AGU Graduate School of Engineering and Science Electrical and Computer Enginering Program

COURSE RECORD

Code	**ECE 661**
Name	**Deep Learning**
Hour per week	3+0 (Theory + Practice)
Credit	3
ECTS	7,5
Level/Year	Graduate
Semester	Fall, Spring
Type	Elective
Location	
Prerequisites	Art of Computing, Calculus, Probability and Statistics, Linear Algebra, Neural Networks
Special Conditions	
Coordinator(s)	Zafer Aydın
Webpage	
Content	This course provides an introduction to deep learning. It covers deep architectures for multi-layer perceptrons, auto-encoders, convolutional neural networks, recurrent neural networks, generative adversarial networks, Hopfield networks, Boltzman machines and belief networks. The course also provides applications of neural networks for text, image, and speech processing. Methods will be implemented by a software and applied on various machine learning problems.
Objectives	O1. Gain an understanding of deep learning architectures O2. Learn the techniques used for developing deep learning models O3. Gain practice by completing programming assignments O4. Apply the concepts to a real problem by completing a course project
Learning Outcomes	LO1. Explain the mathematical and algorithmic principles of deep learning models LO2. Solve a machine learning problem using deep learning methods LO3. Implement a deep learning model using a software LO4. Apply a deep learning method to a real problem
Requirements	A GPA higher than 3.0 or high letter grades from prerequisite courses.
Reading List	1. Deep Learning, I. Goodfellow, Y. Bengio, A. Courville, F. Bach, MIT Press, 2016. 2. Hands-On Machine Learning with Scikit-Learn and Tensorflow: Concepts, Tools, and Techniques to Build Intelligent Systems, A. Geron, O'Reilly Media, 2017.
Ethical Rules and Course Policy	Cheating in assignments and exams is strictly prohibited.

LEARNING ACTIVITIES

Activities	**Number**	**Weight (%)**
Lectures (on-site)	14	30%
Lectures (online videos)	7	20%
Problem solving and assignments	12	30%
Project and Presentations	1	20%
	Total	100

ASSESSMENT

Evaluation Criteria	**Weight** (%)
Quizzes	10%
Homework Assignments	30%
Project Assignment and Presentation	20%
Midterm Exam	20%
Final Exam/Submission	20%
Total	100%

For a detailed description of grading policy and scale, please refer to the website https://goo.gl/HbPM2y section 28.

COURSE LOAD

Activity	**Duration** (hour)	**Quantity**	**Work Load** (hour)
Lectures	3	14	42
Research (web, library)	5	1	5
Required Readings	1	14	14
Online course videos	1	7	7
Assignments	7	12	84
Project	40	1	40
Pre-work for Presentation	4	1	4
Pre-work for Quizzes	1	5	5
Pre-work for Midterm	20	1	20
Pre-work for Final	30	1	30
		General Sum	**251**

ECTS: 7,5 (Work Load/25-30)

CONTRIBUTION TO PROGRAMME OUTCOMES*

	PO1	PO2	PO3	PO4	PO5	PO6
LO1	5	5	3	3	3	3
LO2	5	5	4	4	4	3
LO3	4	5	5	5	3	3
LO4	4	5	5	5	5	4

* Contribution Level: 0: None, 1: Very Low, 2: Low, 3: Medium, 4: High, 5: Very High

WEEKLY SCHEDULE

W	**Topic**	**Outcomes**
1	Deep Feedforward Networks	LO1, LO2
	Activity: Online video lectures, readings	
2	Deep Feedforward Networks	LO1, LO2, LO3
	Activity: Online video lectures, readings, homework	
3	Regularization for Deep Learning	LO1, LO2, LO3
	Activity: Online video lectures, readings, quiz, homework	
4	Optimization for Training Deep Models	LO1, LO2, LO3
	Activity: Online video lectures, readings, homework	
5	Convolutional Networks	LO1, LO2, LO3, LO4
	Activity: Online video lectures, readings, homework	
6	Convolutional Networks	LO1, LO2, LO3, LO4
	Activity: Readings, quiz, homework	
7	Midterm Exam	LO1, LO2
8	Semester break	
9	Recurrent and Recursive Networks	LO1, LO2, LO3, LO4
	Activity: Online video lectures, readings, homework	
10	Recurrent and Recursive Networks	LO1, LO2, LO3, LO4
	Activity: Readings, quiz, homework	

11	Deep autoencoders Activity: Readings, quiz, homework	LO1, LO2, LO3
12	Deep generative models Activity: Readings, homework	LO1, LO2, LO3
13	Deep generative models Activity: Readings, homework	LO1, LO2, LO3
14	Deep generative models Activity: Readings, homework, quiz	LO1, LO2, LO3, LO4
15	Applications of deep learning Activity: Online video lectures, readings, homework	LO1, LO2, LO3, LO4
13	Final exam Activity: Project presentations	LO1, LO2, LO4

Prepared by
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1 May 2018