```
#Program-8
""""
Implement Naive Bayes Classifier for text classification task.
url: https://www.kaggle.com/datasets/uciml/sms-spam-collection-dataset
""""

import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.naive_bayes import MultinomialNB, GaussianNB
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.metrics import accuracy_score, f1_score
import matplotlib.pyplot as plt

# Load the SMS Spam Collection Dataset
sms_data = pd.read_csv("spam.csv", encoding='latin-1') # url:
https://www.kaggle.com/datasets/uciml/sms-spam-collection-dataset

# Preprocess the data
sms_data = sms_data[['v1', 'v2']]
sms_data = sms_data.rename(columns={'v1': 'label', 'v2': 'text'})


sms_data
```

```
     label                                               text
0      ham  Go until jurong point, crazy.. Available only ...
1      ham                      Ok lar... Joking wif u oni...
2     spam  Free entry in 2 a wkly comp to win FA Cup fina...
3      ham  U dun say so early hor... U c already then say...
4      ham  Nah I don't think he goes to usf, he lives aro...
...    ...                                                ...
5567  spam  This is the 2nd time we have tried 2 contact u...
5568   ham              Will Ì_ b going to esplanade fr home?
5569   ham  Pity, * was in mood for that. So...any other s...
5570   ham  The guy did some bitching but I acted like i'd...
5571   ham                         Rofl. Its true to its name

[5572 rows x 2 columns]
```

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# Split the data into features and labels
X = sms_data['text']
y = sms_data['label']

# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.2, random_state=42)

# EDA 1: Distribution of Classes
class_distribution = sms_data['label'].value_counts()
class_distribution.plot(kind='pie', autopct='%1.1f%%',
colors=['#66b3ff','#99ff99'])
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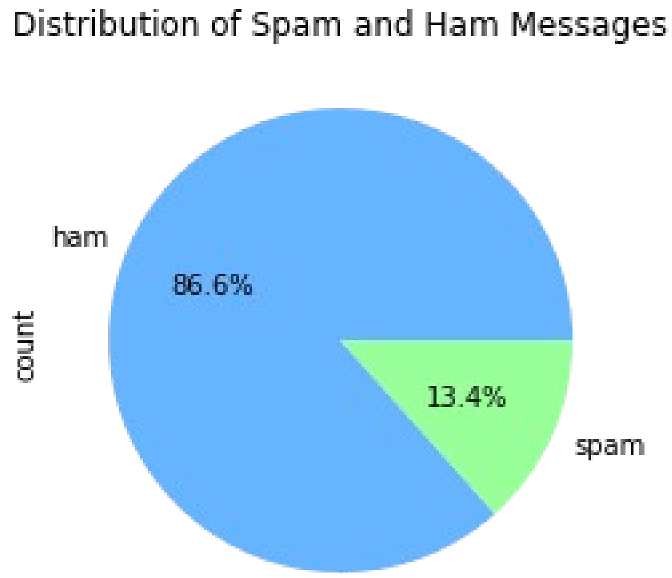
plt.title('Distribution of Spam and Ham Messages')
plt.show()
```



```
# Create a CountVectorizer to convert text data into numerical
features
vectorizer = CountVectorizer()
X_train_vec = vectorizer.fit_transform(X_train)
X_test_vec = vectorizer.transform(X_test)

X_train_vec
```

```
<4457x7735 sparse matrix of type '<class 'numpy.int64'>'
	with 58978 stored elements in Compressed Sparse Row format>
```

```
# Train a Multinomial Naive Bayes classifier
mnb = MultinomialNB(alpha=0.8, fit_prior=True, force_alpha=True)
mnb.fit(X_train_vec, y_train)
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```
MultinomialNB(alpha=0.8, force_alpha=True)
```

```
# Train a Gaussian Naive Bayes classifier
gnb = GaussianNB()
gnb.fit(X_train_vec.toarray(), y_train)
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```
GaussianNB()
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```
# Evaluate the models using accuracy and F1-score
y_pred_mnb = mnb.predict(X_test_vec)
accuracy_mnb = accuracy_score(y_test, y_pred_mnb)
f1_mnb = f1_score(y_test, y_pred_mnb, pos_label='spam')
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```
y_pred_gnb = gnb.predict(X_test_vec.toarray())
accuracy_gnb = accuracy_score(y_test, y_pred_gnb)
f1_gnb = f1_score(y_test, y_pred_gnb, pos_label='spam')

# Print the results
print("Multinomial Naive Bayes - Accuracy:", accuracy_mnb)
print("Multinomial Naive Bayes - F1-score for 'spam' class:", f1_mnb)

print("Gaussian Naive Bayes - Accuracy:", accuracy_gnb)
print("Gaussian Naive Bayes - F1-score for 'spam' class:", f1_gnb)
```

```
Multinomial Naive Bayes - Accuracy: 0.9838565022421525
Multinomial Naive Bayes - F1-score for 'spam' class:
0.9370629370629371
Gaussian Naive Bayes - Accuracy: 0.9004484304932735
Gaussian Naive Bayes - F1-score for 'spam' class: 0.7131782945736436
```