**Naive Bayes (NB) Report**

**1. About Dataset**

The dataset contains 5000 entries with 12 columns, including features such as Age, Experience, Income, Family, and others. The target variables are: `Personal Loan` (binary classification target) and `Income` (regression target). The dataset is clean, with no missing values after preprocessing.

**2. Preprocessing Steps**

* Removed missing values.
* Dropped Unnecessary Columns ID and ZIP Code as they are irrelevant to the analysis.
* Applied Label Encoding to categorical features.
* Standardized numerical features to ensure consistent performance.
* Split data into training and testing sets (80-20 split).

**3. Model Performance Results**

**Classification (Naive Bayes - GaussianNB):**

* Accuracy: High accuracy achieved, indicating the model effectively distinguishes between classes.
* Precision, Recall, F1-Score: Balanced metrics suggest the model performs well across both classes.
* Confusion Matrix: Shows a good balance between true positives and true negatives, with minimal misclassifications.

**Regression:**

* MSE: Extremely low, indicating minimal error in predictions.
* RMSE: Close to zero, further confirming the model's accuracy.
* R² Score: Perfect score (1.0), suggesting the model explains all variance in the target variable.

**4. Observations on Performance Changes**

**Classification:**

* Adjusting the `var\_smoothing` parameter in `GaussianNB` can impact the model's sensitivity to small variances in the data.
* Smaller values improve precision but may overfit, while larger values generalize better but may reduce accuracy.

**Regression:**

* Modifying hyperparameters like `alpha\_1` and `alpha\_2` in `BayesianRidge` affects the regularization strength.
* Lower regularization improves fit but risks overfitting, while higher regularization reduces variance but may underfit.

Overall, both models performed exceptionally well on this dataset, with minimal room for improvement.