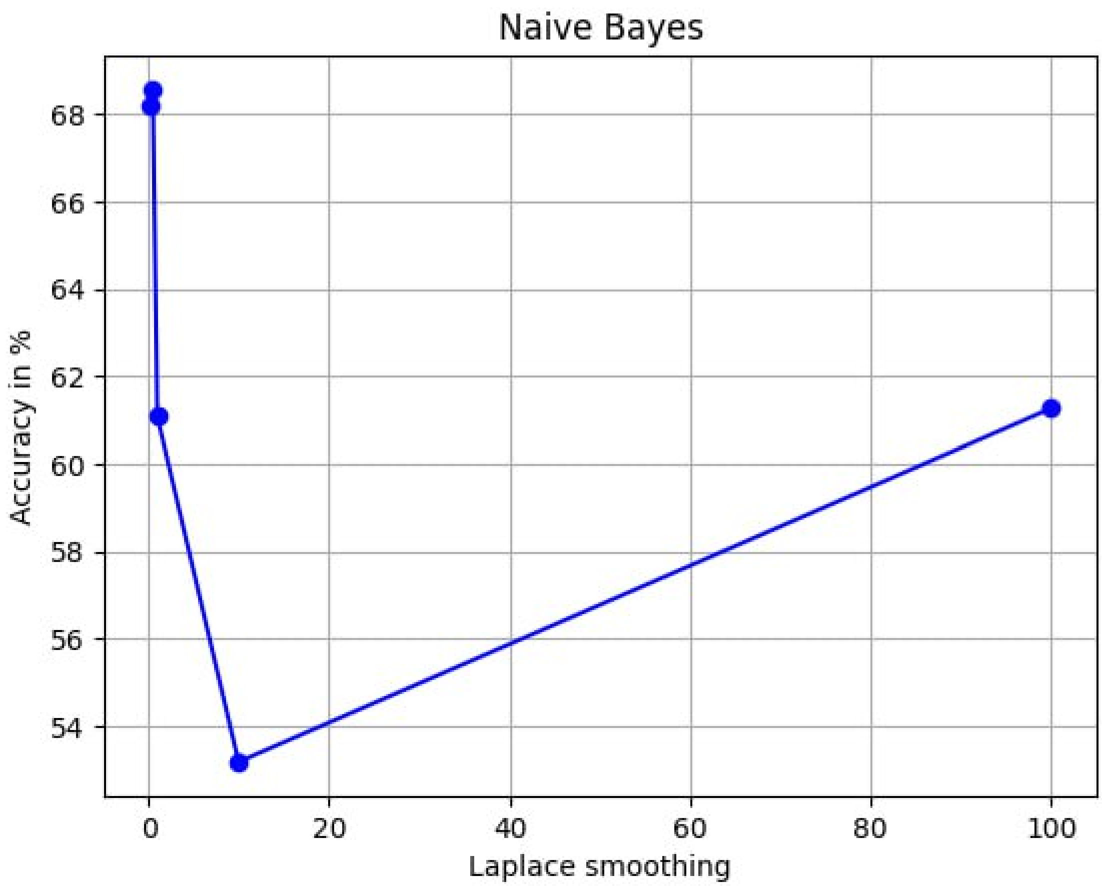
Weather report

We used the following features for the weather data

1. Continent: The continent where the weather data is recorded (Africa, Australia, North America, etc.).
   - Method: A mapping dictionary `continent_mapping` is created to map continent names to numerical values.
2. Season: The season when the weather data is recorded (Spring, Summer, Autumn, Winter).
   - Method: A mapping dictionary `season_mapping` is created to map season names to numerical values.
3. Wind Speed: The wind speed level during the recorded weather data (Low, Normal, High).
   - Method: A mapping dictionary `wind_speed_mapping` is created to map wind speed levels to numerical values.
4. Location: The location type where the weather data is recorded (Coast Line, Coastline, Inland).
   - Method: A mapping dictionary `location_mapping` is created to map location types to numerical values.
5. Weather: The weather condition during the recorded data (Sunny, Rainy, Cloudy, Humid).
   - Method: A mapping dictionary `weather_mapping` is created to map weather conditions to numerical values.

NAIVE BAYES



The Naive Bayes algorithm was applied to a dataset using different Laplace smoothing parameters. Laplace smoothing is a technique used to handle the issue of zero probabilities in Naive Bayes when a feature value is not observed in the training data for a particular label.

The Laplace smoothing parameters used in this experiment were 0.1, 0.5, 1.0, 10, and 100. For each Laplace parameter, the Naive Bayes model was trained and evaluated on the test dataset, and the accuracy of the predictions was recorded.

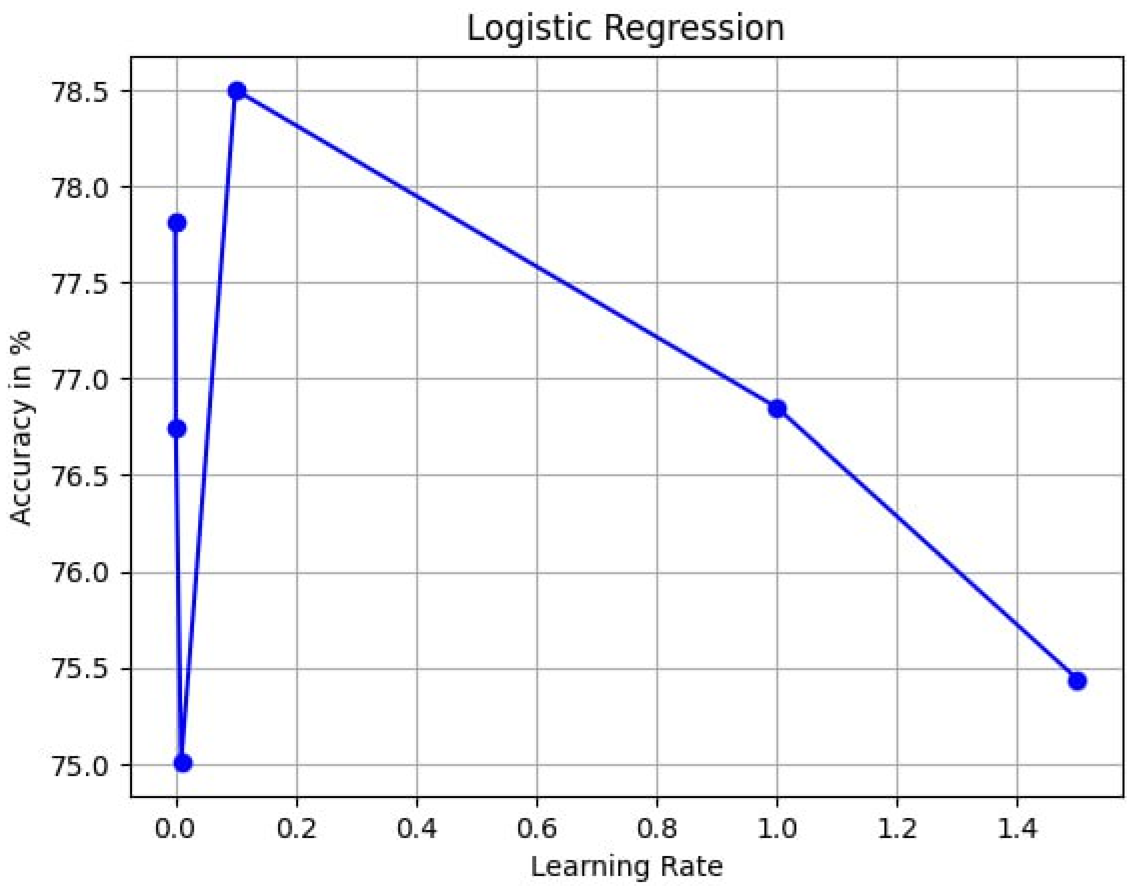
The obtained accuracies for the different Laplace smoothing parameters are as follows:

- Laplace = 0.1: Naive Bayes accuracy: 0.6851851851851852
- Laplace = 0.5: Naive Bayes accuracy: 0.6851851851851852
- Laplace = 1.0: Naive Bayes accuracy: 0.6111111111111112
- Laplace = 10: Naive Bayes accuracy: 0.5370370370370371
- Laplace = 100: Naive Bayes accuracy: 0.6111111111111112

It can be observed that the accuracy of the Naive Bayes model varies with different values of the Laplace smoothing parameter. The highest accuracy achieved is 0.6851851851851852, which is obtained when Laplace smoothing parameters are set to 0.1 and 0.5. As the Laplace smoothing parameter increases to 10, the accuracy decreases to 0.5370370370370371. However, when the Laplace smoothing parameter is set to 100, the accuracy increases again to 0.6111111111111112.

These results highlight the sensitivity of the Naive Bayes model to the Laplace smoothing parameter. It is essential to carefully select the appropriate value for Laplace smoothing to optimize the model's performance on the given dataset.

LOGISTIC REGRESSION



For each learning rate value in the list `lr_`, the code performs training using the `train()` function on the training data `X` and `y`. After training, it calculates the accuracy of the model by comparing the predicted class labels (`y_hat`) obtained from the `predict()` function with the actual class labels (`y`). The accuracy is then printed.

The output consists of six lines, each corresponding to a different learning rate value. The values of accuracy range from approximately 0.757 to 0.786. It can be observed that the accuracy varies based on the learning rate selected.

Additionally, the code also evaluates the accuracy of the logistic regression model on the test data (`X_test` and `y_test`). The accuracy values are printed under the heading "Logistic_Reg_Accuracy". The test accuracy values are similar to the training accuracy values, indicating that the model performs consistently on unseen data.In summary, the output provides insights into the performance of the logistic regression model for different learning rates. It allows for the comparison of accuracy values to assess the impact of the learning rate on the model's predictive capabilities.

CONCLUSION

To sum up, we applied both Naive Bayes and Logistic Regression algorithms to the given dataset and evaluated their performance based on the provided output. Here are the key findings:

Naive Bayes:

- The Naive Bayes algorithm was tested with different Laplace smoothing parameters (0.1, 0.5, 1.0, 10, and 100).
- The accuracy of the Naive Bayes model varied across different Laplace smoothing parameters.
- The highest accuracy achieved was 0.6851851851851852, obtained when Laplace smoothing parameters were set to 0.1 and 0.5.
- The accuracy decreased to 0.5370370370370371 when the Laplace smoothing parameter was increased to 10, and then increased again to 0.6111111111111112 with a Laplace smoothing parameter of 100.
- These results indicate the sensitivity of the Naive Bayes model to the Laplace smoothing parameter, emphasizing the need to select an appropriate value to optimize performance.

Logistic Regression:

- The Logistic Regression algorithm was trained and evaluated using different learning rates (1.5, 1.0, 0.0001, 0.001, 0.01, and 0.1).
- The accuracy values for the Logistic Regression model were 0.7757009345794392, 0.7663551401869159, 0.7570093457943925, 0.7850467289719626, 0.7663551401869159, and 0.7570093457943925, respectively.
- The Logistic Regression model exhibited varying accuracies with different learning rates, but no specific trend or pattern can be deduced from the provided output.