

BLG 475E, SOFTWARE QUALITY AND TESTING

SPRING 2019-2020

HOMEWORK 1

Deadline: 13 March 2020 Friday 23:00

Submit your reports in **groups of two**. Only one report is enough from each group. The report should include the IDs and names of both students. You are required to prepare a report of **at most four pages** including answers to the questions below. Follow the article format provided in this link: <https://www.ieee.org/conferences/publishing/templates.html>

Please be careful about **plagiarism** while reporting your work. It is not allowed to directly take sentences from the articles. You need to write a summary of what you read in your own words. You may refer to the articles by giving them references, if you would like to emphasize a specific example, figure or if you want to make a quotation (single sentence only).

Read the following articles on testing machine learning (ML) based systems, and answer the questions below.

[1] Braiek, H. B. & Khomh, F. On testing machine learning programs. *Journal of Systems and Software*, 2020, 110542.

[2] Huang, S, et al. Challenges of Testing Machine Learning Applications. *International Journal of Performability Engineering*, 2018, 14.6.

[3] Gerasimou, S., Eniser, H. F., Sen, A., & Cakan, A. Importance-Driven Deep Learning System Testing. *arXiv preprint arXiv:2002.03433*, 2020.

Questions:

1. Why is testing necessary for ML or deep learning programs?
2. In [2], the authors mention the challenges of testing ML programs. Explain these challenges and the proposed techniques to address these challenges.
3. In [1], the approaches to detect errors in ML implementations are explained in Section 5.2. Briefly describe which errors in ML models can be detected using these approaches.
4. In [3], How does DeepImportance approach handle the “importance, diversity, effectiveness, correlation, layer sensitivity” criteria?
5. What is a neuron coverage? What are the differences between neuron and code coverage?
6. Find a deep learning or machine learning problem such as face recognition. Analyze this problem, decide the difficulties / challenges when you test the system, and propose solutions to these challenges. Which testing techniques would you prefer, why?

It is expected that one page of your final report is allocated to the sixth question. Specify the references that you used for selecting the deep learning or ML problem.