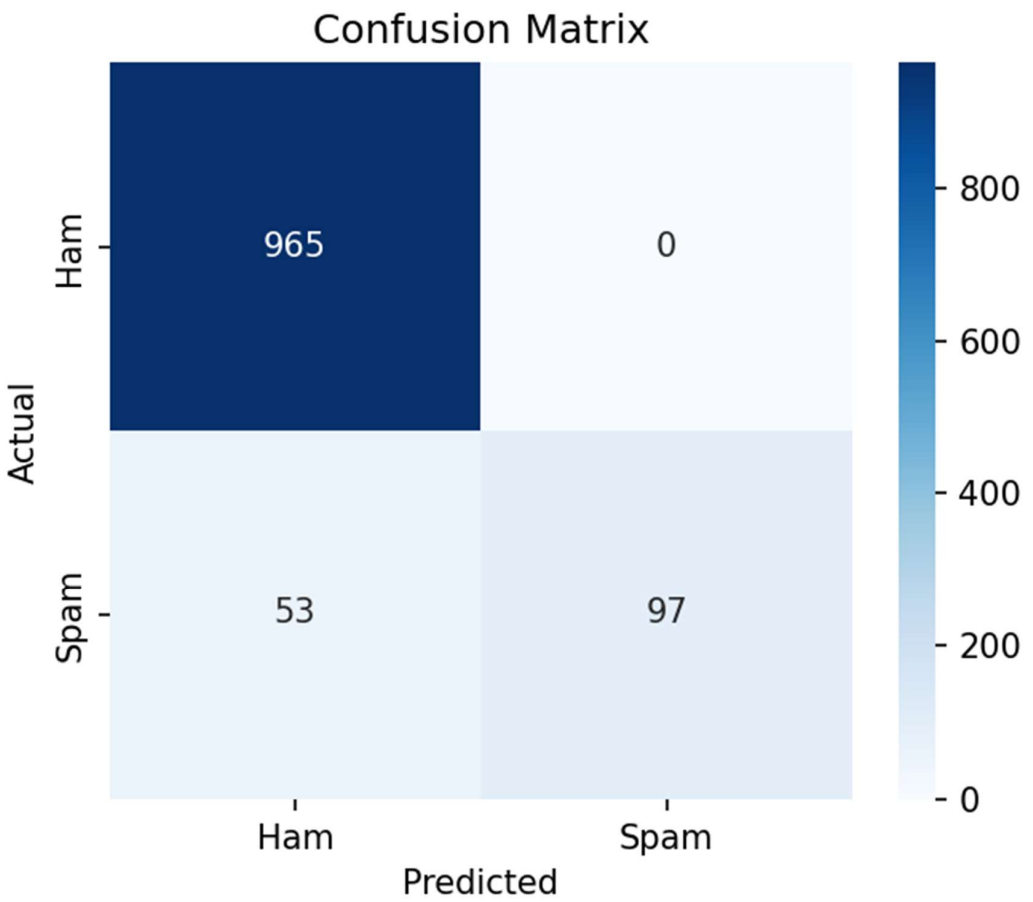
24ADI003/-24BAD409_EXPERIMENT4

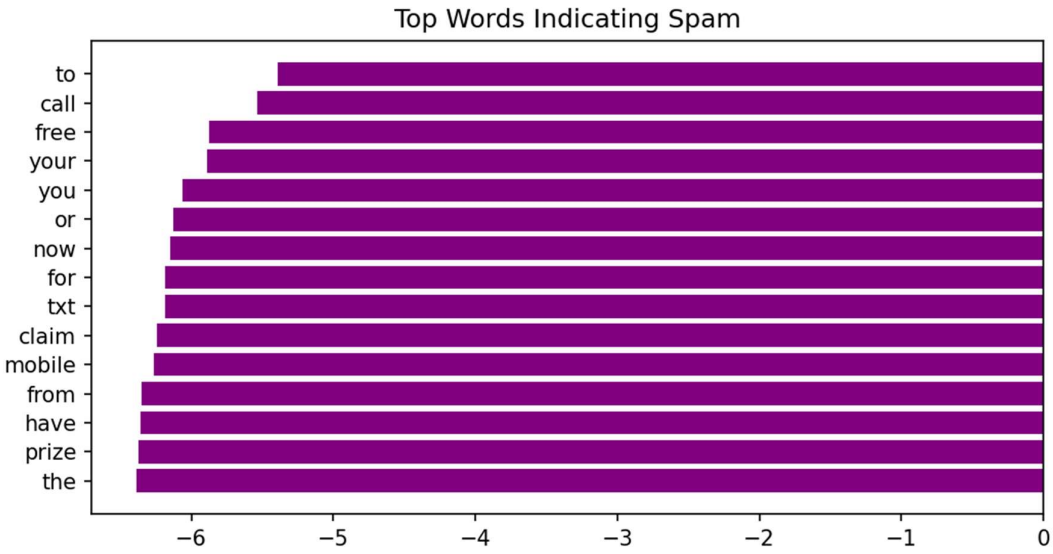
1.Multinomial Naïve Bayes

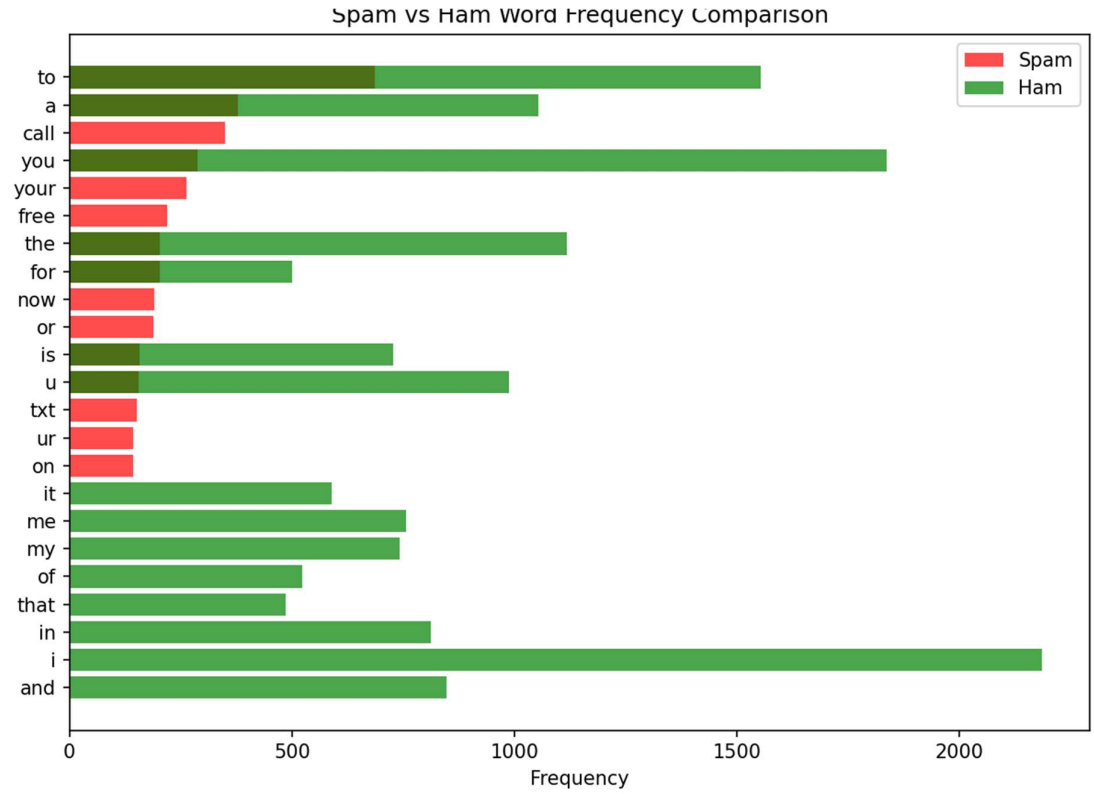
Ouput:

```
2
Enter "help" below or click "Help" above for more information.

= RESTART: C:/Users/SHALINI A/AppData/Local/Programs/Python/Python313/ML EX
A Shalini-24BAD409
Accuracy: 0.9524663677130045
Precision: 1.0
Recall: 0.6466666666666666
F1: 0.7854251012145749

Report:
              precision    recall  f1-score   support

           0       0.95      1.00      0.97       965
           1       1.00      0.65      0.79       150

    accuracy                           0.95      1115
   macro avg       0.97      0.82      0.88      1115
weighted avg       0.95      0.95      0.95      1115


Misclassified Samples:
1044    we know someone who you know that fancies you ...
683     hi im sue i am  years old and work as a lapdan...
15      xxxmobilemovieclub to use your credit click th...
4071    loans for any purpose even if you have bad cre...
2312    tddnewsletteremccouk more games from thedailyd...
3979                                 ringtoneking
1879    u have a secret admirer who is looking  make c...
4369    do you want a new video handset  any time any ...
1779    loan for any purpose    homeowners  tenants we...
1612    rtking pro video club need help inforingtoneki...
Name: text, dtype: object

With Laplace Smoothing (alpha=0.1)
Accuracy: 0.9820627802690582
Precision: 1.0
Recall: 0.8666666666666667
F1: 0.9285714285714286
```

Figures:


Confusion Matrix
965
0
53
97
Ham
Spam
Actual
Ham
Spam
Predicted
800
600
400
200
0





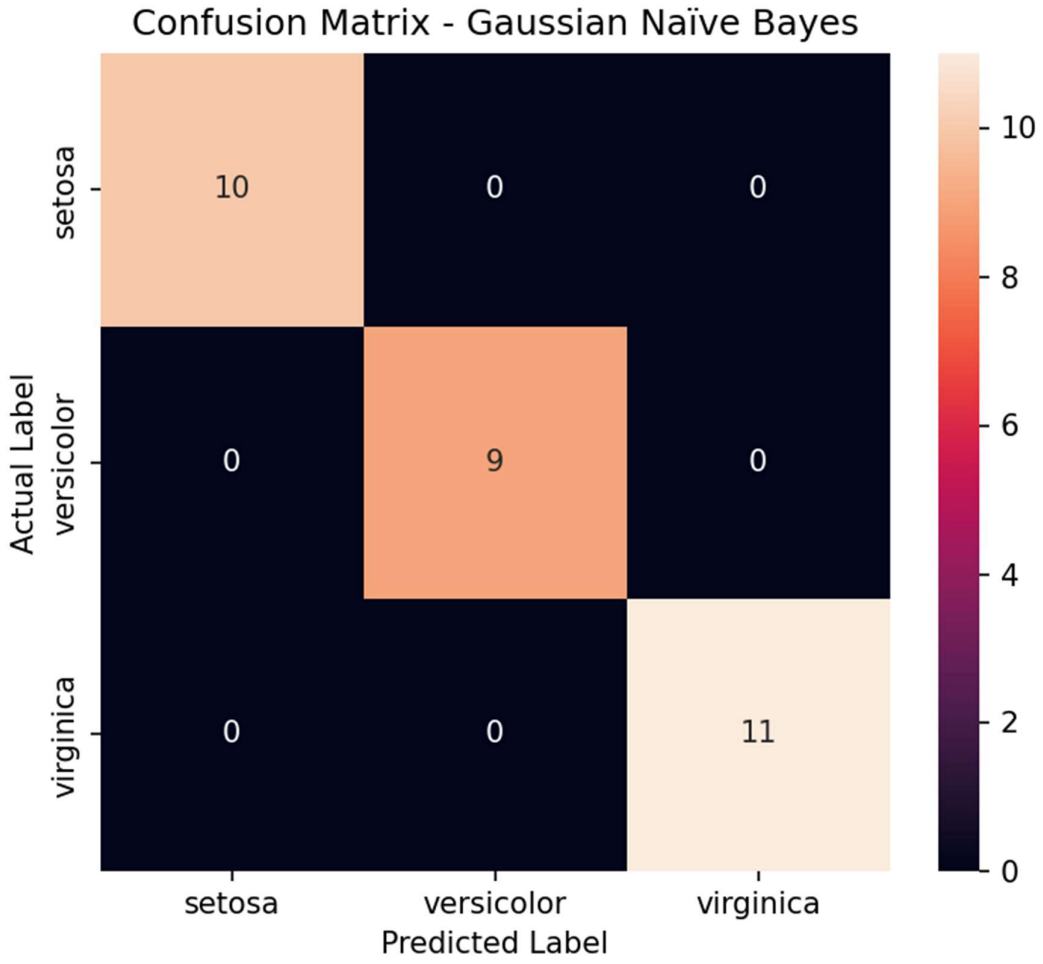
2.Gaussian Naïve Bayes

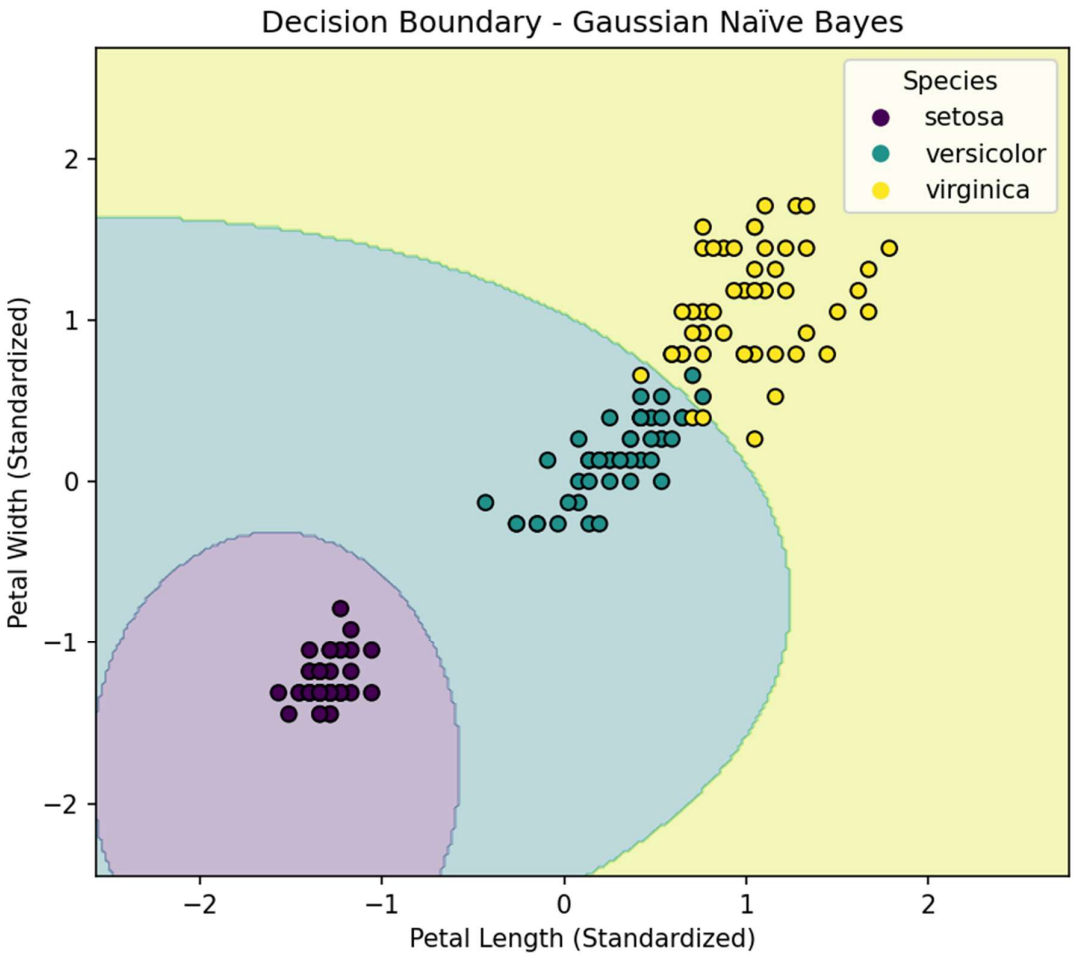
Ouput:

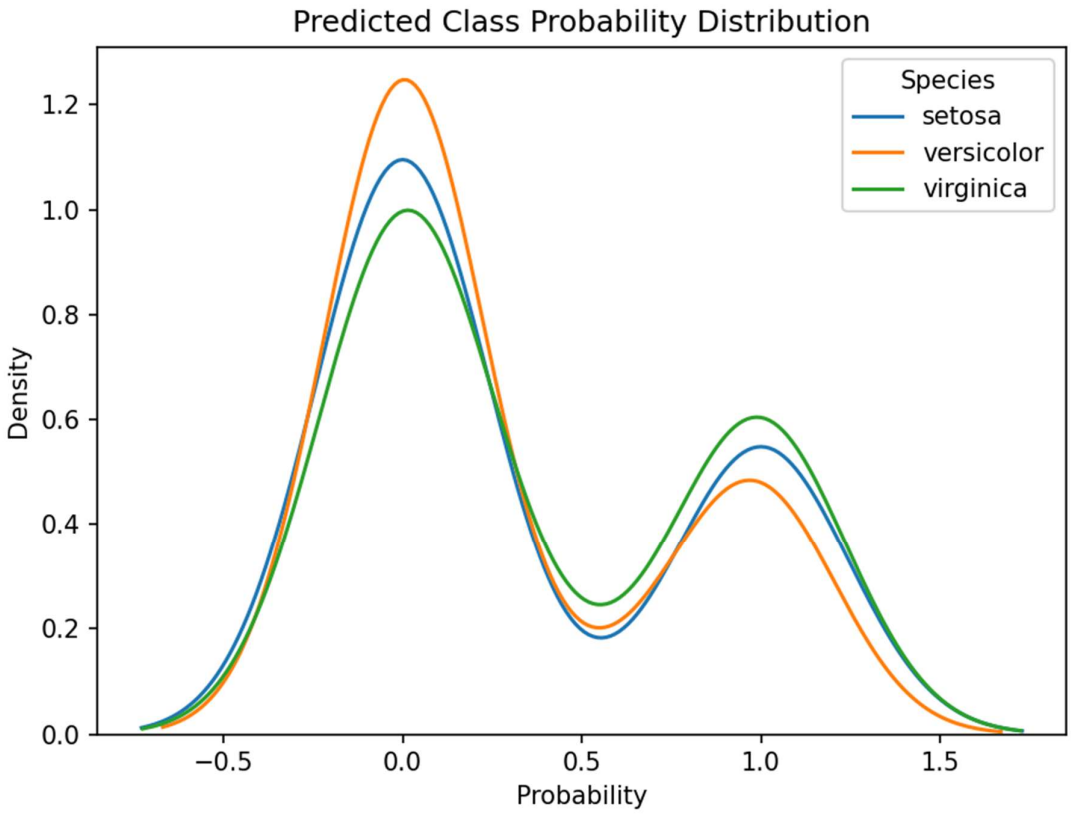
```
Python 3.13.7 (tags/v3.13.7:bcee1c3, Aug 14 2025, 14:15:11) [MSC v.1944 64 bit (A
Enter "help" below or click "Help" above for more information.

= RESTART: C:/Users/SHALINI A/AppData/Local/Programs/Python/Python313/ML
A SHALINI-24BAD409
IRIS CLASSIFICATION USING GAUSSIAN NAÏVE BAYES
   sepal length (cm)  sepal width (cm)  ...  petal width (cm)  species
0                5.1               3.5  ...               0.2        0
1                4.9               3.0  ...               0.2        0
2                4.7               3.2  ...               0.2        0
3                4.6               3.1  ...               0.2        0
4                5.0               3.6  ...               0.2        0

[5 rows x 5 columns]
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   sepal length (cm)  150 non-null    float64
 1   sepal width (cm)   150 non-null    float64
 2   petal length (cm)  150 non-null    float64
 3   petal width (cm)   150 non-null    float64
 4   species            150 non-null    int64
dtypes: float64(4), int64(1)
memory usage: 6.0 KB
None
       sepal length (cm)  sepal width (cm)  ...  petal width (cm)     species
count         150.000000        150.000000  ...        150.000000  150.000000
mean            5.843333          3.057333  ...          1.199333    1.000000
std             0.828066          0.435866  ...          0.762238    0.819232
min             4.300000          2.000000  ...          0.100000    0.000000
25%             5.100000          2.800000  ...          0.300000    0.000000
50%             5.800000          3.000000  ...          1.300000    1.000000
75%             6.400000          3.300000  ...          1.800000    2.000000
max             7.900000          4.400000  ...          2.500000    2.000000

[8 rows x 5 columns]
sepal length (cm)    0
sepal width (cm)     0
petal length (cm)    0
```

```
[8 rows x 5 columns]
sepal length (cm)    0
sepal width (cm)     0
petal length (cm)    0
petal width (cm)     0
species              0
dtype: int64
Accuracy: 1.0
Precision: 1.0
Recall: 1.0
F1 Score: 1.0
              precision    recall  f1-score   support

      setosa       1.00      1.00      1.00        10
  versicolor       1.00      1.00      1.00         9
   virginica       1.00      1.00      1.00        11

    accuracy                           1.00        30
   macro avg       1.00      1.00      1.00        30
weighted avg       1.00      1.00      1.00        30

       Actual   Predicted
0  versicolor  versicolor
1      setosa      setosa
2   virginica   virginica
3  versicolor  versicolor
4  versicolor  versicolor
5      setosa      setosa
6  versicolor  versicolor
7   virginica   virginica
8  versicolor  versicolor
9  versicolor  versicolor
          setosa    versicolor     virginica
0   5.973226e-90  9.956358e-01  4.364232e-03
1   1.000000e+00  4.961577e-14  6.549219e-21
2  7.318611e-290  4.929473e-12  1.000000e+00
3   2.818383e-94  9.775936e-01  2.240644e-02
4  1.138764e-105  8.700226e-01  1.299774e-01
Logistic Regression Accuracy: 1.0
```

Figures:


Confusion Matrix - Gaussian Naïve Bayes
Actual Label
setosa
versicolor
virginica
10
0
0
0
9
0
0
0
11
setosa
versicolor
virginica
Predicted Label
10
8
6
4
2
0


Decision Boundary - Gaussian Naïve Bayes
Species
setosa
versicolor
virginica
Petal Width (Standardized)
Petal Length (Standardized)
2
1
0
−1
−2
−2
−1
0
1
2


Predicted Class Probability Distribution
Species
setosa
versicolor
virginica
Density
Probability
0.0
0.2
0.4
0.6
0.8
1.0
1.2
−0.5
0.0
0.5
1.0
1.5