E0 270-O: Assignment 1

Due date: February 21, 2024

Data

Consider a dataset consisting of images of handwritten digits. The task is to classify the given image as one of 10 possible digits. Each data point is an 8x8 image, whose features are the individual pixel values ranging from 0-16.

Task: Naive Bayes classification

There are ten classes, corresponding to ten digits, and the task is to classify a given image as containing a digit, based on the assumption that the features are conditionally independent given the class label, and that each feature is distributed according to a Gaussian distribution.

You are given a folder containing three python files: `main.py`, `model.py`, and `utils.py`.

1. Fill in the incomplete methods in `model.py` and `main.py` that are marked clearly to be filled in. Do not change any other line of code.
2. Run the code and note down the obtained train and test metrics.

Deliverables

- Completed code for implementing the Naive Bayes algorithm without using any libraries except `numpy` in the given incomplete code snippets.
- A report containing the complete details of the algorithm and your implementation, such as the final formula for posterior and how the classification has been done etc., along with justification for any extra assumptions made if necessary, and metrics corresponding to the learned model, such as confusion matrix, precision, recall and F_1-score with respect to each class, etc.

Submission

Attach **a single zip file** named in the format `Asst1_FirstName_LastName_5DigitsOfSRNo.zip` to the assignment in Teams, before the due date. The zip file should contain the following files: main.py, utils.py, model.py, report.pdf.