



Machine Learning (IC272)

Assignment 3

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Instructions

1. Submit one Jupyter Notebook or MATLAB script with both tasks, clearly structured and commented.
2. Attach a concise 2–3 page report summarizing preprocessing, implementation, and results, with at least two visualizations per task.
3. Do not use scikit-learn. Allowed libraries: numpy, pandas, matplotlib, and seaborn.
4. Marks: Task 1 (50 points), Task 2 (50 points), Total = 100 points. Late submissions: -20 points/day.

Dataset Overview

Given a dataset containing client demographic, financial, and marketing campaign information from a Portuguese banking institution, the objective is to predict whether a client will subscribe to a term deposit. The task involves implementing Support Vector Machine (SVM) classifiers with different kernel variations (Linear, Polynomial, RBF, and Sigmoid) and comparing their performance through systematic hyperparameter tuning.

Dataset Link:

https://www.kaggle.com/datasets/rashmiranu/banking-dataset-classification?select=new_train.csv

Task 1: SVM Classifier (50 Points)

- Load the dataset and perform necessary preprocessing steps.
- Implement a Linear SVM and tune the parameter C over the range $[0.01, 0.1, 1, 10, 100]$. Report the accuracy, precision, recall, F1-score, and the confusion matrix.
- Implement an SVM with a polynomial kernel for degrees 2, 3, 4, and 5. Plot the polynomial degree versus the F1-score.
- Implement an RBF SVM with default parameters. Perform joint optimization using $C \in [0.1, 1, 10, 100]$ and $\gamma \in [0.001, 0.01, 0.1, 1]$.
- Create a detailed comparison table including all SVM variants. Select the top three performing SVM models and compare the ensemble performance with the individual models.