

# Title: Text Classification and Generation Using Django and Hugging Face Transformers

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## 1. Introduction

This project aims to develop a web application that allows users to classify text sentiments and generate text based on prompts. The application is built using Django as the web framework and utilizes Hugging Face's Transformers library for natural language processing tasks.

## 2. Approach and Rationale for Each Task

### 2.1 Data Preparation

- **Task:** Clean and preprocess the IMDb movie reviews dataset.
- **Approach:** The data was cleaned by handling missing values, normalizing text (case folding and removing special characters), and tokenizing the text.
- **Rationale:** Clean data is crucial for building effective models. Proper preprocessing helps improve the model's understanding of the text.

### 2.2 Text Classification

- **Task:** Implement sentiment analysis using a pre-trained BERT model.
- **Approach:** Zero-shot classification was utilized to predict sentiment without extensive fine-tuning.
- **Rationale:** Zero-shot classification allows leveraging existing models, saving time and resources while still providing accurate results.

### 2.3 Text Generation

- **Task:** Generate text based on user prompts using a pre-trained GPT-2 model.
- **Approach:** The model was used directly for text generation without fine-tuning, taking advantage of its pre-trained capabilities.
- **Rationale:** This approach allows quick implementation and effective results without the complexity of fine-tuning.

### 2.4 Web Application Development

- **Task:** Create a user-friendly interface using Django.
- **Approach:** The application was designed to allow users to input text for classification and prompts for text generation.
- **Rationale:** A well-structured web interface enhances user experience and makes the application accessible to non-technical users.

## 3. Challenges Encountered and Solutions Implemented

### 3.1 Challenges in Model Fine-Tuning

- **Challenge:** Difficulty fine-tuning the BERT model due to environment and library compatibility issues.

- **Solution:** Opted for zero-shot classification as a workaround, allowing effective sentiment analysis without needing fine-tuning.

### 3.2 Package Installation Issues

- **Challenge:** Faced multiple issues while installing required packages, especially related to permissions and missing executables.
- **Solution:** Created a virtual environment to isolate dependencies and installed packages there.

### 3.3 Application Interactivity

- **Challenge:** Initial issues with the application not responding to user inputs.
- **Solution:** Debugged the view functions and ensured correct URL routing and form submissions.

## 4. Performance Evaluation and Optimization Strategies

- **Performance Evaluation:** The models provided accurate predictions during testing, with the zero-shot classifier effectively identifying sentiments with a good degree of accuracy.
- **Optimization Strategies:**
  - Leveraged caching mechanisms in Django to reduce response times for frequent queries.
  - Analyzed and monitored database queries to optimize performance.
  - Considered optimizing hyperparameters if fine-tuning was required in future implementations.

## 5. Potential Improvements or Future Work

- **Improved User Interface:** Enhance the web interface with better design and additional functionalities, such as displaying historical predictions.
- **Model Fine-Tuning:** Investigate successful fine-tuning strategies for BERT and GPT-2 to improve the accuracy and coherence of predictions.
- **Broaden Use Cases:** Expand the classification tasks to include more sentiment categories or apply topic modeling.
- **Deployment:** Consider deploying the application using cloud platforms (like Heroku or AWS) to make it accessible online.

## 6. Conclusion

The project successfully created a web application that allows users to classify text and generate text using pre-trained models. Challenges were encountered, but effective solutions were implemented, leading to a functional application. Future work will focus on enhancements and optimizations to further improve user experience and model performance.