The Digital Gangsters

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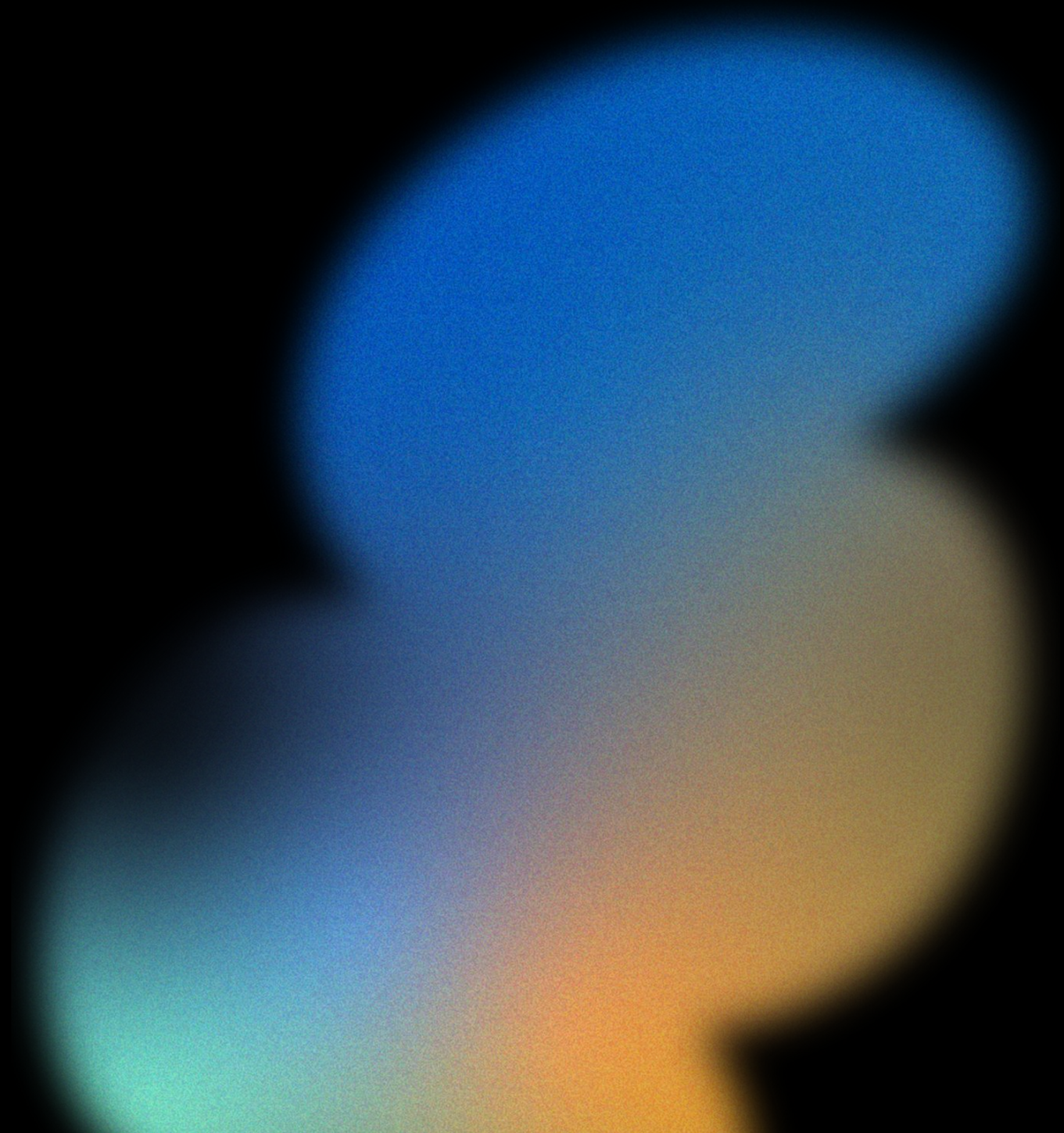
Executive Summary

Our goal is to create a Convolutional Neural Network (CNN) specifically to classify weapons in an image.

The Model is then optimized for integration with OpenCV enabling real time analysis of video and live-streaming feeds.

By leveraging this technology we aim to enhance threat detection capabilities and proactively mitigate potential security risks.



Datasets

Metadata.csv
Weapons classifier dataset from Kaggle.

License: CCO: Public Domain

Train.csv
Dataset obtained from Kaggle.

License: GPL 2

Metadata images
The weapons dataset is a collection of 9 different classes of weapons. In total, 714 images, 4 columns(imagefile, labelfile, target, train_id)

Train images
The random images dataset is a collection of various non weapon images.

In total 6,469 images, two columns(image and class)

Preprocessing

Model Requirements

- Tensorflow,
- Tensorboard,
- Numpy,
- Gradio,
- Pillow
- OpenCV-Python,
- Scikit Learn,
- Pandas,
- Datetime

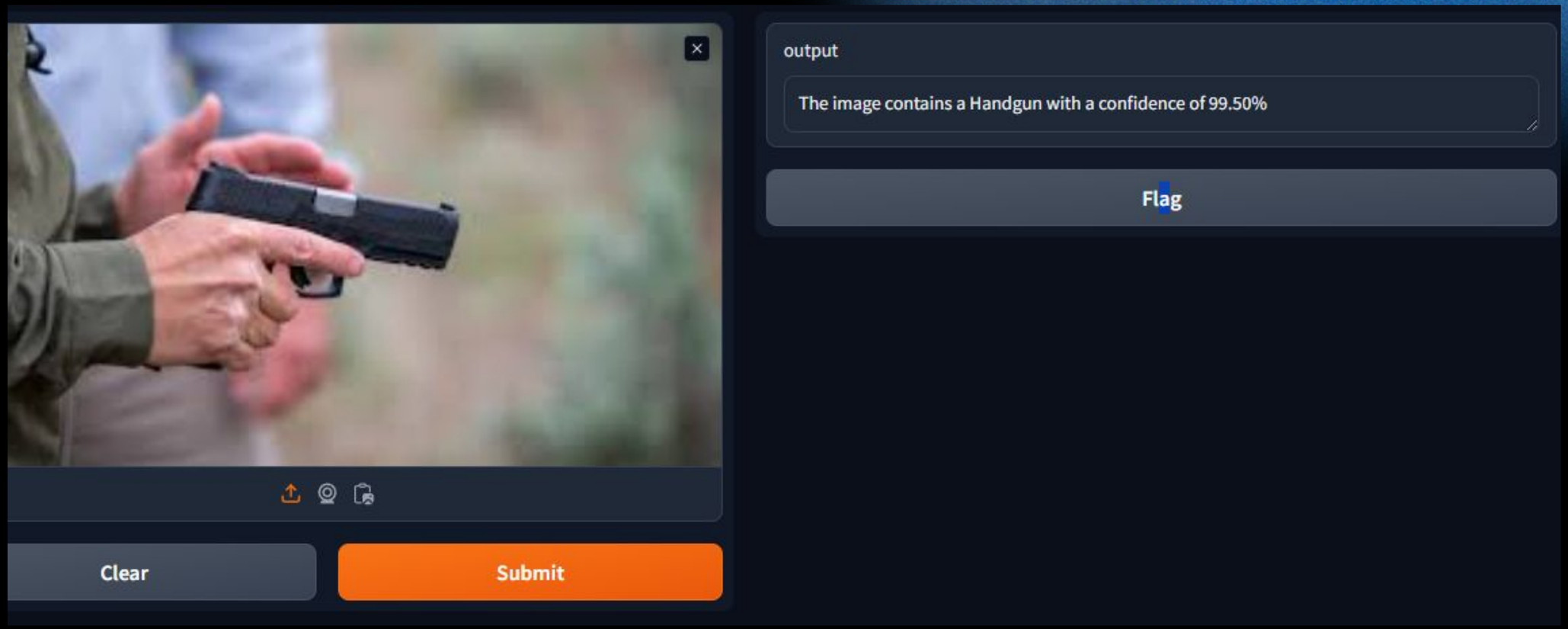
Augment the images

Had to parse the weapon type and the file name from the imagefile column, we also had to normalize and augment images

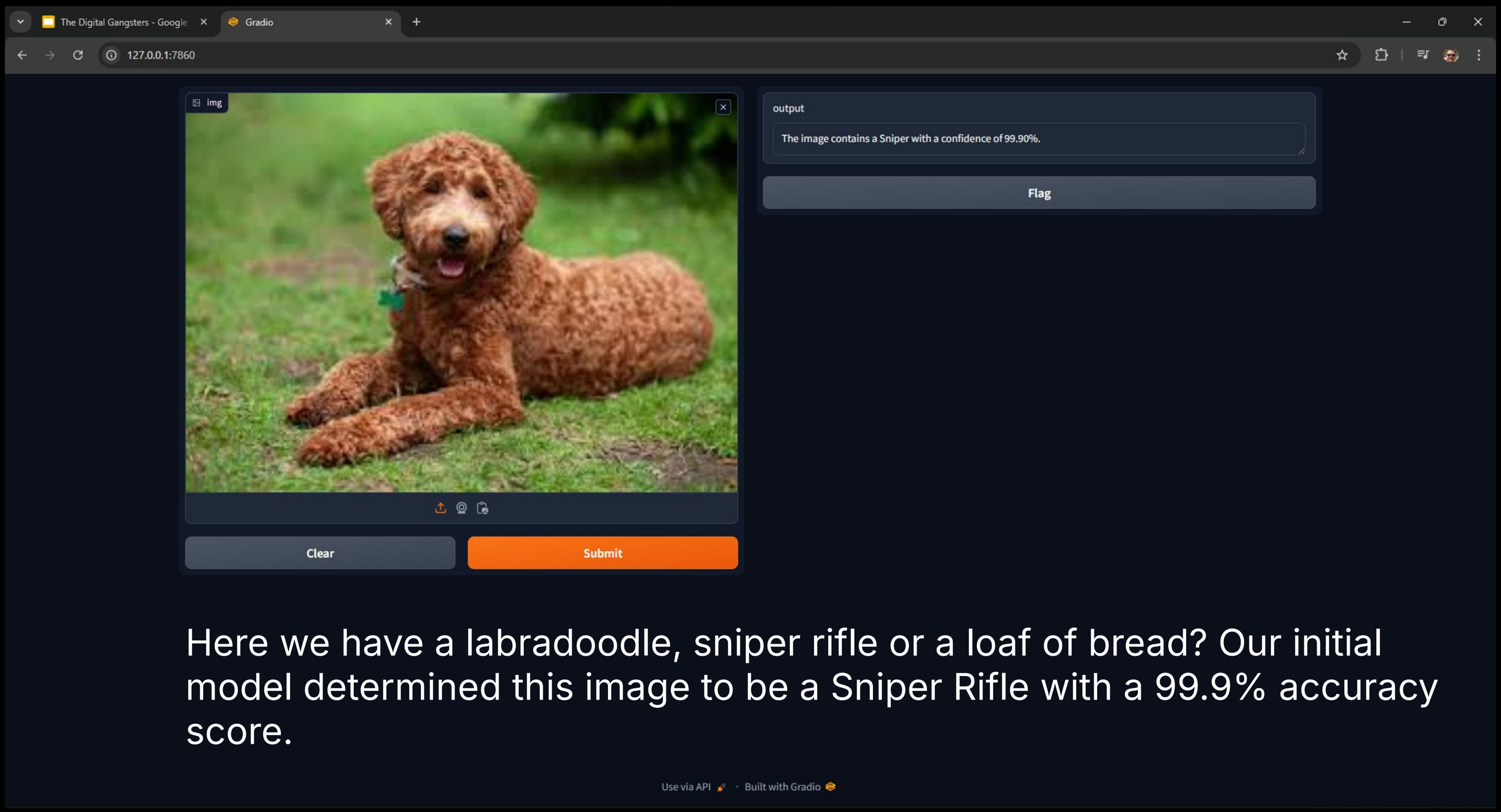
Image Preprocessing

Images were resized to a uniform dimension of 64×60 pixels. Each image was converted to a floating-point numpy array and normalized to have pixel values between 0 and 1, which standardizes the input for the model.

Gradio

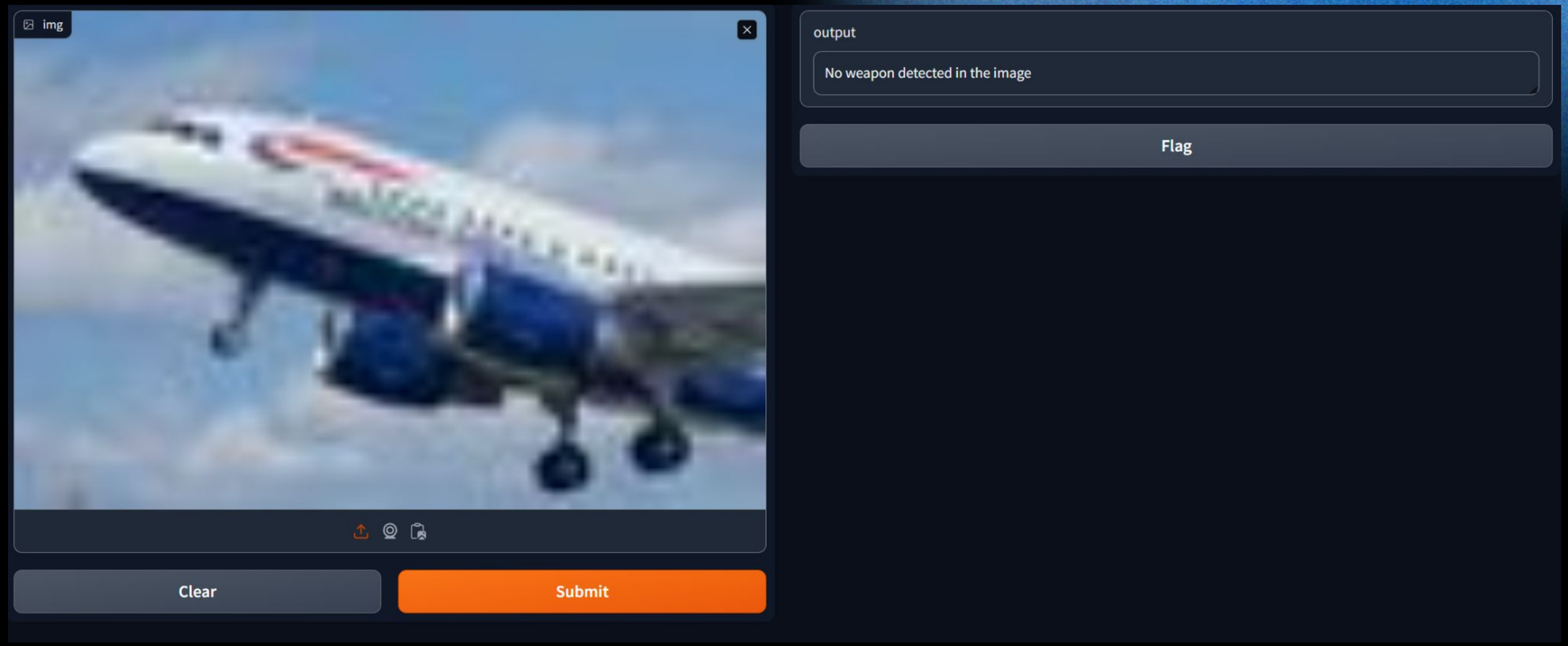


Here we have a weapon image displaying a 99.5% accuracy score



Here we have a labradoodle, sniper rifle or a loaf of bread? Our initial model determined this image to be a Sniper Rifle with a 99.9% accuracy score.

Gradio



Here no weapon is detected in the image.

OpenCV

- OpenCV (Open Source Computer Vision Library) is an open-source software library primarily designed for computer vision and image processing tasks. It provides a wide range of tools and algorithms for tasks such as image recognition, object detection, face recognition, video analysis, and more.

- Library gave us an easy way to open a webcam stream to process images through the model, but it has much more capabilities beyond that.

Issues

- When an image has different weapons within the same image, only one gets detected. We did attempt to use a MultiLabelBinarizer encoder to help with this problem, however the encoder requires the training data to be labeled with multi object labels as well. We didn’t have time to generate that training data.

- The MultiLabelBinarizer encoder could potentially benefit in later iterations of the project.

Model Demonstration