ROBOTICS AND INTELLIGENT SYSTEMS MASTER PROGRAM
COURSE SYLLABUS

Course Details				
Code	**Academic Year**			**Semester**
RIS502	1			2
Title	**T**	**A**	**L**	**ECTS**
Intelligent Systems	2	2	0	8

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	- 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	- 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 Lanugage 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
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