Real-Time Machine Learning

Facial and Mask Recognition in Real-Time
The Team

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Overview

- Use Machine Learning for Real Time Tasks
  - Facial Recognition
    - ID Face in frame
    - ID Mask
  - Applications
    - Building security camera
    - Photo ID
Timeline

- Learning
  - ML
  - Python
  - Pytorch
  - Hardware

- Algorithms
  - Facial Recognition
  - Put names to faces
  - Saving unknown & masked faces
  - Check for mask using CNN
Program Overview

- Combined useful aspects of two codes
  - Doorcam
  - Facial Recognition
- Known Face Identification
- Saves Unknown Faces
- Mask Identification

```python
# Main Loop
def main_loop():
    unknown_number = 1
    mask_number = 1
    while True:
        # Grab a single frame of video
        ret, frame = video_capture.read()
        # Resize frame of video to 1/4 size for faster face recognition processing
        small_frame = cv2.resize(frame, (0, 0), fx=0.25, fy=0.25)

        # Convert the image from BGR color (which OpenCV uses) to RGB color (which face_recognition uses)
        rgb_small_frame = small_frame[:, :, ::-1]

        # Find all the face locations and face encodings in the current frame of the video
        face_locations = face_recognition.face_locations(rgb_small_frame)
        face_encodings = face_recognition.face_encodings(rgb_small_frame, face_locations)

        # Loop through each detected face and see if it is one we have seen before
        for face_encoding in face_encodings:
            # See if the face is a match for the known face(s)
            matches = face_recognition.compare_faces(known_face_encodings, face_encoding)
            name = "unknown"
            if True in matches:
                name = known_face_names[matches.index(True)]
            elif name == "unknown" and mask == False:
                unknown_number_string = str(unknown_number)
                unknown_number = unknown_number + 1
                unknown_number_string += "1.jpg"
```
Convolutional Neural Network (CNN)

**General Knowledge**
- Algorithm takes input image and identifies what it is
- Image goes through layers which apply filters onto the image

**Our Program**
- Two 2D convolutional layers
- Two pooling layers
- Three fully-connected layers
- Learning rate 0.001
- 4 epochs and batch size of 4
Video Demonstration
The project is a Facial Recognition Project that aims to identify who a person is in front of someone's camera is connected to in real-time. The system can identify people by their face images and compare them to databases in the database the device has set up.

However, with many people moving in the front of the cameras while on, the device takes a hard time on identifying who that person is, so we need to build an AI model which can detect and locate the faces of all the people present in the image and then use facial recognition to identify who they are.

References

Netusha Dias, David Banyamin

Real-Time Machine Learning

Summary

- Used Convolutional Neural Networks to identify whether a person is wearing or not
- Real-Time video feed
- Face detection

Future Work

- Incorporate the Convolutional Neural Network for better accuracy
- Increase computational power
- Add and remove faces
- Change the face features

Mask Recognition

- Use a Convolutional Neural Network to identify whether a person is wearing or not
- Real-Time video feed
- Face detection

Future Work

- Incorporate the Convolutional Neural Network for better accuracy
- Increase computational power
- Add and remove faces
- Change the face features

The device can be used to identify people in an area and report any suspicious activity.
Conclusion & Future

Results:
- Got a functioning program
  - Identify the person in front of the camera
  - Saves unknown and masked individuals

Improvement:
- CNN
  - Adjust ability to read a masked face
  - Ability to read multiple masked faces

Potential Use:
- Security camera
  - Ensure people are wearing masks before entrance
References


Thank You!
Any Questions?