CS/DS 4342: Machine Learning
Homework 3

Due: November 18th, 2024 11:59pm

Instructions

- **Collaboration:** You must complete this assignment individually; Discussions about the homework to understand the problems are permitted, but sharing problem solutions or code is not allowed.

- **Formatting:** The assignment consists of one programming assignment. You must submit your solutions electronically as a .ipynp file containing the codes and results for the assignment.

- **Citing Sources:** Cite any sources of help (except the course materials) in your PDF.

- **Usage of AI tools:** Responsible and sensible use of generative AI (e.g., ChatGPT) is permitted. However, any use of generative AI must be documented, clearly stating how and for what task it has been used, along with the specific ways it contributed to your work.

- **Submission:** Submit the completed `HW3-template.ipynb` file, which should include the code you implemented and the test results for both parts of the assignment.

Objective: The goal of this assignment is to implement a hard-margin Support Vector Machine (SVM) using the built-in quadratic programming solver provided by the CVXOPT Python package.

Support Vector Machine (SVM) using the quadratic programming [100 points]

In this assignment, you will implement a class called `LinearSVM-QP` that supports the training of a linear, hard-margin Support Vector Machine (SVM) using the quadratic programming (QP) solver from the `cvxopt` Python package. Specifically, you will implement the `fit` and `predict` methods (along with other functions), ensuring they follow the same API as other machine learning tools in the `sklearn` package.

You will find function prototypes provided in the `HW3-template.ipynb` file under the *Linear SVM (QP)* section. Use the test code in the same file to validate your implementation and report your results within the Jupyter Notebook.