RescueTrek Phase 2 Gun Detection Model

Introduction

The RescueTrek Phase 2 Gun Detection Model is a machine learning model designed to detect guns and humans in images and video footage, facilitating the identification of potential shooters. The model utilizes the YOLOv5 object detection algorithm implemented with PyTorch for gun detection and FaceNet with TensorFlow for facial detection. This combination ensures accurate and efficient analysis of input imagery and video.

Model Architecture

The model architecture consists of two primary components: gun detection using YOLOv5 and facial detection using FaceNet.

YOLOv5 Integration

The RescueTrek Phase 2 Gun Detection Model utilizes YOLOv5, an object detection algorithm, for detecting guns and humans in images and video footage. YOLOv5 is implemented using PyTorch as the underlying framework.

Model Files

The YOLOv5 model files are included in the repository. The model architecture and pre-trained weights can be found in the `yolov5` folder.

Running Object Detection

To perform object detection using YOLOv5, follow these steps:

1. Ensure that the necessary dependencies are installed by referring to the Installation section in the README.
2. Open the `GUI.py` script located in the root directory.
3. Run the `GUI.py` script, which will launch a user interface for performing object detection.
4. Use the user interface to select images or video footage on which you want to perform object detection.
5. The YOLOv5 model will process the input data and detect guns and humans.
6. The results will be displayed in the user interface, highlighting the detected objects and their respective bounding boxes.

By integrating YOLOv5 into the RescueTrek Phase 2 Gun Detection Model, the system can effectively identify potential shooters by detecting guns and humans in the provided data.

Please note that for optimal performance, ensure that the images or video footage provided for object detection are of sufficient quality and contain relevant visual information.

FaceNet Integration

The RescueTrek Phase 2 Gun Detection Model utilizes FaceNet, a facial recognition system, for facial detection. FaceNet is implemented using the `facenet_keras_weights.h5` file, which contains the pre-trained weights of the FaceNet model.

Training Faces

To train the facial detection model on specific faces, follow these steps:

1. Prepare a folder named `facepics` and populate it with images of the faces you want to train the model on.
2. Open the `train_GUI.py` script located in the FacialDetection_v1 folder.
3. Run the `train_GUI.py` script, which will initiate the training process using the images in the `facepics` folder.
4. The script will save the trained weights to the `facenet_keras_weights.h5` file upon completion of the training process.

Detecting Faces

To detect faces using the FaceNet model, follow these steps:

1. Open the `detect.py` script located in the FacialDetection_v1 folder.
2. The script utilizes the `facenet_keras_weights.h5` file to load the trained weights of the FaceNet model.
3. Run the `detect.py` script to perform facial detection on the provided images or video footage.

By integrating FaceNet into the RescueTrek Phase 2 Gun Detection Model, the system can accurately detect faces and further enhance the identification process of potential shooters.

Please ensure that the images provided for training in the `facepics` folder are representative and diverse to achieve optimal performance in face detection.

Twilio Integration

The RescueTrek Phase 2 Gun Detection Model incorporates Twilio, a communication platform, to enable real-time alerts about potential shooters. The `detect.py` script in the FacialDetection module utilizes Twilio's API to send SMS alerts to designated recipients.

To set up the Twilio integration and configure the necessary credentials, follow these steps:

1. Sign up for a Twilio account at https://www.twilio.com/ and obtain your account SID and authentication token.

2. Open the `detect.py` script located in the FacialDetection_v1 folder.

3. Locate the Twilio configuration section in the script:

```
# Twilio Configuration

account_sid = 'YOUR_TWILIO_ACCOUNT_SID'

auth_token = 'YOUR_TWILIO_AUTH_TOKEN'

twilio_phone_number = 'YOUR_TWILIO_PHONE_NUMBER'
```

4. Replace `'YOUR_TWILIO_ACCOUNT_SID'` with your Twilio account SID, `'YOUR_TWILIO_AUTH_TOKEN'` with your Twilio authentication token, and `'YOUR_TWILIO_PHONE_NUMBER'` with your Twilio phone number.

5. Save the changes to the `detect.py` script.

With the Twilio integration set up, the `detect.py` script will utilize Twilio's API to send SMS alerts to the designated recipients listed in the `contacts.csv` file.

Please ensure that you have the necessary Twilio credits or subscriptions to send SMS messages, as additional costs may apply.

Installation and Setup

To install and set up the environment for the RescueTrek Phase 2 Gun Detection Model, follow the instructions provided in the Installation section of the README.

Usage

To utilize the RescueTrek Phase 2 Gun Detection Model, follow the steps outlined in the Usage section of the README.

Future Improvements

- Fine-tuning the gun detection model using transfer learning on a larger and more diverse dataset to improve its accuracy and robustness.
- Exploring additional preprocessing techniques to enhance the model's performance, such as data augmentation and image normalization.
- Using Amazon Web Services servers to run the model for scalability

Contributions and License

Contributions to the RescueTrek Phase 2 Gun Detection Model are welcome and can be submitted via pull requests. The project is licensed under the MIT License, allowing for open-source use and modification.