

Team Void - GAT 130

SMS & E-Mail Spam Detection

IBM Z Datathon - 2024



2. Problem Statement

Develop a machine learning model to automatically detect and classify SMS and email messages as either spam or non-spam (ham).

87%

of all humans have this problem

39%

are actively looking for a solution

89%

feel existing solutions don't meet
their needs

3. Solution

To solve the problem of spam detection, the following approach was implemented:

1. **Data Collection:** A dataset containing SMS and email messages labeled as either **spam** or **ham** (non-spam) was used to train the model. The data was in CSV format and included real-world examples of messages.
2. **Data Preprocessing:**
 - Text was cleaned by removing irrelevant characters, punctuations, and stopwords using **regular expressions** (regex).
 - Tokenization was applied to break down the messages into words or smaller units.
3. **Feature Extraction:**
 - The cleaned text was transformed into numerical data using techniques like **TF-IDF** (Term Frequency-Inverse Document Frequency) or **Bag of Words** to convert text into a matrix of word frequencies or importance, enabling the model to interpret the text data.
4. **Model Training:**
 - Several **classification algorithms** were used, such as **Naive Bayes**, **Support Vector Machines (SVM)**, or **Logistic Regression**, to classify messages based on their features as either spam or ham.
 - The model was trained on a portion of the dataset while the remaining portion was used for evaluation.
5. **Model Evaluation:**
 - The trained model was evaluated using performance metrics such as **accuracy**, **precision**, **recall**, and **F1-score**. This ensured the model's effectiveness in correctly identifying spam messages while minimizing false positives.
6. **Prediction:**
 - After evaluation, the final model was deployed to predict whether incoming messages are spam or not based on their features, improving the user's experience by filtering out unwanted communications.

This approach effectively automates the spam detection process and reduces the burden on users, offering a high-accuracy solution that continuously improves with data.



4. Tech Stack

1) **Python**: Main programming language for data handling and model training.

2) Libraries:

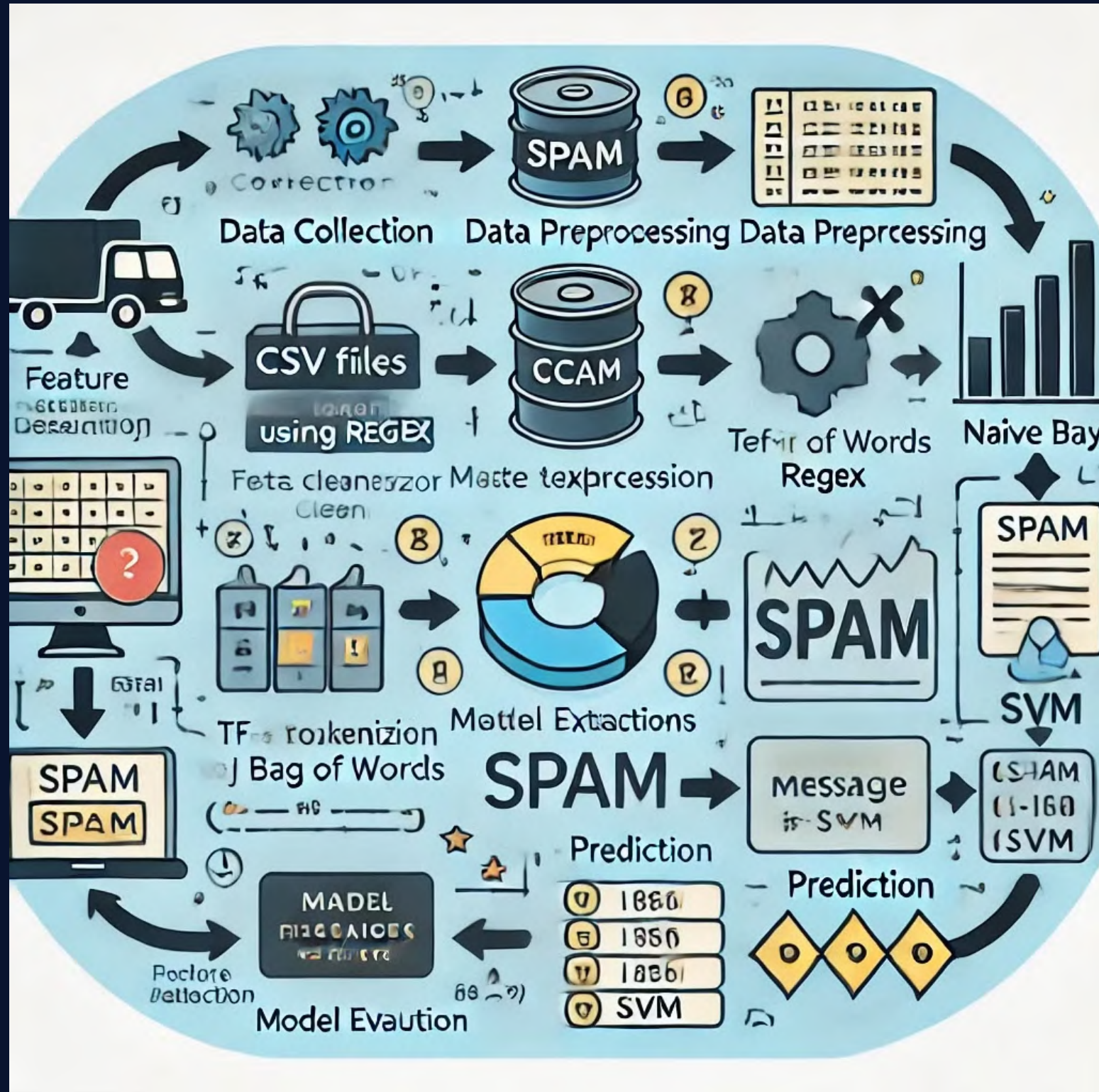
- **NumPy**: For numerical operations.
- **Pandas**: For loading and manipulating CSV data.
- **Matplotlib & Seaborn**: For visualizing data insights and distribution.
- **Regex (re)**: For cleaning and processing the message data.
- **Scikit-learn** : For training the model.

3) Dataset:

- CSV files (spam.csv, spam2.csv, etc.) are being used for training the model.
- SMS messages labelled as either "**ham**" (not spam) or "**spam**".
- Over 10k+ datasets have been used to train the model for accuracy and perfection.



5. Flowchart



1) Data Loading:

The SMS messages dataset is loaded into the environment using Pandas.

2) Data Preprocessing:

- Text cleaning using regex (removing unnecessary characters).
- Possibly tokenization and conversion to features for the model.

3) Feature Extraction:

Likely using **TF-IDF** or **Bag of Words** (though not explicitly seen yet) to convert text into numerical features.

4) Model Training:

A classification algorithm (perhaps Logistic Regression, Naive Bayes, or SVM) will be used to train on the labelled data.

5) Evaluation:

The model will be evaluated using metrics such as accuracy, precision, recall, etc.

6) Prediction:

Once trained, the model will predict whether a given message is spam or not.

6. Future Improvements

- 1) Continuous Learning:** Implement online learning algorithms to allow the model to adapt and evolve as new spam patterns emerge.
- 2) Multilingual Spam Detection:** Extend the model to handle spam messages in multiple languages.
- 3) Real-Time Spam Detection:** Optimize the model for faster real-time predictions on a larger scale.

7. Development Team

"Behind every great solution is a team of innovators, strategists, and problem solvers. Our team's passion for technology and commitment to excellence drives us to create cutting-edge solutions that transform challenges into opportunities."



Keerthan K Acharya

3rd Year
ISE, GAT



Preetham G Shiva

3rd Year
ISE, GAT



Vikas Gowda

3rd Year
ISE, GAT



Shreyas V

3rd Year
ISE, GAT

Thank you

