

Machine Learning Systems Design

Department of Computer Engineering
Sharif University of Technology
Spring 2023

Instructor

Ali Zarezadeh
zarezade@ce.sharif.edu
ali.zarezade@gmail.com
Tel: +98 21 8190 1334
Meeting Hours: By appointments

Teaching Assistants

Hossein Basafa *Lead TA*
hossein.basafa.hb@gmail.com

Aryan Ahadinia
aryan.ahadinia@sharif.edu

Ali Amiri
callmeamiri@gmail.com

Hossein Jafarinia
hussein.jafarinia@gmail.com

Narges Javid
jatages@gmail.com

Omid Ghahroodi
oghahroodi98@gmail.com

Objective

The purpose of this course is to empower students to research in the development of a complete cycle of making an intelligent model for use in a commercial product. Unlike the classic course of machine learning, in this course the automation of this cycle, and its challenges in industrial applications is desired. This cycle includes all practical components such as data collection and labeling, data preprocessing, scalable model development, system evaluation, deployment, and system monitoring, and detecting and dealing with data distribution changes. In the end, the student is expected to be able to automatically launch and maintain one of these cycles in a real-world problem with the help of the tools and techniques introduced in the course, as well as the ability to research in the systemic fields of machine learning. get the

References

- [1] Chip Huyen. *Designing Machine Learning Systems, An Iterative Process for Production-Ready Applications*. O'Reilly, 2022.
- [2] Andrew Ng. *Machine Learning Yearning*. 2017.
- [3] Sara Robinson Michael Munn and Valliappa Lakshmanan. *Machine Learning Design Patterns*. O'Reilly, 2020.
- [4] Martin Kleppmann. *Designing Data-Intensive Applications*. O'Reilly, 2017.
- [5] Andriy Burkov. *Machine Learning Engineering*. True Positive, 2020.
- [6] Cathy Chen. *Reliable Machine Learning*. O'Reilly, 2021.
- [7] Alfredo Dez. *Practical MLOps*. O'Reilly, 2021.

Grading

Please note that grades will be calculated out of 21.

- **Final Project:** 12 points
- **Assignments:** 3 points
- **Quizzes:** 2 points
- **Final Exam:** 4 points

Classes

Classes will be held in person in Ibn-Sina A22 on Saturday and Monday from 16:30 and 18:00. In special circumstances, virtual classes will be held on CW. Schedule of the classes is available in the appendix. If a class is canceled by students, that class may be considered as completed in the continuation of the curriculum.

Assignments and Project

We will have three assignments and three phase of projects. Each assignment and project phase is relevant to one of course topics. Students have 14 days to submit answer for assignments and 21 days to submit answer for each project phase. Regarding *the late submission policy*, students are allowed to submit answers with 5 days of delay. 15 days of delay will be ignored in way to minimize your loss. After that, 0.5% of the assignment grade will be subtracted for each hour of delay. Note to note that all assignments and

Exams

We we'll have 7 quizzes in this course. The first quiz is about course introduction. After that, each two quizzes are about one of three sections of the course. The quizzes will be held in class time in person. Schedule of quizzes is available in appendix. At the end, we will have a final exam. The date of final exam is announced in Edu.

Statement on Collaboration, Academic Honesty, and Plagiarism

We encourage working together whenever possible on homework, working problems in tutorials, and discussing and interpreting reading assignments. Talking about the course material is a great way to learn. Regarding homework, the following is a fruitful (and acceptable) form of collaboration; discuss with your classmates possible approaches to solving the problems, and then have each one fill in the details and write her/his own solution *independently*. At the top of each homework you turn in, we expect you to briefly list all sources of information you used, except known course materials like Text Book, Lectures, etc. A brief note such as “Did homework with ABC and ACB in study group” or “Looked at old solution for Problem 4” would be sufficient. Besides the morality issues, it will help TAs on grading your hand outs. There will be a zero tolerance policy for Cheating/Copying HW's. The first time you are caught, you will receive a -100% of grade for the task at hand. If you are caught for a second time, you will fail the course. Refer to the Education Committee's statement on homework etiquette.

Course Pages

- Webpage, <https://SharifMLSD.github.io/>: This is the main page of our course and all exercises, slides and course resources will be placed in it.
- Quera, <https://quera.org/course/13002/>: Delivery of exercises and announcements will be done entirely through Quera. Make sure you enter an email on Quera that you check regularly. Your questions from the exercises will also be answered in Quera.

Class Schedule

Week Date	Title	Assignment
17 Bahman	Introduction to ML system design	
24 Bahman	Introduction to ML system design	
1 Esfand	Introduction to ML system design	Quiz1
6 Esfand	Data LifeCycle	
8 Esfand	Data LifeCycle	Quiz2
13 Esfand	Data LifeCycle	
15 Esfand	Data LifeCycle	CA1
20 Esfand	Data LifeCycle	Workshop-dvc
22 Esfand	Data LifeCycle	Project-ph1
27 Esfand	Data LifeCycle	Quiz3
Happy New Year!		
14 Farvardin	Modeling Pipeline	
19 Farvardin	Modeling Pipeline	Deadline for Project-ph1
21 Farvardin	Modeling Pipeline	Quiz4
26 Farvardin	Modeling Pipeline	
28 Farvardin	Modeling Pipeline	CA2
4 Ord	Modeling Pipeline	
9 Ord	Modeling Pipeline	
11 Ord	Modeling Pipeline	Quiz5, Project-ph2
16 Ord	Deployment and Monitoring	
18 Ord	Deployment and Monitoring	
23 Ord	Deployment and Monitoring	Quiz4
25 Ord	Deployment and Monitoring	
30 Ord	Deployment and Monitoring	Deadline for Project-ph2
1 Khr	Deployment and Monitoring	CA3, Workshop-mlflow
6 Khr	Deployment and Monitoring	
8 Khr	Deployment and Monitoring	Quiz7, Project-ph3
13 Khr	Problem Solving	
10 Tir	Problem Solving	Deadline for Project-ph3

Important: Note that this schedule is tentative and may be affected by unforeseen circumstances.