METU - Department of Computer Engineering

CENG 502 –Advanced Deep Learning

2023-2024 Spring

Web: https://user.ceng.metu.edu.tr/~skalkan/ADL/

Emailing List: METUClass page of the course

Instructors: Sinan Kalkan (A-209) [Office hours: by appointment]

Lectures: Tuesday, 9:40-12:30 [BMB-4]

Credits: METU: 3 Theoretical, 0 Laboratory; ECTS: 8.0

Catalog: Advanced deep learning problems and methods; Working with sequential data using Recurrent Neural Networks; Specialized Recurrent Neural Networks such as Elman, Jordan and Echo State Networks; Long Short Time Memory and its variants; Memory networks; Deep Neural Turing Machines; Deep Reinforcement Learning.

Textbook: We will mainly follow the state of the art with papers. However, the following might be handy at times:

- Y. Bengio, I. Goodfellow and A. Courville, "Deep Learning", MIT Press, 2016.

Grading:

Paper Presentation	30%
Paper Quizzes	30%
Project	40%

Prerequisite: CENG 501 or consent of the instructor.

Tentative Schedule:

Week & Date		Topic
1	**19 Feb**	**Review of Fundamental Deep Learning Methods** [Problem Definition; Overview of Approaches; Autoencoders; Convolutional Neural Networks; Deep/Restricted Boltzmann Machines]
2	**26 Feb**	**Review of Fundamental Deep Learning Methods** [Problem Definition; Overview of Approaches; Autoencoders; Convolutional Neural Networks; Deep/Restricted Boltzmann Machines]
3	**4 Mar**	**Attention in Deep Learning** [Attention types; Self-attention & transformers; Transformers in vision & NLP]
4	**11 Mar**	**Attention in Deep Learning** [Attention types; Self-attention & transformers; Transformers in vision & NLP]
5	**18 Mar**	**Attention in Deep Learning** [Attention types; Self-attention & transformers; Transformers in vision & NLP]
6	**25 Mar**	**Memory Networks** [Dynamic Memory Networks; Hierarchical Temporal Memory Networks; Sparse Distributed Memory]
7	**1 April**	**Memory Networks** [Dynamic Memory Networks; Hierarchical Temporal Memory Networks; Sparse Distributed Memory]
8	**8 April**	*Ramadan Feast; Term Break*
9	**15 Apr**	**Deep Turing Machines** [Turing Machine; Neural Turing Machine; Neural Random-Access Machine]
10	**22 Apr**	**Deep Reinforcement Learning** [Reinforcement Learning; Deep Reinforcement Learning]
11	**29 Apr**	**Deep Reinforcement Learning** [Reinforcement Learning; Deep Reinforcement Learning]
12	**6 May**	**Representation Learning** [Autoencoders; Self-supervised learning; Contrastive learning]
13	**13 May**	**Representation Learning** [Autoencoders; Self-supervised learning; Contrastive learning]
14	**19 May**	**Project demos**