SMS Spam Classifier

This project is a web application that classifies SMS messages as "spam" or "ham" (legitimate). It involves training a machine learning model to distinguish between spam and non-spam messages, integrating the trained model with a Django REST Framework API for real-time predictions, and providing a simple frontend for user interaction.

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Features

- **Data Preprocessing**: The project includes steps for cleaning and preprocessing the dataset (`spam.csv`) to extract relevant features from the text.
  - The cleaning process involves removing punctuation, stop words, and other noise from the text data.
  - Stemming is applied to reduce words to their root form for better generalization.
- **Model Training**: A `DistilBERT` model is trained on the dataset to classify SMS messages.
- **Model Evaluation**: The model is evaluated using 3-fold cross-validation on the training data regarding accuracy, precision, recall, and F1 score.
- **API Integration**: The trained model is served using `Django REST` Framework, which provides an endpoint for real-time predictions.
- **Frontend Interface**: A simple form-based interface allows users to input SMS messages and view classification results.
- **Error Handling**: Handles invalid inputs (e.g., empty string) gracefully with appropriate error messages.

Prerequisites

- `Python 3.8` or higher
- `pip` (Python package manager)
- `Jupyter Notebook` (for training the model and viewing the evaluation results)

Installation

1. **Clone the Repository**:

   ```
   git clone https://github.com/Stx666Michael/SMS-Spam-Classifier.git
   cd sms-spam-classifier
   ```

2. **Set Up the Python Environment** (optional):

   ```
   python3 -m venv venv
   source venv/bin/activate  # On Windows, use `venv\Scripts\activate`
   ```

3. **Install the Required Packages**:

   ```
   pip install -r requirements.txt
   ```

Usage

1. **Model Training and Evaluation** (optional):

   - Open `task.ipynb` in a Jupyter environment to train the `DistilBERT` model on the `spam.csv` dataset.
   - This script handles data preprocessing, model training, and evaluation.
   - The trained model weights will be saved as `model_weights.pth` in the `model/` directory.

2. **Start the Django Server**:

   ```
   cd app
   python manage.py runserver
   ```

3. **Frontend**:

   - Visit `http://localhost:8000/` to access the frontend.
   - Input an SMS message, and the result will be displayed after calling the API.

4. **Access the API Endpoint**:

   - The `/api/predict/` endpoint accepts POST requests with a JSON payload:

     ```
     {
       "sms": "Your message text here"
     }
     ```

- The response will include the classification result (`spam` or `ham`) and the confidence probability.

Model Training and Evaluation

The model is trained using the `DistilBERT` architecture, which is a lightweight version of the `BERT` model. The training history is shown in `task.ipynb`, along with the evaluation metrics for each fold of the cross-validation.

Training Results

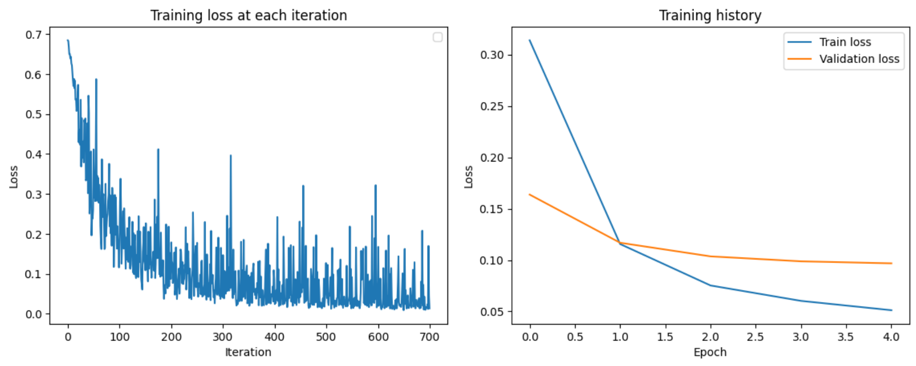


Figure 1: Training Results

Evaluation Results

Fold	Accuracy	Precision	Recall	F1 Score
1	0.98	0.95	0.90	0.93
2	0.98	0.94	0.89	0.91
3	0.98	0.96	0.86	0.91
Avg.	0.98	0.95	0.88	0.92

Note that the precision and recall are calculated for the `spam` class.

API Integration

The trained model is integrated into a Django REST Framework API:

- The API exposes a `/predict/` endpoint to classify SMS messages.
- The endpoint accepts POST requests with an SMS message and returns the classification result along with the confidence level.

Example API Request

```
curl -X POST http://localhost:8000/api/predict/ \
-H "Content-Type: application/json" \
-d '{"sms": "Amazon is sending you a refunding of $32.64. Please reply with your bank accour
```

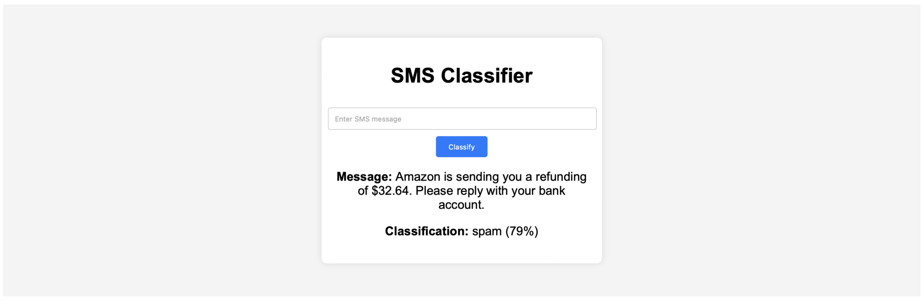
Example Response

```
{
  "sms": "Amazon is sending you a refunding of $32.64. Please reply with your bank account.'
  "classification": "spam",
  "probability": 79
}
```

Frontend

The project includes a simple frontend interface for user interaction:

- Takes user input for an SMS message.
- Sends the input to the API endpoint via a POST request.
- Displays the classification result ("spam" or "ham") and the confidence probability.



Message: Amazon is sending you a refunding of $32.64. Please reply with your bank account.

Classification: spam (79%)

Figure 2: User Interface