**PROBLEM DEFINITION**

Boarding a flight involves a lengthy process where a passenger needs to go through security and flight validation procedures. This process is often done by airport staff. Airport security staff will have to check your hand luggage, and make sure that all the items pass scrutiny. After going through security checks, you will need to find your boarding gate. The airport staff will scan your documents to validate your flight details, before you board the aircraft. This process can be lengthy, and may create long queues. Airport staff can make errors through this process, which may create conflict, and possible customer dissatisfaction.

We will build a system that detects unwanted items in hand luggage. We will also build an automated flight validation system that confirms the passenger's identity, and details. This setup will create an automated passenger boarding kiosk.

We will build this solution to automate the boarding process, and improve the boarding experience. We aim to reduce contact between our airport staff, and passengers.

We will use various artificial intelligence systems, and cloud technologies to implement our solution.

We will use object detection, image classification, spatial analysis, optical character recognition, layout and text extraction, face detection, face recognition, emotion extraction, and sentiment extraction. We will also use cloud storage, and cloud infrastructure to build our solution environment.

We are dealing with customer data, so we will have to keep the data secure, and private to the relevant stakeholders. We will use Azure cloud security features to secure passenger's data. We will also train our models on unbiased data. We will use facial image training data from all races. We will also use digital IDs from different countries to train our models. We will use training data from people of all ages, skin color, sex, and different dimensions, and proportions.


**SOLUTION STRATEGY**

We will create a solution that simplifies the process of checking the hand luggage, and validating flight details. The solution we be in the form of an automated passenger boarding kiosk. The passenger will walk to the automated boarding kiosk, place the hand luggage on a platter mounted to the kiosk, and the camera will capture the items on the hand luggage. If the system detects an unwanted item, it will give back feedback in the form of a beeping trigger, and a screen message giving details of the found item, providing clear directions. The passenger will place his or her digital ID in the image scanner. The image scanner will be in the form of a camera. The camera will capture details on the digital ID, perform text extraction, optical character recognition, and ID recognition. A video camera will be mounted on the kiosk to capture the passenger's facial details, perform facial detection, and verify identity through facial recognition. The passenger will get security clearance, and flight validation from the kiosk, on one's way to the boarding gate.

The solution will detect digital IDs, and boarding passes. It will perform identity validation, and object detection in hand luggage. We will extract information from identification cards, and boarding passes, using Azure Form Recognizer. We will match each passenger's digital ID face, with the face extracted from video, using Azure Computer Vision, Azure Face services, and Azure Video Analyzer. We will use

Azure Video Analyzer to extract each passenger's emotions. We will perform lighter detection in the carry-on items using Azure Custom Vision.

Text data will be collected from the boarding pass, and digital ID. This data will be cross-referenced with the flight manifest to validate flight boarding. The passenger's identification will be validated by matching the ID photo, with the extracted video photo.

We will use 95% precision, 90% recall, 80% threshold value to validate the passenger's identity. We will use 90% precision, 85% recall, and 80% threshold value to detect lighter images.