

# SMS Spam/Ham Classifier Project Report

## 1. Introduction

This project focuses on building an intelligent SMS Spam/Ham Classifier that can automatically identify whether an incoming message is Spam or Ham (Not Spam). The goal is to use machine learning and natural language processing (NLP) to classify text messages based on their content. This system is designed using Python, Scikit-learn, and Streamlit, making it interactive and practical.

## 2. Dataset Details

The dataset used in this project is the 'SMS Spam Collection Dataset' from the UCI Machine Learning Repository. It contains approximately 5,500 messages labeled as either 'spam' or 'ham'. Each message is paired with its label, indicating whether it is a legitimate or promotional/fraudulent text.

## 3. Model and Methodology

The system is based on the Multinomial Naive Bayes algorithm, a probabilistic classifier ideal for text data. The text data is first cleaned, tokenized, and transformed into numerical vectors using TF-IDF (Term Frequency-Inverse Document Frequency). The model is trained to calculate the likelihood that a given message belongs to either the Spam or Ham class.

## 4. Model Performance

The classifier achieved an accuracy of approximately 97% on the test dataset. The precision and recall values, around 0.95 and 0.96 respectively, indicate the model's ability to detect spam messages accurately while minimizing false alarms. This performance validates the effectiveness of Naive Bayes for spam detection.

## 5. Example Predictions

The model was tested with various examples to validate its predictions. For instance, messages like 'You've won a free trip to Paris! Click to claim your prize!' and 'Get a free iPhone!!!!' were correctly identified as Spam. Meanwhile, messages like 'Hey, are we meeting tomorrow?' and 'Call me when you're free' were classified as Ham. These examples demonstrate the model's strong ability to distinguish between spam and legitimate communication.

## **6. Technologies Used**

- Python
- Streamlit
- Scikit-learn
- Pandas
- Joblib
- TF-IDF Vectorizer

## **7. Conclusion**

The SMS Spam/Ham Classifier effectively demonstrates how machine learning can be applied to natural language processing tasks. By leveraging TF-IDF and Naive Bayes, the model achieves high accuracy in spam detection. Future improvements may include experimenting with deep learning models like LSTMs or BERT for even better performance.