

AI Text Summarizer Using Python, Hugging Face & Flask

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Abstract

⌚ Goal

Build an AI-powered text summarizer using state-of-the-art Hugging Face Transformers to automatically generate concise summaries from long paragraphs.

</> Implementation

The system is implemented using Python and Flask for a responsive web interface. It improves readability, reduces processing time, and significantly enhances productivity.

Introduction



Efficiency

Manual text summarization is tedious and time-consuming. AI extracts key ideas automatically.



NLP Power

Natural Language Processing models like BART are highly effective for abstractive summarization.



Accessibility

This project demonstrates a lightweight tool accessible via a simple web interface.

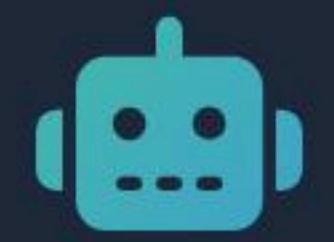
Problem Statement

⚠ **Information Overload:** Growing digital content makes reading everything impossible.

💡 **Need for Speed:** Students, researchers, and professionals require quick insights.

✖ **Tool Limitations:** Traditional summarization tools often lack context and accuracy.

Objectives



Build AI Model

Implement a Hugging Face transformer model for core summarization logic.



Create Web App

Develop a user-friendly Flask web application for interaction.



Condense Text

Convert lengthy documents into short, meaningful summaries efficiently.

Existing vs. Proposed

👎 Existing System

Manual summarization is slow and error-prone. Basic extractive tools just pick random lines, lacking true contextual understanding.

👍 Proposed System

Uses Hugging Face BART for *abstractive* summarization. It generates human-like summaries via a Flask web interface.

System Features



Clean UI

Simple text input area.



Fast

Real-time inference.



Lightweight

Easily deployable.



Accurate

Context-aware output.

System Architecture

→ **User:** Interacts with the Web UI.

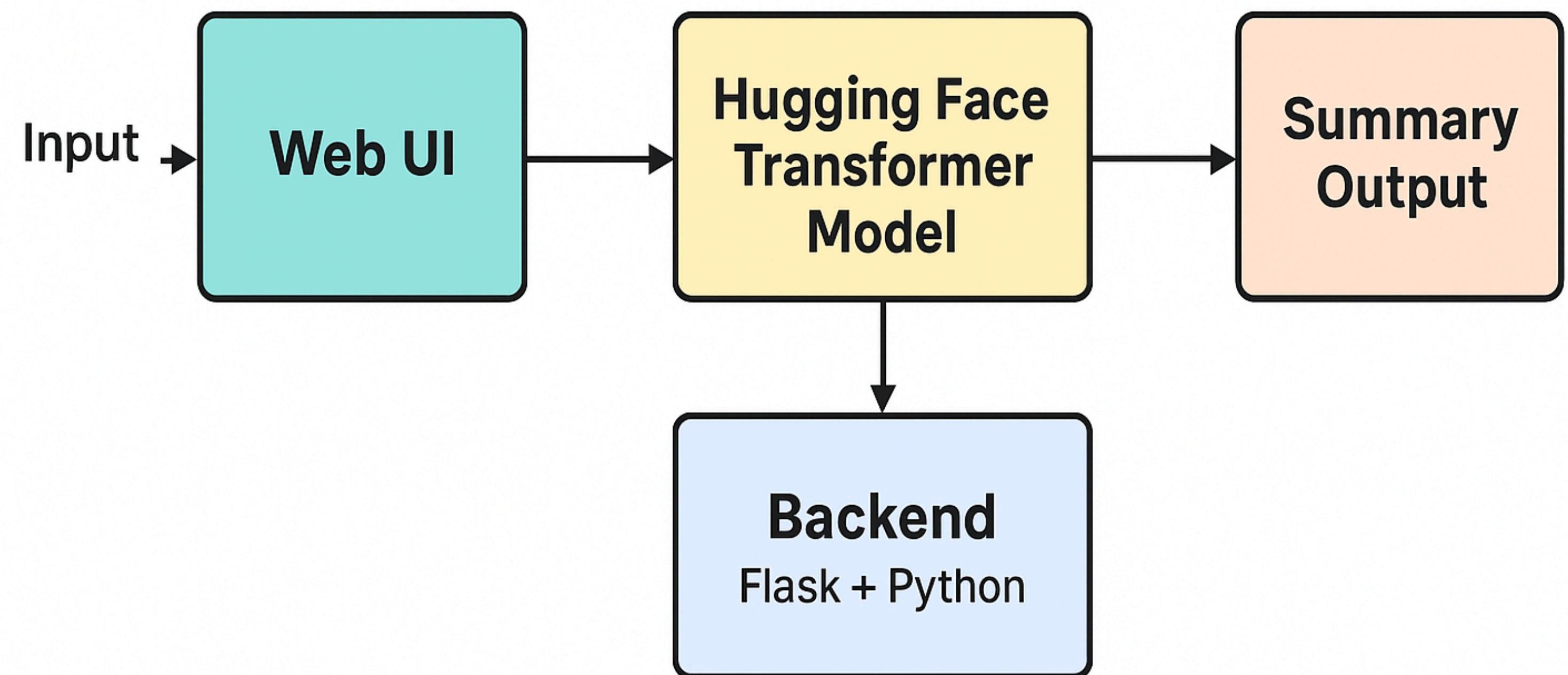
→ **Input Layer:** Flask Form / Text Area.

→ **Backend:** Python & Flask Server.

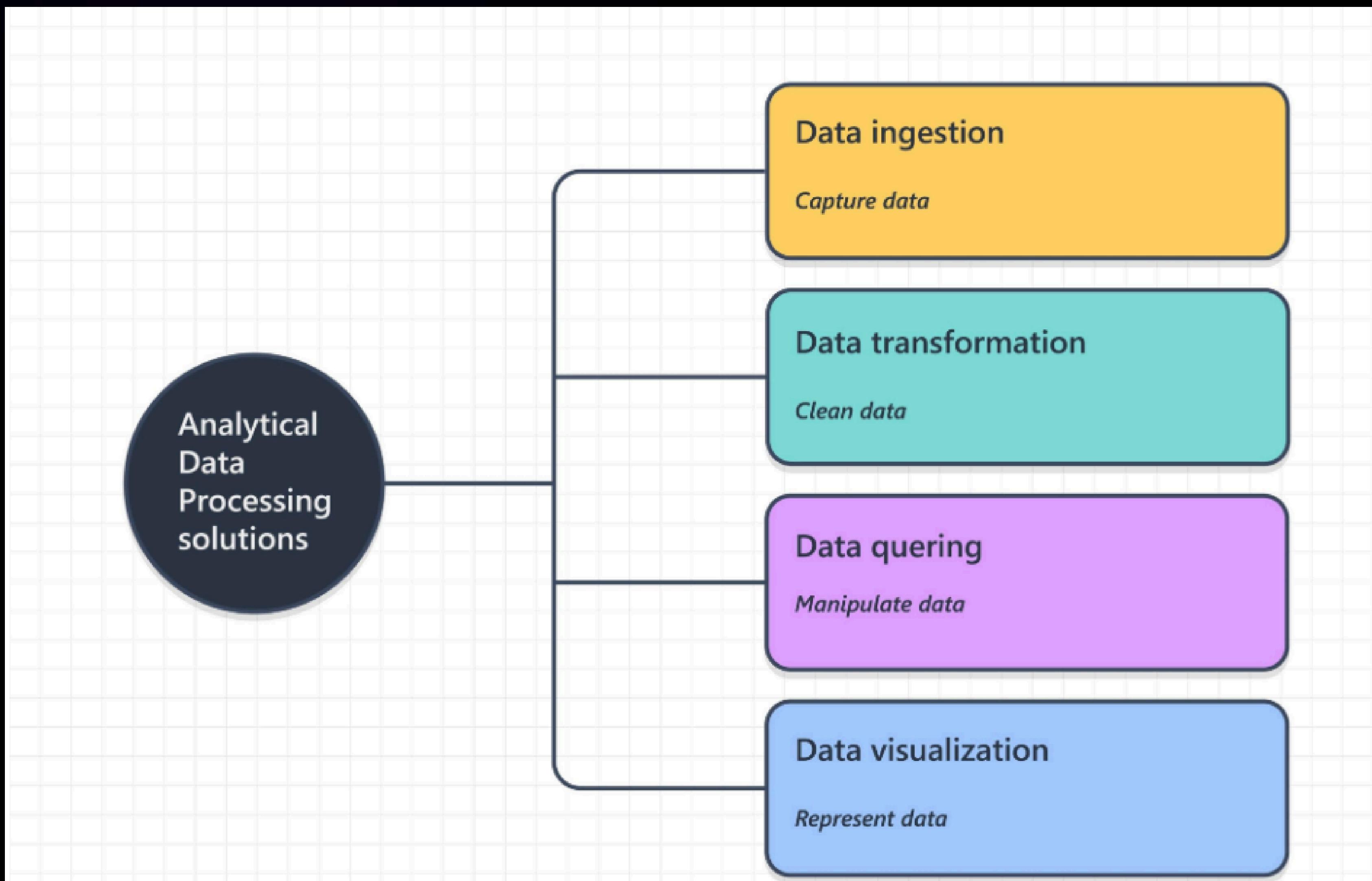
→ **Model Layer:** BART (Hugging Face) processes text.

→ **Output:** Summary returned to user.

SYSTEM ARCHITECTURE



Workflow Diagram



Step-by-Step Flow

- ▶ **Start:** Application Initialization.
- ⌨️ **Input:** User enters text.
- 🕒 **Process:** Flask sends to Model.
- ⚙️ **Generate:** AI creates summary.
- 💻 **Output:** Display result.

Key Modules: Input & Preprocessing

Module 1: Input

Captures user data via the text area. It validates the text length to ensure it meets model requirements before sending the request to the backend.

Module 2: Preprocessing

Cleans the raw input by removing unnecessary special characters and normalizing spacing, preparing the text for the transformer pipeline.

Module 4: Flask Web Module



Routes

Handles HTTP GET/POST requests.



Templates

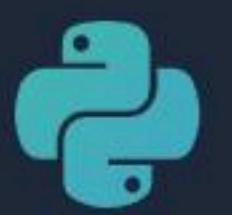
Renders HTML templates using Jinja2.



Integration

Connects the UI to the AI Model.

Technologies Stack



Python

Core Logic



Flask

Web Framework



Transformers

Hugging Face



HTML/CSS

Frontend UI

Requirements

Software

Python 3.8+
Flask Framework
Transformers Library
Jinja2 Templates

Hardware

RAM: 4–8 GB (Recommended)
CPU: Multi-core for inference
Storage: 2GB+ (for Model weights)

Implementation Steps

 1. Install dependencies (pip install).

 3. Load Hugging Face model.

 5. Connect Flask routes.

 2. Build summarization function.

 4. Create HTML interface.

 6. Run & Display summaries.

Code Snippet: Backend (Python)

Initializing the pipeline and defining the Flask route.

✓ Load Model

✓ Define Route

```
from transformers import pipeline
from flask import Flask, render_template, request

app = Flask(__name__)
summarizer = pipeline("summarization",
                      model="facebook/bart-large-cnn")

@app.route('/', methods=['POST', 'GET'])
def index():
    # ... logic here
```

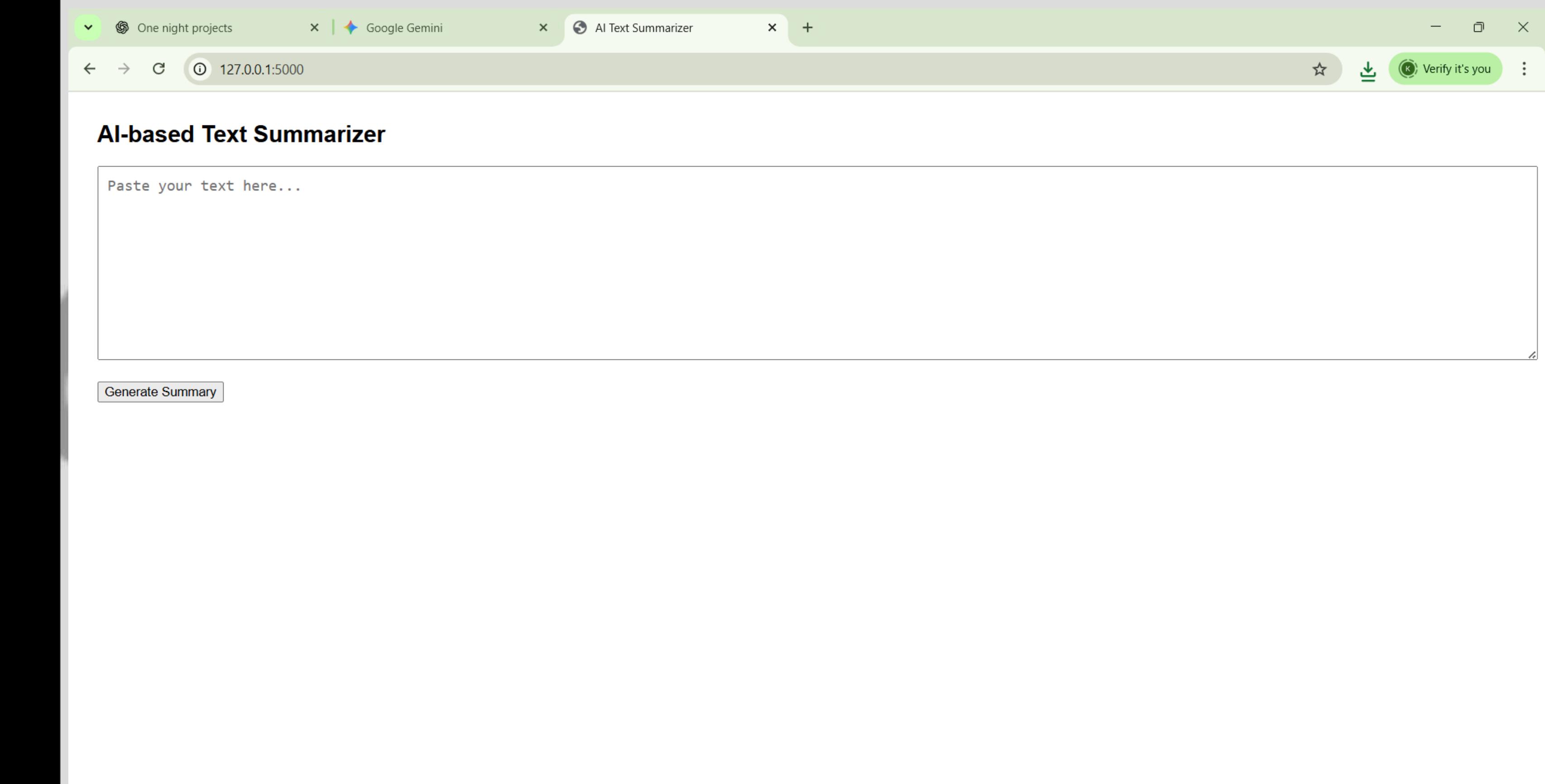
Code Snippet: Frontend (HTML)

Simple HTML structure to accept user input and submit it to the backend.

Summarize

User Interface

The clean and minimal input interface. Users simply paste their long text into the text area and click "Summarize".



Generated Output

The result page displaying the original text alongside the AI-generated summary, demonstrating the model's abstractive capabilities.

The screenshot shows a web browser window titled "AI-based Text Summarizer" at the URL "127.0.0.1:5000". The window has three tabs: "AI overview", "Google Gemini", and "AI Text Summarizer". The main content area displays a block of text about Artificial Intelligence (AI) followed by three summary options: "Generate Summary", "Short Summary", "Medium Summary", and "Detailed Summary".

AI-based Text Summarizer

Artificial Intelligence (AI) is a rapidly evolving field of computer science that focuses on creating machines capable of performing tasks that traditionally require human intelligence. These tasks include understanding natural language, recognizing images and speech, learning from experience, solving complex problems, and making decisions. AI systems work by processing vast amounts of data, identifying hidden patterns, and continuously improving their performance through algorithms such as machine learning and deep learning. Today, AI is deeply integrated into our daily lives – from recommendation systems on apps like YouTube and Netflix, to voice assistants like Siri and Alexa, to more advanced applications like autonomous vehicles, fraud detection systems, and medical diagnosis tools. Industries such as healthcare, finance, education, manufacturing, and transportation are being transformed by AI-driven automation, which helps increase efficiency, reduce errors, and enhance productivity. As AI grows more advanced, it also brings new opportunities and challenges, raising important questions about ethics, privacy, and the future of work. Overall, AI represents one of the most powerful technological advancements of the 21st century, reshaping the world and opening the door to endless possibilities.

Generate Summary

Short Summary:
Artificial Intelligence (AI) is a rapidly evolving field of computer science. Today, AI is deeply integrated into our daily lives. Industries such as healthcare, finance, education, manufacturing, and transportation are being transformed by AI-driven automation

Medium Summary:
Artificial Intelligence (AI) is a rapidly evolving field of computer science. Today, AI is deeply integrated into our daily lives. Industries such as healthcare, finance, education, manufacturing, and transportation are being transformed by AI-driven automation.

Detailed Summary:
Artificial Intelligence (AI) is a rapidly evolving field of computer science. Today, AI is deeply integrated into our daily lives. Industries such as healthcare, finance, education, manufacturing, and

Advantages



Fast

Rapid inference time.



Easy to Use

No technical skills needed.



Concise

Removes fluff.



State-of-the-Art

Transformer powered.

Real-World Applications



Education

Summarizing textbooks.



Media

News & Blog digestion.



Business

Report & Legal analysis.

Conclusion

✓ Effectiveness

The system effectively utilizes the Hugging Face BART model to condense long texts into meaningful summaries without losing context.

◻ Scalability

The Flask UI makes the tool interactive and simple, serving as a solid foundation for future expansion into APIs or mobile apps.

Future Enhancements



File Upload

Support for PDF & Docx.



Voice

Voice-to-Summary feature.



Multilingual

Support other languages.



Cloud

Deploy on Render/Spaces.

Questions?

Thank you for your attention.