Data Collection and Preprocessing Phase

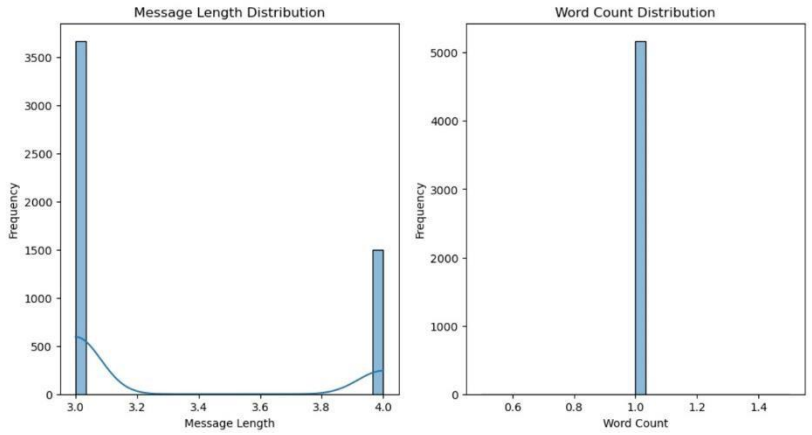
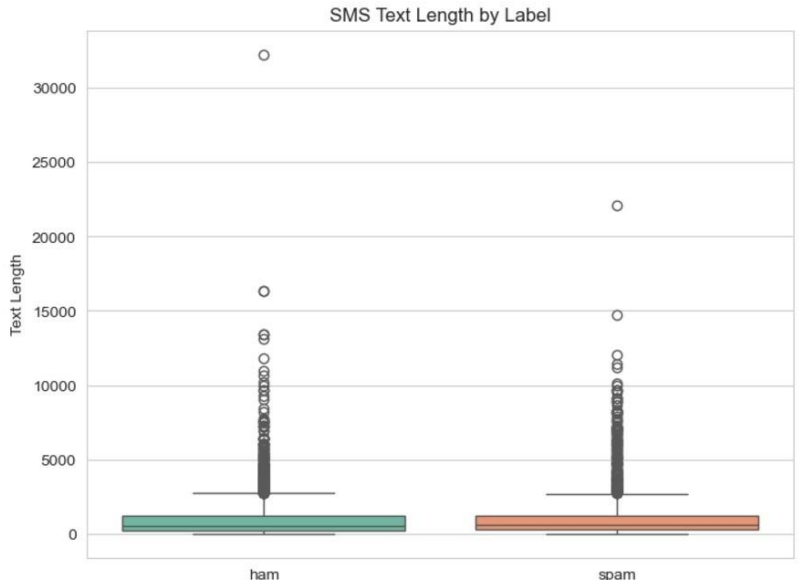
Date	15 March 2024
Team ID	SWTID1728285970
Project Title	SMS- Spam Detection Using NLP
Maximum Marks	6 Marks

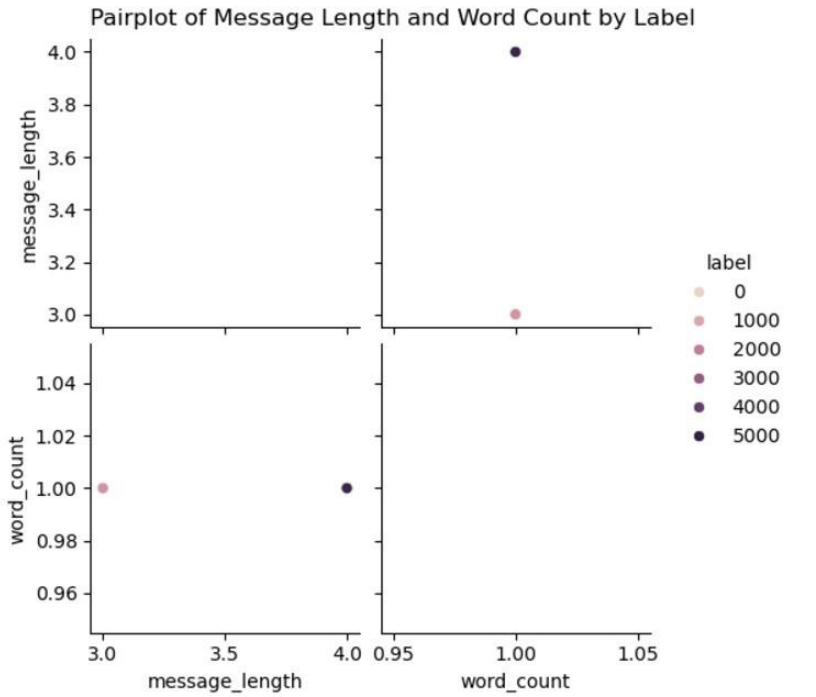
Data Exploration and Preprocessing Template

Identifies data sources, assesses quality issues like missing values and duplicates, and implements resolution plans to ensure accurate and reliable analysis.

Section	Description
Data Overview	Dimension: 5171 rows × 4 columns

	Unnamed: 0	label_num
count	5171.000000	5171.000000
mean	2585.000000	0.289886
std	1492.883452	0.453753
min	0.000000	0.000000
25%	1292.500000	0.000000
50%	2585.000000	0.000000
75%	3877.500000	1.000000
max	5170.000000	1.000000

Univariate Analysis	
Bivariate Analysis	

Multivariate Analysis	
Outliers and Anomalies	-

Data Preprocessing Code Screenshots

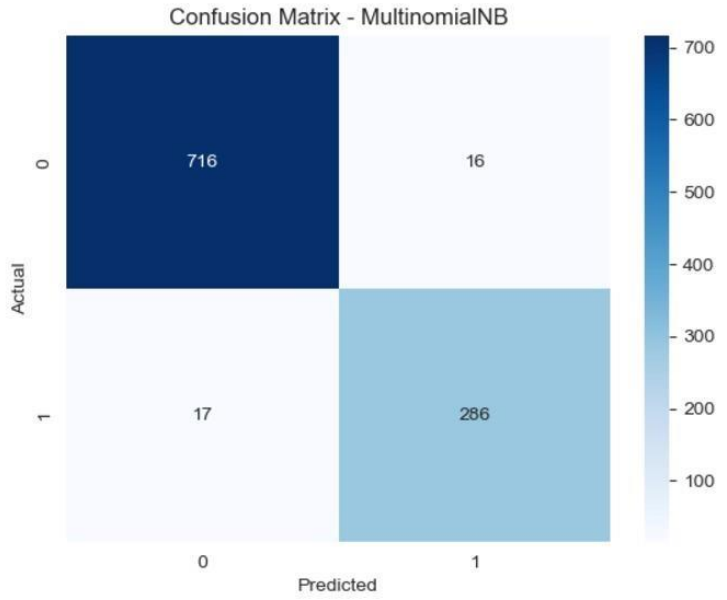
Loading Data

```
#Load our dataset
df = pd.read_csv("spam_ham_dataset.csv")
```

```
#top 5 rows of the dataframes
df.head()
```

	Unnamed: 0	label	text	label_num
0	605	ham	Subject: enron methanol ; meter # : 988291\r\n...	0
1	2349	ham	Subject: hpl nom for january 9 , 2001\r\n(see...	0
2	3624	ham	Subject: neon retreat\r\nho ho ho , we ' re ar...	0
3	4685	spam	Subject: photoshop , windows , office . cheap ...	1
4	2030	ham	Subject: re : indian springs\r\nthis deal is t...	0

Handling Missing Data	[5]: ``` # Drop the column'Unnamed: 0' df = df.drop("Unnamed: 0", axis=1) ``` [6]: ``` # Return the shape of the data df.shape ``` [6]: ``` (5171, 3) ``` [7]: ``` # Return the number of dimensions df.ndim ``` [7]: ``` 2 ``` [8]: ``` # Return the size of the data df.size ``` [8]: ``` 15513 ``` [9]: ``` # Returns the sum of all NA values df.isna().sum() ``` [9]: ``` label 0 text 0 label_num 0 dtype: int64 ```

Data Transformation	``` import seaborn as sns import matplotlib.pyplot as plt # Confusion matrix for Naive Bayes sns.heatmap(cm, annot=True, fmt="d", cmap="Blues") plt.title("Confusion Matrix - MultinomialNB") plt.ylabel("Actual") plt.xlabel("Predicted") plt.show() ``` 

Feature Engineering	

```
# Download stopwords if necessary
nltk.download('stopwords')

# Initialize variables
corpus = []  # List to store preprocessed text
pe = PorterStemmer()  # Initialize stemmer
stopword = stopwords.words("english")  # List of stopwords

# Loop through all rows in the dataset for text preprocessing
for i in range(len(df)):
    # Remove non-alphanumeric characters
    text = re.sub("[^a-zA-Z0-9]", " ", df["text"][i])

    # Convert text to lowercase
    text = text.lower()

    # Split the text into words
    text = text.split()

    # Apply stemming and remove stopwords
    text = [pe.stem(word) for word in text if word not in set(stopword)]

    # Join the words back into a single string
    text = " ".join(text)

    # Append the processed text to the corpus
    corpus.append(text)

# Convert the preprocessed text data into numerical features using TfidfVectorizer
tfidf = TfidfVectorizer(max_features=35000)  # Limit to top 35000 features
X = tfidf.fit_transform(corpus).toarray()  # Transform the corpus into a feature matrix

# Extract dependent variable (target labels) from the dataset
y = pd.get_dummies(df['label'])['spam'].values  # Convert 'spam' and 'ham' labels to binary values
```

Save Processed Data	

```
import pickle  ## Importing pickle for dumping models
pickle.dump(cv, open('cv-transform.pkl', 'wb'))  ## Saving into cv-transform.pkl file
```

```
import pickle
pickle.dump(model , open ("spam-sms-mnb-model.pkl" , "wb"))
```