understand the complexity of Deep Learning algorithms and their limitations.		

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2	Select the appropriate algorithms for real-life applications.
3	Be capable of confidently applying common techniques and algorithms in building intelligent systems.
4	Be capable of performing experiments in Deep Learning using real-world data.
5	Assess the model quality in terms of relevant performance/error metrics for each application.

Weekly Content

1	Computer Vision, Image Classification, K-Nearest Neighbor, Linear Classification
2	Image Classification with Neural Networks, Backpropagation
3	Convolutional Neural Networks, Convolution and Pooling
4	Training Neural Networks, Activations Functions, Data Processing, Transfer Learning
5	CNN Architectures, Introduction to RNNs and LSTM Language Modeling, Image Captioning
6	Introduction to NLP, Word-2-Vec, Skip-Gram, Word Representations in Vector Space
7	N-gram Language Models
8	Sequence Modeling: Recurrent and Recursive Neural Nets
9	Machine Translation, Seq2Seq and Attention
10	Convolutional Neural Networks for Sentence Classification
11	Introduction to Reinforcement Learning , Markov Decision Processes, Dynamic Programming
12	Monte Carlo Methods
13	Temporal Difference Learning
14	On-Policy Approximation of Action Values
15	Off-Policy Approximations of Action Values

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: Dr. Techn. Canan Yıldız

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