Course Information

Course Code

5710796

Course Section

1

Course Title

DEEP GENERATIVE MODELS

Course Credit

3

Course ECTS

8.0

Course Catalog Description

Deep generative modeling with Autoregressive models; Energy-based models; Adversarial models; Variational models.

Prerequisites

No prerequisites

Consent of Dept./Inst.

CENG 783 or a similar course on the fundamentals of deep learning. Preferably strong background on the fundamentals of probability and statistics.

Schedule

Friday , 13:40 - 16:30, -

Course Website

https://user.ceng.metu.edu.tr/~gcinbis/courses

Learning Management System

https://odtuclass.metu.edu.tr

Instructor Information

Name/Title

Assist.Prof.Dr RAMAZAN GÖKBERK CİNBİŞ

Office Address

B205

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Personal Website

http://user.ceng.metu.edu.tr/~gcinbis/

http://user.ceng.metu.edu.tr/~gulmbis/

Office Phone

Office Hours

By appointment -- please email.

Course Objectives

At the end of the course, the students will be expected to:

- Comprehend a variety of deep generative models.
- Apply deep generative models to several problems.
- Know the open issues in learning deep generative models, and have a grasp of the current research directions.

Course Learning Outcomes

Students who passed the course will be able:

- to understand the theory behind comtemporary deep generative models,
- to have a grasp of the open issues and trends in generative models,
- to have an understanding of the advantages and disadvantages of different types of deep generative model formulations.

Instructional Methods

- Lectures
- Student paper presentations.
- Projects and project demonstrations

Lectures will be online (some will be live, ie synchronous, and some will be pre-recorded lectures, ie. asynchronous).

Tentative Weekly Outline

Week	Topic	Relevant Reading Assignments
1	Introduction, course logistics, deep learning review	
2	Review of probability, statistics and graphical models	
3	Autoregressive Flows & Maximum Likelihood Estimation	
4	Latent Variable Models & Variational Approximation	
5	Latent Variable Models, variational approximation (cont'd)	
6	Normalizing Flow Models	
7	Generative Adversarial Networks	
8	Generative Adversarial Networks	

Week	Topic	Relevant Reading Assignments
9	No class (national holiday)	
10	Generative Adversarial Networks, Evaluation metrics	
11	Energy-based Models	
12	Midterm (tentative)	
13	Hybrid Models & Discrete Latent Variable Models	
14	Paper presentations.	
15	Paper presentations / project demos. (tentative)	

Course Textbook(s)

There are no required textbooks for the course.

Course Material(s) and Reading(s)

Material(s)

Suggested Books:

- Y. Bengio, I. Goodfellow and A. Courville, ?Deep Learning?, MIT Press, 2016.
- C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.

Reading(s)

Suggested and required papers to read will be announced throughout the semester.

Assessment of Student Learning

Assessment	Dates or deadlines
Midterm: • May cover everything up to that date, including lectures & paper presentations. • May involve (random) oral exam.	

Assessment	Dates or deadlines

Projects (developer)

Each student (or group) will implement one particular algorithm and contribute to the shared git repository **in PyTorch**, including documentation & demo in the format of a **jupyter notebook**. (Details will be provided in class.)

- No free-form project. Each project is a proper & full-fledged implementation of one or more particular model(s) / paper(s).
- There will be version-1 and version-2 submissions. First version will be evaluated by the assigned reviewer(s), who will give a written feedback.
- The final grade will be a weighted average of the grade for the first version and the second version. Both versions will be graded by the instructor after submission of the final version.
- The developer is expected to submit a complete and near-final version of the project in the first version, and benefit from the reviewer feedback to fix any remaining minor problems in the second version.
- No code copy-paste is allowed, the submitted code + jupyter notebook should be a genuine implementation of the model. For model-independent utility functions (eg. data loading, etc), external code may be used with proper acknowledgement of the source.
- Projects will be submitted to a joint git repository. The repository (including all projects) are planned to be made publicly available online at the end of the semester.
- The minimum and maximum project developer group sizes will be determined within the first few weeks of the semester. Students may or may not be required to work individually.
- In the last week of classes or during the final exam periods, there will project demonstrations. Project demonstration durations and guidelines are to be declared during the semester.

Projects (reviewer)

Each student will be assigned as a peer-reviewer to one or more project(s) developed by the other student(s).

- The reviewer will be responsible for checking the implementation of the corresponding model and the jupyter notebook. Each reviewer will give a written feedback to the corresponding developer with a list of mistakes and missing points.
- Reviewer will have at least one week to review and give feedback.
- For mistakes and shortcomings denoted by the reviewer regarding the full submission material in the first version of a project, only the developer will be penalized. The developer(s) is expected to fix these problems in the second version of the project.
- For mistakes and shortcomings missed by the reviewer but found by the instructor(s) in the first version, both the developer and the reviewer will be penalized.
- The reviewer will additionally be evaluated in terms of the quality and coverage of his/her written review.

Assessment	Dates or deadlines

Paper presentations:

- Reserve presentation slot by email (first-come, first-served). You may choose from one of the suggested titles or propose an alternative paper.
- Prepare well for the presentation: you will effectively be the instructor of the class during your presentation. Please prepare your presentation as a short-lecture that focuses on a particular work, rather than a dry summary of the contents of the paper. Therefore, please cover important related work (if not already covered in the class) in your presentation, in order to (i) make the presentation accessible for everyone, and, (ii) properly discuss the strengths and weaknesses of the paper compared to related work.
- Each student will make one or more presentations. Each presentation should take around 20 minutes (excluding discussions). The expected duration and the expected number of presentations may be altered depending on class size. If a student makes multiple presentations, their grade averages will be taken.
- Each presenter is required to send us a complete draft of the slides (as a pdf) 2 days before the presentation date, and the final slides before class on the presentation date. Slides will be published on the course webpage.

Course Grading

Deliverable	Grade Points
Midterm	30
Paper presentation	20
Project - developer	30
Project - reviewer	10
Homework	5
Attendance	5
Total	100

Course Policies

Class Attendance

Class attendance is required. Online lecture attendance records will be used as reference with attendance records. Presence in both lecture hourse (in synchronous lectures) and paper presentation hours are required, latter is particularly important as a courtesy to the presenter.

Students are responsible for all material covered in class and paper presentations in the midterm, therefore, participation is strongly recommended. Some material in synchronous lectures, such as paper presentations by students, may not be made available for online access.

Any one of the following may result in an automatic FF / NA:

- not making the required number of applications for paper presentation with relevant papers (as described in class) for available presentation dates (among those announced in class) on time (as defined in class),
- not presenting a paper on his/her pre-scheduled date,
- not submitting his/her project (if the project is done individually),
- not contributing substantially to the project (if the project is done as a group),

- not writing a proper project review feedback,
- being absent in the midterm,
- being absent in his/her project presentation.

Information for Students with Disabilities

To obtain disability related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the ODTÜ Disability Support Office as soon as possible. If you need any accommodation for this course because of your disabling condition, please contact me. For detailed information, please visit the website of Disability Support Office: http://engelsiz.metu.edu.tr/

Academic Honesty

The METU Honour Code is as follows: *"Every member of METU community adopts the following honour code as one of the core principles of academic life and strives to develop an academic environment where continuous adherence to this code is promoted. The members of the METU community are reliable, responsible and honourable people who embrace only the success and recognition they deserve, and act with integrity in their use, evaluation and presentation of facts, data and documents."*