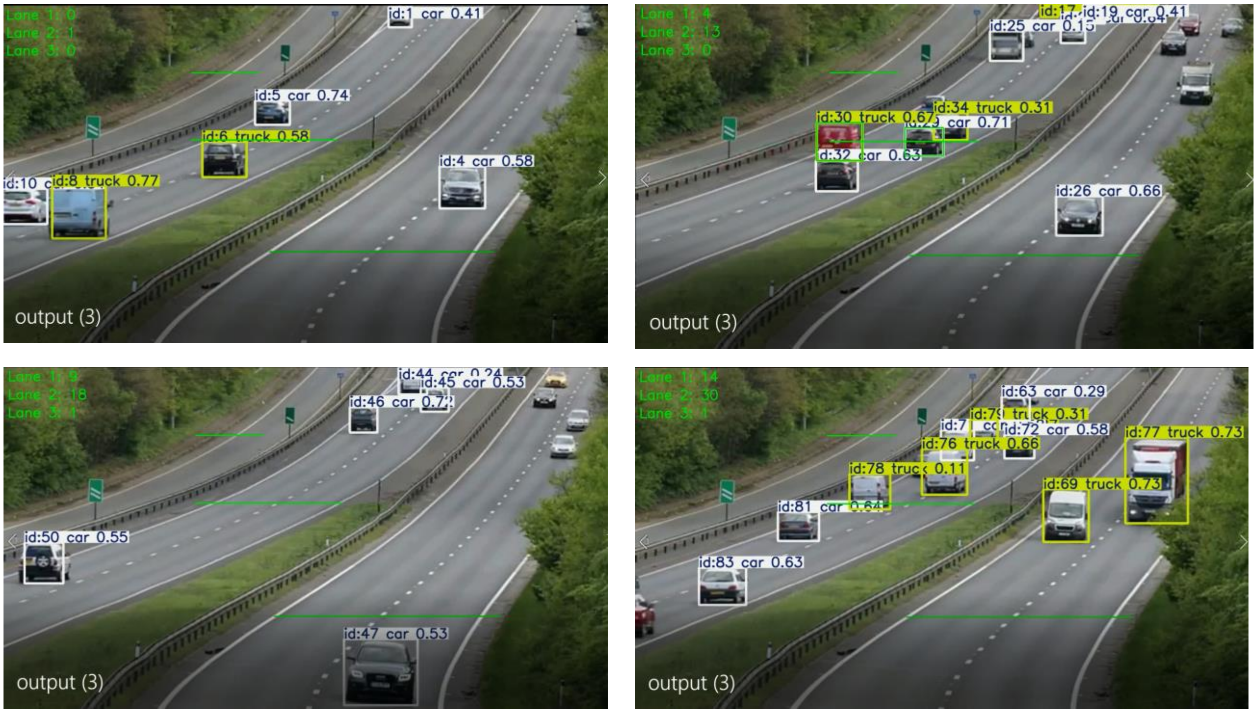
Question 1: Traffic Analysis

Result



Description

Dataset: Top-down view of traffic footage captured in England.

DL model: YOLOv10 is used for better inference speed, which enabled real-time applications. YOLO-based trackers can maintain object identities across frames.

Steps:

1. Identify and label lanes.
2. initialize a YOLOv10 model for object detection and tracking. Object classes of 2, 3, 5, and 7 which correspond to these objects: car, motorcycle, bus, and truck, were given to the model to tell the model to look for these objects and track them across frames.
3. The bounding boxes of all detected object across frames is extracted and compared with the lane boundary (obtained in the first step). Calculate the

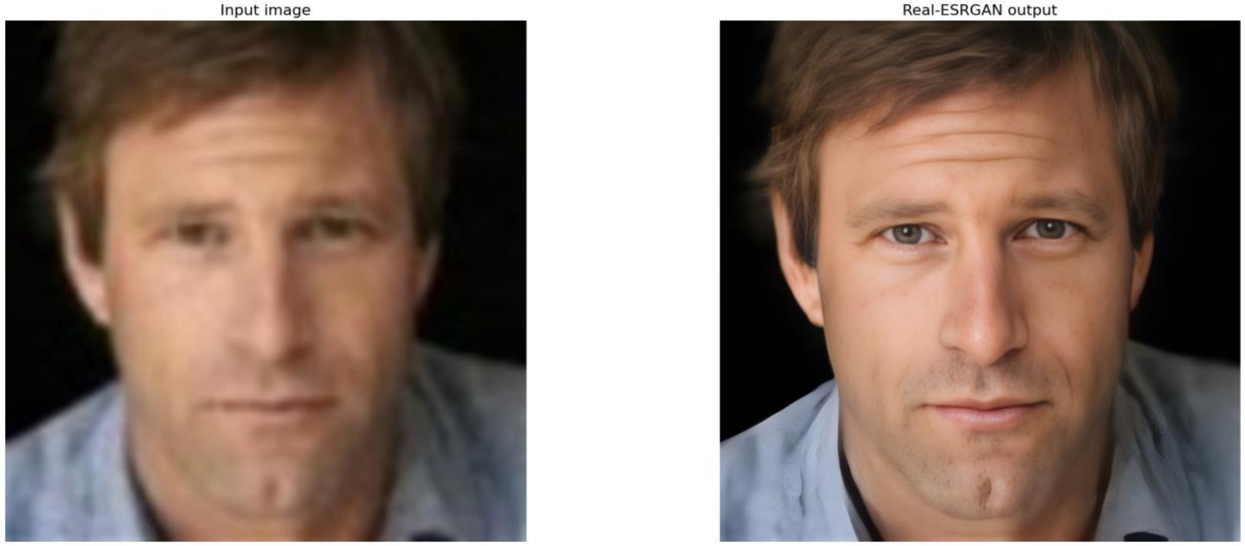
number of times an object crosses the lane boundary, which will be recorded down on the top left corner of the output video.

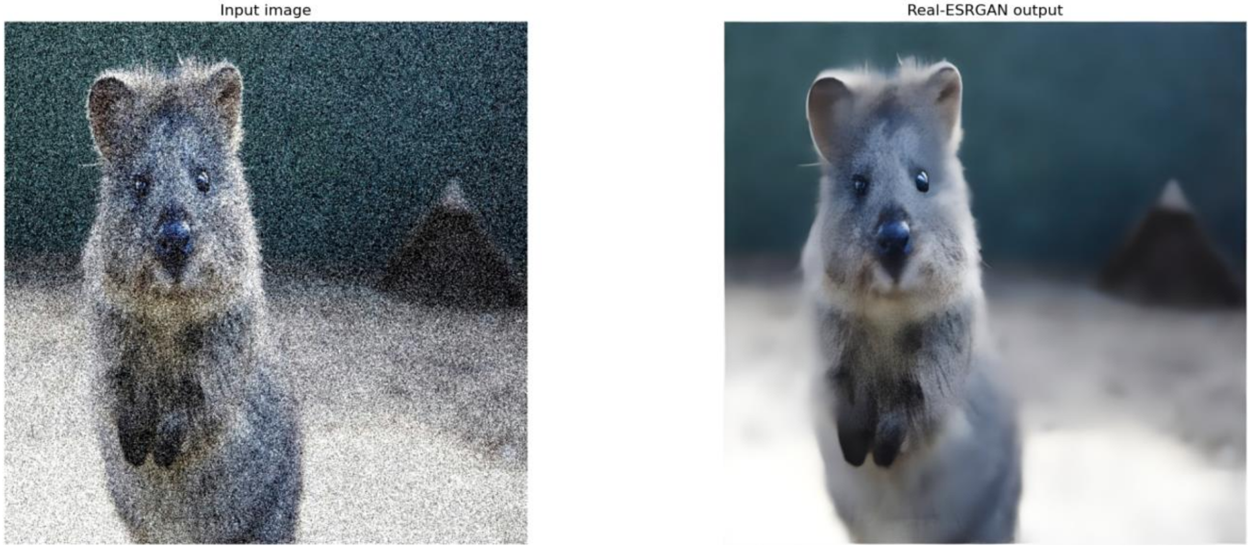
4. Save the annotated videos as shown in the above along with the bounding box of object, lane boundary labels, and counts of passing by objects on multiple lanes.

Results: The proposed model can track vehicle presents within the video quite accurate, across frames, with near real time inference speed. The counter works well as well, as shown in the output video.

Question 2: Image Processing

Result





Description

Dataset: Two low-quality images diagnosed with blurry and grainy conditions are used.

DL model: REAL-ESRGAN, a generative adversarial network, developed to enhances and restore image quality. The model can be found in this link: https://github.com/xinntao/Real-ESRGAN

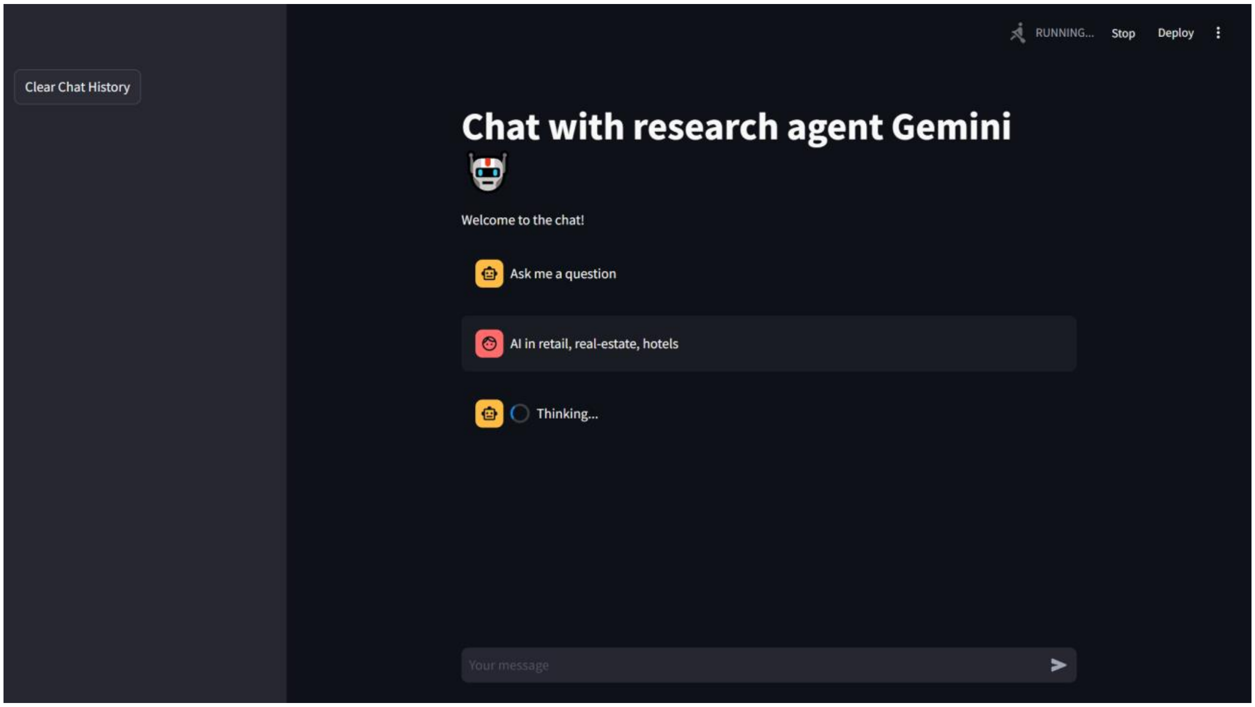
Steps: 1. Clone the project and import all necessary packages.

2. Clone the inputs into the working directory.
3. Inference by calling the pre-built scripts.
4. Read and display the images for pre and post restoration.

Results: As shown above, the model is able to restore both blurry and grainy images to a better quality.

Question 3: Generative AI

Result



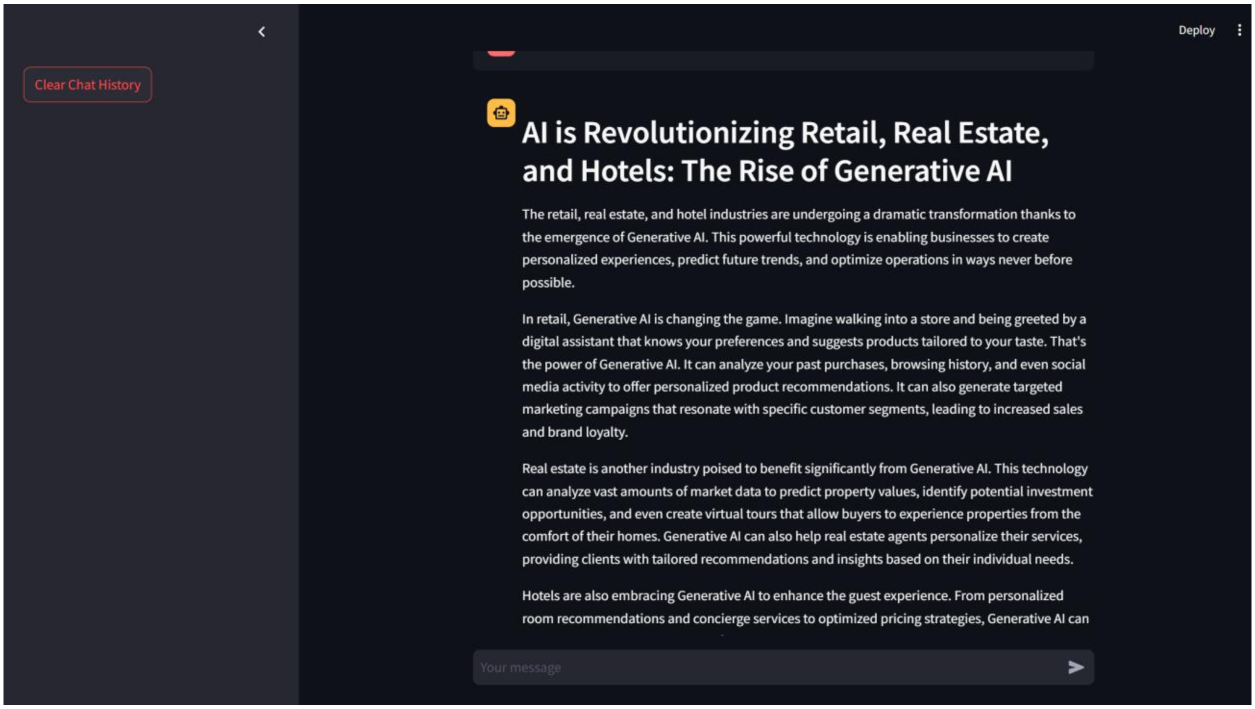
Chat with research agent Gemini 🤖

Welcome to the chat!

Ask me a question

AI in retail, real-estate, hotels

Thinking...



AI is Revolutionizing Retail, Real Estate, and Hotels: The Rise of Generative AI

The retail, real estate, and hotel industries are undergoing a dramatic transformation thanks to the emergence of Generative AI. This powerful technology is enabling businesses to create personalized experiences, predict future trends, and optimize operations in ways never before possible.

In retail, Generative AI is changing the game. Imagine walking into a store and being greeted by a digital assistant that knows your preferences and suggests products tailored to your taste. That's the power of Generative AI. It can analyze your past purchases, browsing history, and even social media activity to offer personalized product recommendations. It can also generate targeted marketing campaigns that resonate with specific customer segments, leading to increased sales and brand loyalty.

Real estate is another industry poised to benefit significantly from Generative AI. This technology can analyze vast amounts of market data to predict property values, identify potential investment opportunities, and even create virtual tours that allow buyers to experience properties from the comfort of their homes. Generative AI can also help real estate agents personalize their services, providing clients with tailored recommendations and insights based on their individual needs.

Hotels are also embracing Generative AI to enhance the guest experience. From personalized room recommendations and concierge services to optimized pricing strategies, Generative AI can

Description

What this tool about?: This application is a research agent that uses LLM and SERP tools to perform RAG-based functionalities. It is meant for doing autonomous research through browsing information in the search agent, and come up with a compelling story based on what ever it can find on the internet as per requested by its users. As an example, if a user asks for new trends of AI in retails, real estates, and hotels, it will perform research by itself, fetching the most relevant and latest information and compile them to form an essay. This tool is considering a RAG application mainly because it pulls knowledge from external sources using SERP tools.

Tools: Streamlit (as the Graphical User Interface), crewai (framework for developing a multi-agent LLM application)

LLM model: Gemini-pro (its free!)

Steps: To build the research agent RAG application, the crewai framework is used, which consisted of 4 core components: **agents**, **tasks**, **tools**, and **processes**. **Agents** are individual entities within the CrewAI framework. In this application, two agents are initiated, namely the researcher and writer. **Tasks** are a set of assignments allocated for each agent. In this case, the researcher agent is tasked to do research on the internet and compile a long report covering the topics asked by users, while the write agent is tasked to write compelling and nice to read articles based on whatever information collected by the researcher agent. **Tools** are functions that enable the agent to carry out a set of functions. For example, the research agent is provided with the SERP tools to enable web searching capabilities. **Processes** are the workflow of the application. In this case, the sequential process is defined in which the researcher agent will pass all information to the writer agent before dying, while the writer agent will need to wait for the researcher agent to finish execution first before starting.

Results: As shown in the above, a “ChatGPT” like interface is built using streamlit, which support user interaction with the underlying LLM agents. Besides that, the application is able to answers to user’s question accurately as well.