

Machine Learning Practical Laboratory: Collaborative Practical Learning with Incremental Tasks

Pedagogy Name: Collaborative Problem-Based Learning (CPBL)

Objectives:

1. To foster collaborative learning by enabling students to work in groups to solve machine learning tasks.
2. To enhance students' understanding of key machine learning concepts such as data pre-processing, feature selection, cross-validation, and model evaluation through hands-on practice.
3. To develop students' ability to interpret and discuss results from various machine learning models and algorithms.
4. To encourage critical thinking by having students analyze and compare the performance of different machine learning algorithms on diverse datasets.

Expected Outcomes:

By the end of these practical sessions, students will be able to:

1. Collaboratively perform machine learning tasks and document their findings effectively.
2. Apply feature selection techniques and evaluate their impact on model performance.
3. Implement cross-validation to assess the reliability of their machine learning models.
4. Analyze datasets using multiple machine learning algorithms (e.g., KNN, Naïve Bayes, SVM, NN) and interpret the results.
5. Compare and contrast the performance of different models on standard datasets, leading to a deeper understanding of model selection and evaluation.

Guidelines for the Practical File (From 4th Practical Onwards):

Group Formation:

- Students may form groups of a maximum of three members to complete the tasks and prepare the Practical File.

File Format:

- The Practical File format remains the same as previously provided. Additionally, you need to include the interpretation of results for various scenarios. Please refer to the attached template for guidance.

Tasks to be Included in the Practical File:

Practical 4: KNN

Tasks:

- Perform all tasks as mentioned in the practical list.

- Additionally, perform feature selection on the dataset and analyze the results. Document the findings as per the attached template.

Practical 5: PCA + SVM/NB

Tasks:

- Perform all tasks as mentioned in the practical list.
- Additionally, perform the following tasks on the given dataset:
 - Feature selection - PCA
 - Cross-validation
- Interpret and discuss the results as per the attached template.

Practical 6: Neural Network

Tasks:

- Perform all tasks as mentioned in the practical list.
- Additionally, perform the following tasks on the given dataset:
 - Feature selection
 - Cross-validation
- Use the **IBM Churn Dataset** for all the tasks. Document the findings as per the attached template.

Homework Assignments:

- **Tasks:**
 - In addition to the above tasks, students are required to perform the following analysis on the IBM Churn dataset:
 - Apply the KNN, Naïve Bayes, SVM, and Neural Network (NN) algorithms and document the analysis in the Practical File.
 - KNN & SVM Classification Task:
 - Apply the KNN & SVM algorithm for classification on the following datasets:
 - Pima Dataset
 - IBM Churn Dataset
 - IRIS Dataset
 - Car Evaluation Dataset
 - Include the analysis and results for each dataset in the Practical File.
- **Note:**
 - The Homework Assignment is compulsory for all students.
 - The evaluation of the Homework Assignment will be conducted during Continuous Practical Evaluation 3.

Guidelines and Conditions:

1. Group Collaboration:

- Each group is responsible for ensuring that all members contribute equally to the tasks. Group members should divide the work equitably and collaborate on the analysis and documentation.

2. Documentation Standards:

- All results and findings must be clearly documented using the provided template. The Practical File should be well-organized, with each task clearly labeled and explained.

3. Plagiarism Policy:

- Any form of plagiarism will result in penalties. Students must ensure that all analyses and interpretations are original and done independently.

4. Timely Submission:

- The Practical File, including the Homework Assignment, must be submitted by the specified deadline. Late submissions may result in deductions in marks.