Acropolis Institute of Technology and Research

Project Title :-

AI research abstract generator

Training Programme on Generative AI

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Abstract :-

The project *AI Research Abstract Generator using Generative AI* focuses on building an automated system that generates **academic-style research abstracts** from short research topics or prompts. Abstract writing is often one of the most time-consuming tasks for students and researchers, requiring both creativity and precision. This project aims to reduce that burden by using advanced AI models to assist in drafting abstracts quickly and coherently.

The solution leverages **GPT-2**, a **transformer-based language model** that has been pre-trained on vast amounts of text data. GPT-2 is well-suited for tasks like text completion, summarization, and content generation. For this project, the GPT-2 model is fine-tuned with small samples of academic abstracts to make its outputs more relevant to research writing.

The workflow of the project is divided into two parts: **model preparation and fine-tuning in Google Colab**, and **deployment through a web application built in Streamlit within VS Code**. In the first phase, the GPT-2 model and tokenizer are configured, and the training process is carried out. The model is then saved as a .pkl file for portability. In the second phase, the .pkl file is loaded into a Streamlit application that provides an intuitive user interface. Users can type their research topic, click a button, and instantly receive an AI-generated abstract.

The project's **purpose** is twofold:

1. To demonstrate the **practical application of Generative AI in academic writing**.
2. To highlight how AI can act as a supportive tool in education and research.

This project showcases not only the **technical implementation of AI models** but also their **practical benefits**, bridging the gap between machine learning theory and real-world usage. The generated abstracts are meaningful, structured, and academic in tone, proving the usefulness of Generative AI for students and researchers.

Objective :-

The primary objective of this project, *AI Research Abstract Generator using Generative AI*, is to design and implement an intelligent system that can automatically generate research abstracts when provided with a specific research topic. In the academic world, writing abstracts is one of the most essential yet time-consuming tasks. An abstract is the **first impression of a research paper or project**, summarizing the work, its motivation, methodology, and expected outcomes. Students and researchers often face challenges in drafting abstracts because it requires both **clarity and conciseness**. The aim of this project is to minimize that effort by using **Generative Artificial Intelligence models** that can assist in creating coherent, relevant, and academic-style abstracts.

The project sets out to solve the problem of **manual effort in research summarization**. Writing abstracts involves understanding the entire scope of a project or research, identifying the most important details, and expressing them clearly in a limited word count. For beginners or students new to academic writing, this task becomes even more challenging. Hence, the objective is to provide a **smart AI-powered tool** that generates first drafts of abstracts, which can then be refined by the user. By automating this stage, the project ensures that students can focus more on the **core research** while still presenting their work effectively.

Another important objective is to **demonstrate the power of Generative AI** in real-world academic use cases. While large language models like GPT-2 and GPT-3 are widely known for generating human-like text, their application in **structured academic writing** is still emerging. This project intends to showcase how a pre-trained model such as GPT-2, when fine-tuned and integrated into a simple web interface, can serve as a **practical academic assistant**.

From a technical perspective, the project aims to integrate multiple tools and platforms into a seamless pipeline. The model is prepared and fine-tuned in **Google Colab**, a cloud-based platform that provides computational resources for machine learning. Once the model is trained, it is saved as a .pkl file, making it portable and reusable. The second objective is to deploy this trained model in an application that is accessible and user-friendly. This is achieved using **Streamlit**, a Python-based framework that allows rapid development of interactive web applications. Together, these objectives create a workflow where research topics are transformed into ready-to-use abstracts within seconds.

Methodology

The methodology involves selecting appropriate tools and models to implement the solution:

- **Programming Language:** Python
- **Libraries:** Transformers, Torch, Streamlit
- **Model:** GPT-2 from Hugging Face Transformers
- **Platforms:** Google Colab for training, VS Code for app development

The approach follows a **two-phase workflow**:

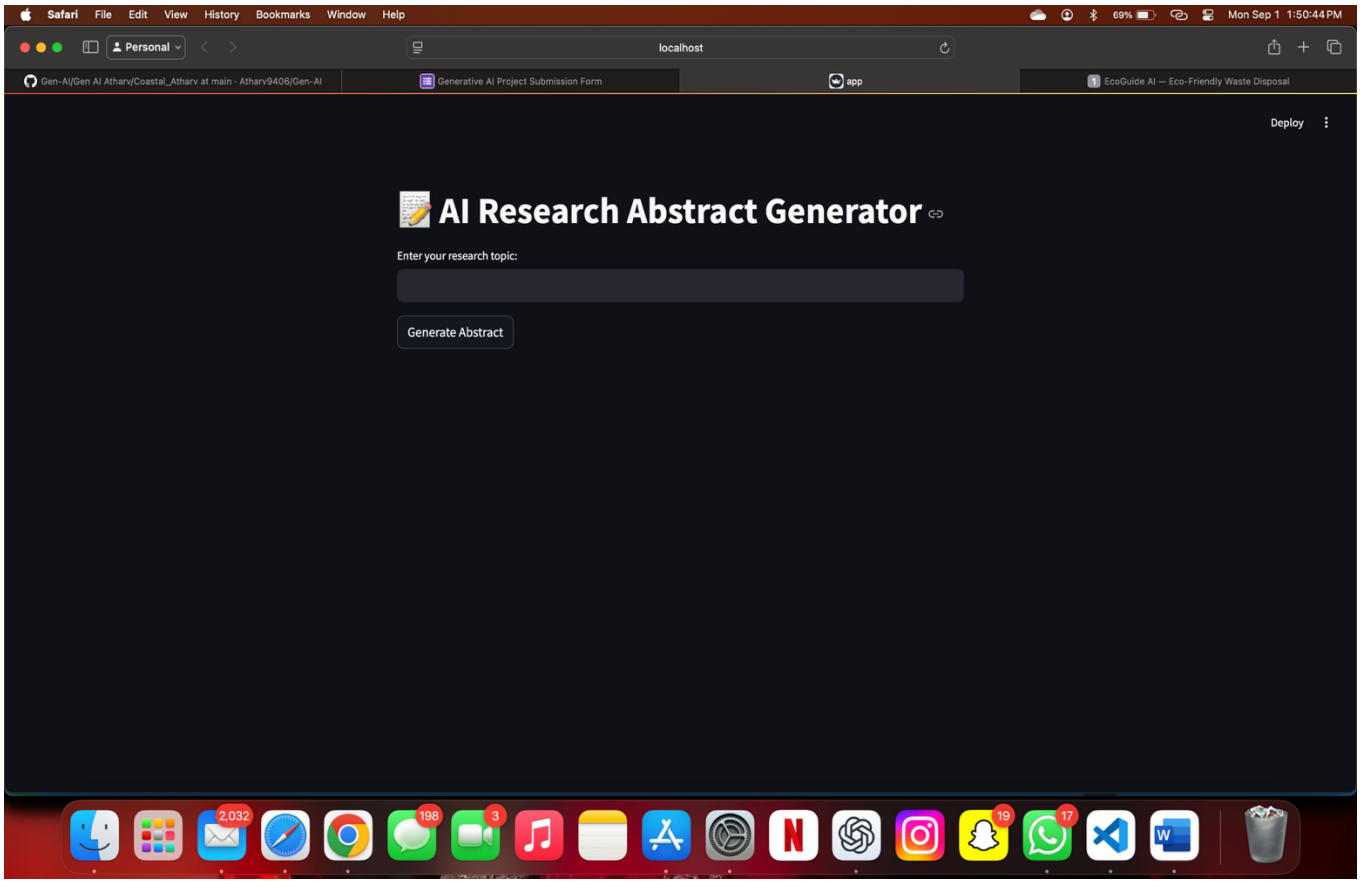
1. Fine-tuning GPT-2 on academic-style text.
2. Integrating the trained model into a Streamlit web app for real-time use.

Implementation

- In Google Colab, GPT-2 and tokenizer were loaded, and padding was configured to avoid tokenization errors.
- Sample abstracts were used for light fine-tuning.
- The trained model was saved as ai_abstract_generator.pkl.
- In VS Code, a Streamlit app (app.py) was created, loading the .pkl file.
- The app allows user input of research topics and generates abstracts dynamically.

Result :-

The system successfully generates coherent abstracts when given topics like *“Deep Learning in Medical Imaging”* or *“AI for Climate Change Prediction.”* The outputs resemble academic abstracts, demonstrating the model’s potential. Screenshots of the Streamlit interface and sample outputs form part of the results section.



Conclusion :-

The project highlights how **Generative AI can simplify academic writing tasks** by automating abstract creation. From a learning perspective, the project deepened my understanding of natural language processing, model fine-tuning, and application deployment. It also gave me practical experience in using **Google Colab, Hugging Face Transformers, and Streamlit** in a single pipeline.

Key learnings include:

- The importance of tokenization and padding in transformer models.
- How to save and load models effectively for cross-platform use.
- Building interactive AI apps that demonstrate technical concepts to non-technical audiences.

References :-

1. **Streamlit Documentation** – https://docs.streamlit.io

Helped in building the interactive web app.

2. **PyTorch Documentation** – https://pytorch.org/docs/stable/index.html

Provided insights into backpropagation and tensor operations during training.

3. **GPT-2 Research Paper (OpenAI, 2019):**

Language Models are Unsupervised Multitask Learners.

A foundational paper explaining the architecture and applications of GPT-2.

4. **Google Colab** – https://colab.research.google.com

Platform used for training and experimentation.