Project Problem Description

Project's objective explaination:

The project's objective is to develop a computer vision and AI based passenger boarding kiosk for the airport operations which could assist airline passengers to onboard the plane without any human assistance. This process will become the evolution of passenger validation in the world

In full working condition, the kiosk will have the following functions:

- Airline passengers should be able to scan their ID card and Boarding pass at the kiosk
- The kiosk should be able to extract passenger information from the boarding pass and then verify it from the ID card.
- Kiosk should be able to take a 20-30 second video of the person and perform facial recognition to match the live person at the kiosk with the ID card provided during the scan.
- Kiosk should also be able to scan the passenger's carry-on baggage and identify any prohibited item and stop the passenger from boarding.
- If all scanning and validation goes well, the kiosk greets the passenger with a final message that "He/she can board the plane" or if there are issues, the kiosk can suggest the passenger to "Please see an airline representative to complete the boarding along with issues during the validation process".

The simulated kiosk experience can be created as below:

- A passenger manifest (list of passengers boarding in the plane) is created with a list of 5+ passengers with their corresponding boarding info, including:
- Fabricated Digital IDs for all the passengers listed in the manifest are created. The Digital IDs contain passenger's personal information: DI, EXP, Class, End, Last Name, First Name, DOB, Sex, Hair, Eye, Height, Weight, RSTR
- Fabricated boarding passes for all the passengers listed in the manifest are created. The full boarding passes has information just like in the manifest
- The project owner fabricated ID card is also part of passengers list to validate the face recognition using the project owner video
- A 15-30 seconds video of project owner is used as the Kiosk face recognition system
- Passenger carry-on items are also scanned for lighter and if lighter is present, the passenger is flagged for prohibited items in the carry-on baggage.
- All of this data is processed by various Azure computer vision services to simulate the automated airline boarding process.

Input Data Sources:

- Flight Manifest List for all passengers, including their info about: Passenger Name, Carrier, Flight No., Class, From, To, Date, Baggage, Seat, Gate, Boarding Time, Ticket No.
- Passenger ID card with information about: Last Name, First Name, DOB, Sex, …
- Passenger Boarding Pass has same information categories as in manifest
- Passenger 15-30 second video showing their face
- Passenger baggage photo

The Solution Strategy:

- I will use the **Azure Form recognizer service**, a custom model will be trained with about 10+ fabricated boarding passes to extract passengers information from the Boarding passes.
- I will use **Azure Form recognition digital ID** service to extract the personal information from the passengers digital ID.
- I will use **Face API** to extract passenger face form the digital ID.
- The face photo extracted from the digital ID will be verified from the face photo extracted from the passenger video (as provided) using **Azure Video Indexer service**.
- I will use **Azure custom vision services** to create a custom object detection model to detect lighter in the passenger's luggage.
- After extracting enough information about the passenger, I will:
    - Compare Name on ID, Boarding pass and manifest
    - Compare Face on ID and in video
    - Compare Boarding information in boarding pass and manifest
    - Check if luggage contains a lighter or not

  After all successful validations, the passenger is validated and can board the plane

Model performance metrics and threshold:

- For the form extraction, I will use a threshold of confidence above 50%
- For the face validation, I will use a similar confidence score of at least 75%
- For the object detection, I will use the threshold for the training precision of at least 75%