

**Proposal for Final Project**

**Text Classification for Spam Detection**

**Objective**

The objective of this project is to design and implement a machine learning model capable of classifying text messages as spam or non-spam. Spam detection is crucial in preventing unwanted, fraudulent, or harmful messages from overwhelming users' inboxes, particularly in email and SMS communication. By leveraging machine learning algorithms and natural language processing (NLP) techniques, this project aims to create a robust, scalable, and efficient solution for automated spam detection.

**Problem Statement**

Spam messages constitute a significant percentage of global communication and pose threats ranging from simple inconvenience to phishing attacks and data breaches. Traditional rule-based spam filters are limited in adaptability and fail to address the evolving nature of spam tactics. This project seeks to address these challenges by developing a data-driven approach to classify messages as spam or legitimate, using labeled datasets and supervised machine learning models.

**Scope**

1. **Data Collection**: We Acquire and preprocess a publicly available dataset on Kaggle containing labeled text messages, such as the SMS Spam Collection Dataset.
2. **Exploratory Data Analysis (EDA)**: Analyze and visualize patterns in spam and legitimate messages to identify key features for classification and the common words in the dataset.
3. **Model Development**: Evaluate different machine learning algorithms, including DecisionTreeClassifier, RandomForestClassifier, MultinomialNB, and Support Vector Machines, to identify the best model for this problem.
4. **Model Tuning**: Optimize the selected model using hyperparameter tuning techniques to achieve maximum accuracy and generalizability.
5. **Model Evaluation**: Assess performance using metrics such as accuracy, precision, recall, F1-score, and classification report
6. **Deployment**: Deploy the trained model via a REST API to simulate a real-world application for spam detection.

**Deliverables**

1. A clean and preprocessed dataset ready for analysis and model training.
2. Comprehensive EDA results showcasing trends and insights.
3. A trained and validated machine learning model with detailed performance evaluation.
4. A deployment-ready API that can classify text messages in real-time.
5. A project presentation summarizing findings, challenges, and conclusions.

**Intended Approach**

The project will follow a structured workflow:

1. Data preprocessing techniques will include tokenization, removal of stopwords, Lemmatize, and vectorization (TF-IDF).
2. Multiple models will be trained and compared, with the best-performing algorithm chosen based on evaluation metrics.
3. The Best Performing Model will be Hyper tuned with GridSearchCv.
4. Deployment will involve creating an endpoint for predictions using Flask Serving.
5. Graphic User Interface Using Streamlit to communicate with the model hosted on Flask for real time classification responds

By the end of the project, the team aims to deliver a functional spam detection model that can be integrated into practical applications like email systems or messaging platforms.