香港中文大學
The Chinese University of Hong Kong

Efficient Video Analytics

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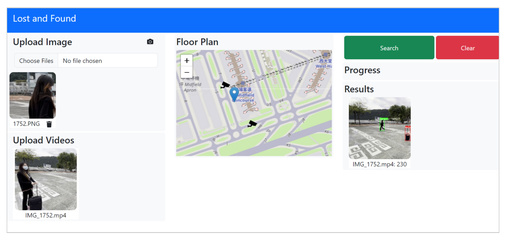
Introduction

Our ultimate goal was to create an accurate and efficient lost-and-found system for Hong Kong Airport. By inputting a linguistic or pictorial description of the owner and the lost item, our system can quickly find the moment the item was lost. Our preliminary expectations before embarking on the Summer Research were threefold:

- Design a user-friendly front-end web UI.
- Implement the fundamental functionality of the system.
- Enhance the performance of our system as much as possible.

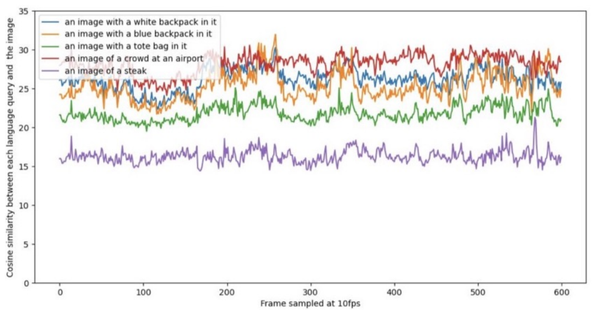
Basic Implementation

We started by building the user interface and using the "Center-Distance Method" to detect the "LOST" status of an item.



Detection Methods and Models

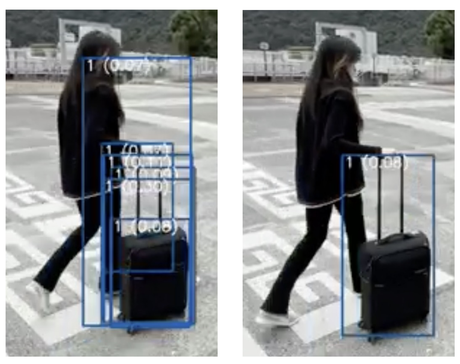
- **CV Models**
  YOLOv5 + Deep SORT
  YOLOv5 + CLIP
  OWL-ViT
- **"LOST" Detection**
  Center-Distance
  Detecting Co-occurrence



Further Approaching

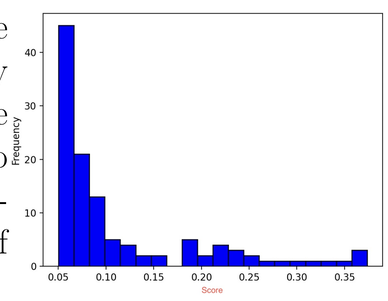
- **Non-Maximum Suppression**

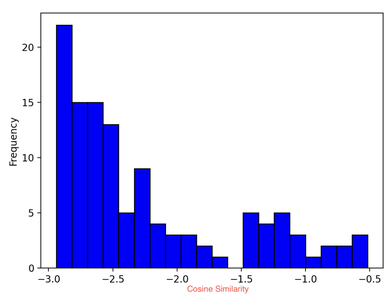
We found there was a large amount of overlap in the objects recognized. We integrated the Non-Maximum Suppression algorithm into our model, which simplified multiple recognition bounding boxes caused by the same object into one.



- **Scores and Cosine Similarity**

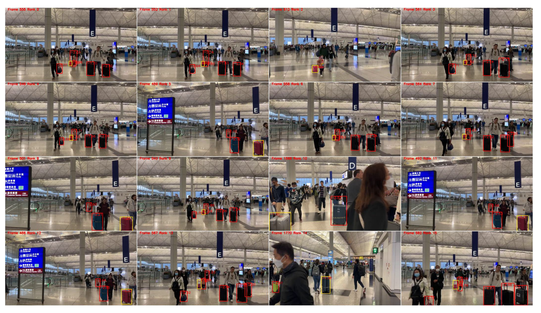
We use the Cosine Similarity directly as the score for the prediction result to widen the gap between the scores of different objects.





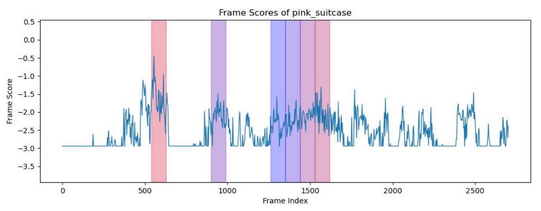
- **Top-K Selection**

We integrated the Top-K Selection algorithm into the model to solve the problem that the False Positive rate of our model is to high. The yellow boxes are the Top-16 of the image detecting result of "pink box".



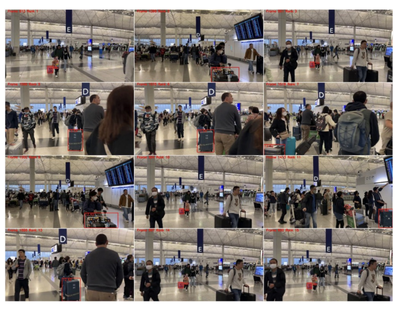
- **Chunk Extraction**

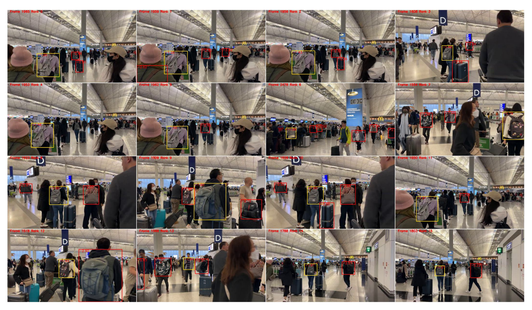
We developed new algorithms that rank and output chunks instead of frames. The redder the colour, the higher the score of the chunk.



Result

Now, we can run either an image or language query on a video and pick out frames or chunks containing objects with Top-K scores from the result.
These are two examples: image query for the pink luggage and language query for "black and white striped backpack".





Future Work

- Utilize the "Detecting Co-occurrence" method.
- Incorporate Everest, a video analytics system for Top-K queries, into our model.

References

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