Text Summarization App with Flask and Spacy

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SpaCy is an open-source library for advanced natural language processing in Python. It is perfect for both industrial and scholarly applications because it is made to process vast amounts of text efficiently. Pre-trained models for multiple languages are provided by SpaCy, making tasks like dependency parsing, named entity identification, and part-of-speech tagging possible. Its modular design makes it an adaptable option for developers, enabling smooth integration with other libraries and tools in the NLP ecosystem.

Flask App For Summarization using Advance NLP

The motive behind this project is to create and develop an application or model that can efficiently summarize a large textual article or text document. This, in

text. For all this, we require a basic knowledge of Flask, HTML, and NLP.

Steps for Creating a Text Summarizer App

Step 1: Create a virtual environment

Open Anaconda Navigator and Launch vs-code or open any other IDE like Pycharm. To create a virtual Environment write the following code in the terminal.

- *python -m venv <enviroment name>*
- *<enviroment name>\Scripts\activate*

```
> python -m venv myenv
> myenv\Scripts\activate
```

Write this line of codes on the terminal

Step2: Developing NLP/ML model for text summarization

app.py: The app.py begins by importing necessary libraries for web handling, form creation, and text processing, and initializes a Flask instance with a secret key for session management while loading the SpaCy English model for NLP tasks. It defines a Form class using Flask-WTF, featuring a text input field and a submit button with validation to ensure the field isn't empty.

The application also downloads essential NLTK resources (stopwords and punkt) for tokenization and stopword removal. The root route (/) of the web application creates an instance of the Form, checks if it has been submitted and validated, processes the input text using the prediction function to generate a summary if valid, and renders the home.html template, passing the form and summary for display.

remove_punc(text): This function starts by tokenizing the input text into individual sentences and then further breaks down each sentence into words. It filters out any punctuation marks from these words. After filtering, it reconstructs the sentences from the remaining words and finally returns the text devoid of punctuation.

remove_tags(text): This function defines a list of HTML tags to be removed. It then tokenizes the input text into sentences and further into words within each sentence. It filters out the specified HTML tags from these words. After filtering, the function reconstructs the sentences from the remaining words and returns the cleaned text.

remove_stpwrds(text): This function begins by loading a set of English stopwords. It then tokenizes the text into sentences and further into words within each sentence. The function filters out any stopwords from these words. After filtering, it reconstructs the sentences from the remaining words and returns the text without stopwords.

extract_keywords(text): This function processes the input text using SpaCy to obtain part-of-speech tags for each token. It then filters tokens based on specified tags (PROPN, ADJ, NOUN, VERB). Finally, it collects and returns the filtered keywords that meet the criteria.

summarize_text(text): This function preprocesses the input text by removing punctuation, HTML tags, and stopwords. It then extracts keywords from the cleaned text and calculates their frequency. The function normalizes the keyword frequencies and assigns a strength score to each sentence based on these frequencies. Finally, it selects and returns the top sentences with the highest scores as the summary.

Python

```python
from flask import Flask, render_template, request
from flask_wtf import FlaskForm
from wtforms import StringField, SubmitField
from wtforms.validators import DataRequired
import spacy
import nltk
from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize, sent_tokenize
from nltk.tokenize import sent_tokenize
from heapq import nlargest
import string
from collections import Counter

app = Flask(__name__)
app.secret_key = 'b83a1e0ea4e74d22c5d6a3a0ff5e6e66'
nlp = spacy.load("en_core_web_sm")

class Form(FlaskForm):
     text = StringField('Enter the text', validators=[DataRequired()])
     submit = SubmitField('Submit')

nltk.download('stopwords')
nltk.download('punkt')

@app.route('/', methods=['GET', 'POST'])
def home():
    form=Form()
    pred= None

    if form.validate_on_submit():
        text=form.text.data
```

```
        pred=prediction(text)
    return render_template('home.html',form=form,pred=pred)

def prediction(text):
    # Function to remove punctuation from the text
    def remove_punc(text):
        new_sent = []
        for sent in sent_tokenize(text):
            words = word_tokenize(sent)
            new_word=[]
            for i in words:
                if i not in string.punctuation:
                    new_word.append(i)
            new_sent.append(' '.join(new_word))
        return ' '.join(new_sent)

    # Function to remove specific HTML tags from the text
    def remove_tags(text):
        br_tags=['<br>','']
        new_sent = []
        for sent in sent_tokenize(text):
            words = word_tokenize(sent)
            new_word=[]
            for i in words:
                if i not in br_tags:
                    new_word.append(i)
            new_sent.append(' '.join(new_word))
        return ' '.join(new_sent)

    # Function to remove stopwords from the text
    def remove_stpwrds(text):
        stop_words = set(stopwords.words('english'))
        new_sent = []
        for sent in sent_tokenize(text):
            words = word_tokenize(sent)
            new_word=[]
            for i in words:
                if i.lower() not in stop_words:
                    new_word.append(i)
            new_sent.append(' '.join(new_word))
        return ' '.join(new_sent)
```

```
    # Function to extract keywords from the text
    def extract_keywords(text):
        doc = nlp(text)
        keywords = []
        tags = ['PROPN', 'ADJ', 'NOUN', 'VERB']
        for token in doc:
            if token.pos_ in tags:
                keywords.append(token.text)
        return keywords

    # Function to summarize the text based on keyword frequency
    def summarize_text(text):
        doc = nlp(text)
        text = remove_punc(text)
        text = remove_tags(text)
        text = remove_stpwrds(text)
        keywords = extract_keywords(text)
        freq = Counter(keywords)
        max_freq = freq.most_common(1)[0][1]
        for i in freq.keys():
            freq[i] = freq[i] / max_freq

        sent_strength = {}

        for sent in doc.sents:
            for word in sent:
                if word.text in freq.keys():
                    if sent in sent_strength.keys():
                        sent_strength[sent] += freq[word.text]
                    else:
                        sent_strength[sent] = freq[word.text]

        summarized_sentences = nlargest(4, sent_strength, key=sent_strength.get)
        return summarized_sentences

    # Call the summarization function and return the result
    summary = summarize_text(text)
    return summary
```

```
if __name__ == '__main__':
    app.run(debug=True)
```

Step 3: Setting up GUI

home.html: The provided code sets up a Flask web application that allows users to input text and receive a summarized version in three key points, which are then displayed on a webpage. The form uses the POST method to submit data to the root URL (/). It includes a text area for input and a submit button.

HTML

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Text Summarizer</title>
    <script src="https://code.jquery.com/jquery-3.2.1.slim.min.js" integrity="sha384-KJ3o2DKtIkvYIK3UENzmM7KCkRr/rE9/Qpg6aAZGJwFDMVNA/GpGFF93hXpG5KkN" crossorigin="anonymous"></script>
    <script src="https://cdn.jsdelivr.net/npm/popper.js@1.12.9/dist/umd/popper.min.js" integrity="sha384-ApNbgh9B+Y1QKtv3Rn7W3mgPxhU9K/ScQsAP7hUibX39j7fakFPskvXusvfa0b4Q" crossorigin="anonymous"></script>
    <script src="https://cdn.jsdelivr.net/npm/bootstrap@4.0.0/dist/js/bootstrap.min.js" integrity="sha384-JZR6Spejh4U02d8jOt6vLEHfe/JQGiRRSQQxSfFWpi1MquVdAyjUar5+76PVCmYl" crossorigin="anonymous"></script>

    <link rel="stylesheet" href="https://cdn.jsdelivr.net/npm/bootstrap@4.0.0/dist/css/bootstrap.min.css" integrity="sha384-Gn5384xqQ1aoWXA+058RXPxPg6fy4IWvTNh0E263XmFcJlSAwiGgFAW/dAiS6JXm" crossorigin="anonymous">

    <style>
```

```
        .container {
            background-color: rgb(235, 235, 235);
            padding: 20px;
            border-radius: 10px;
            margin-top: 20px;
            color: rgb(11, 1, 10);
        }

        body {
            background-color: rgb(12, 12, 228);
            background-image: linear-gradient(to bottom right, rgb(66, 114, 186),rgb(73, 154, 198), rgb(92, 144, 149));
            height: 100vh;
            display: flex;
            justify-content: center;
            align-items: center;
            flex-direction: column; /* Added */
        }

        .header {
            color: white;
            font-size: 60px;
            margin-bottom: 20px;
        }

        .line {
            width: 50%;
            height: 2px;
            background-color: white;
            margin-bottom: 20px;
        }
    </style>

</head>
<body>
    <div class="header">Text Summarizer</div>
    <div class="line"></div>


    <div class="container">


        <form method="POST" action="/">
```

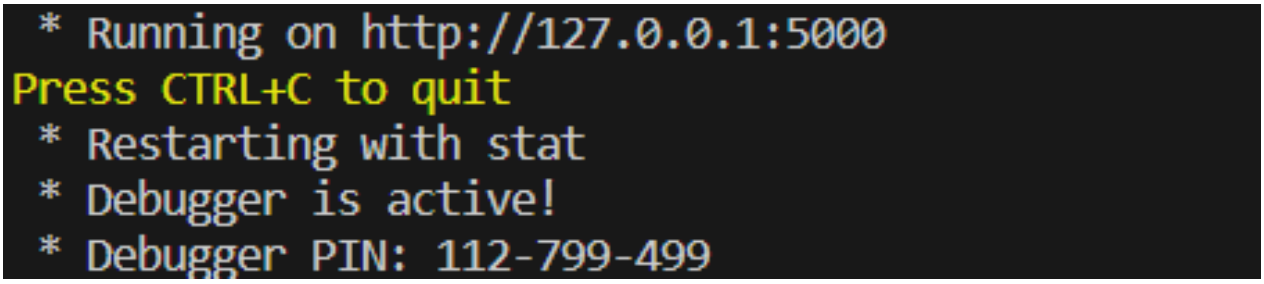
```
            <div class="form-group">
                <label for="text">Enter the text</label>
                <textarea class="form-control" id="text" name="text" rows="5" placeholder="Enter your text here" required>{{ text }}</textarea>
            </div>


            <button type="submit" class="btn btn-primary">Submit</button>

            {{ form.hidden_tag() }}
        </form>


        <!-- Content here -->
        {% if pred %}
        <h2>Summary:</h2>
        <ul>
            {% for sentence in pred %}
                <li>{{ sentence }}</li>
            {% endfor %}
        </ul>
        {% endif %}
      </div>


</body>
</html>
```

Output:

Step 4: Running the app on local host.

Line of code to run the flask app

Just write "python app.py" on the terminal and this would be generated.



Code running on local host

After that just click on the "http://127.0.0.1:5000" and you would be redirected to a webpage, which would the homepage of the application.

Output:

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