



FERFI

Facial Expression Recognition for Investigations

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Introduction & Background

In criminal related investigations, an investigator's goal is to collect facts about an issue. Some of the events are collected from witnesses or suspects. In such stressful investigations, many people tend to lie or hide the truth. This situation hinders the investigator from understanding the situation to make a decision. If an investigator finds a person under investigation is deceiving the police, this will encourage them to perform more investigation and analysis. If the accused is innocent or guilty, in this project, the system can determine the destination and then show the result of the accused's feelings.

Objectives

We aim to develop a FER system to assist in the police and social workers in their interviews for investigating an issue or a crime, in order to understand human emotions using ML and DL techniques. The project objectives are as follows:

- To create a software system that is capable of detecting facial expressions.
- To collect facial expression images from existing databases for system training and testing.
- Use ML and DL to create an algorithm that analyzes facial expressions and then detects human emotions.
- To make the software system capable of recognizing the emotions of a woman wearing a niqab.
- To make the software system capable of recognizing the emotions of a person wearing a face mask.

Methodology

Deep learning (DL), machine learning (ML) and the FER-2013 dataset were used to build a neural network model. A face-api JavaScript module was used to detect face in live video. HTML and CSS were used to design and build the website. PHP was used to design the MySQL database in which the investigator and defendant's data were stored. JavaScript was used to connect the neural network model with the website. Server life was also used to access the camera and record a live video.

Results

The neural network model was trained on 28,709 images and tested on 7178 images, and it was also tested on a set of videos. For this model, the accuracy that we achieved for the training set is 93% and for the validation set is 64%.

Figure 1: Happy emotion test

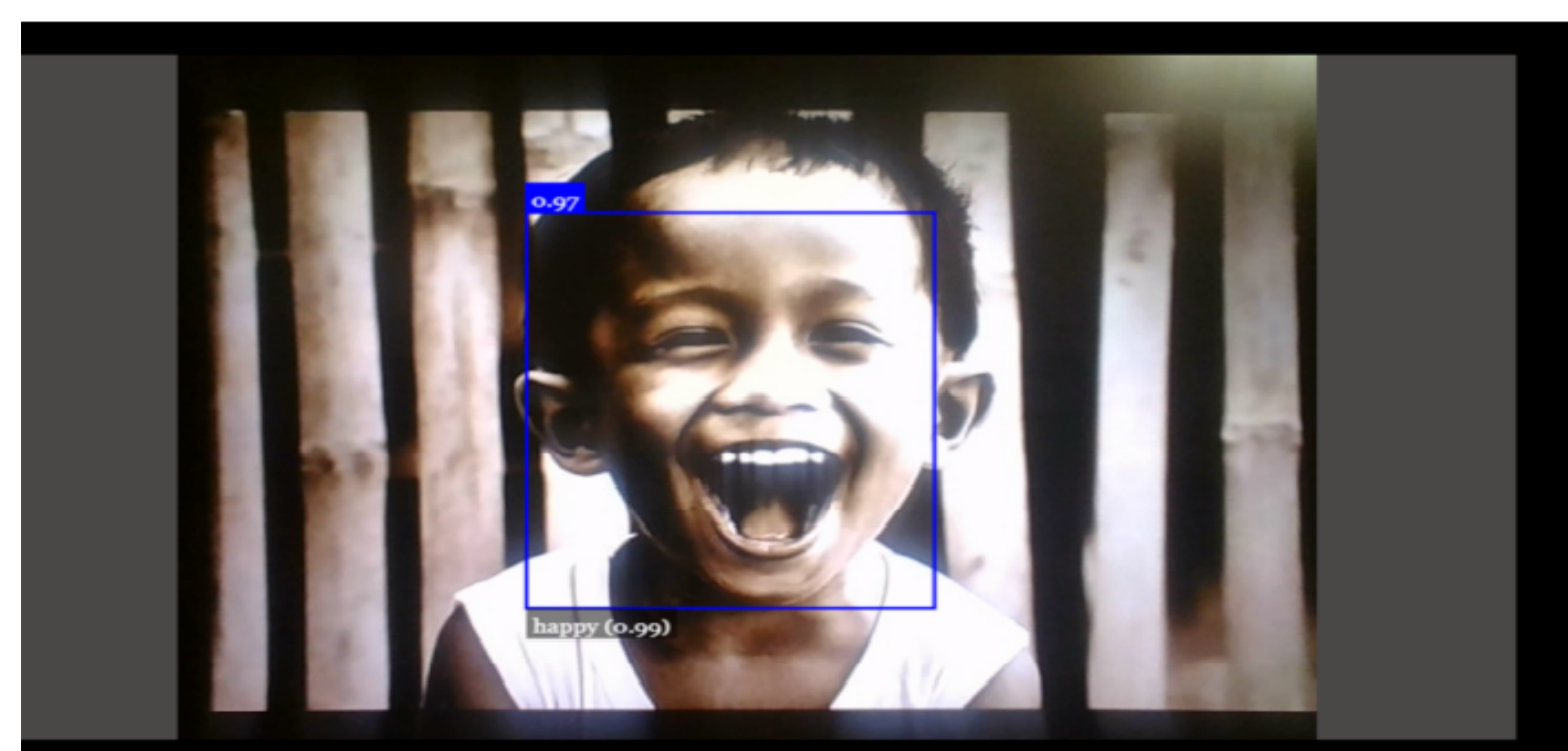


Figure 2: Angry emotion test

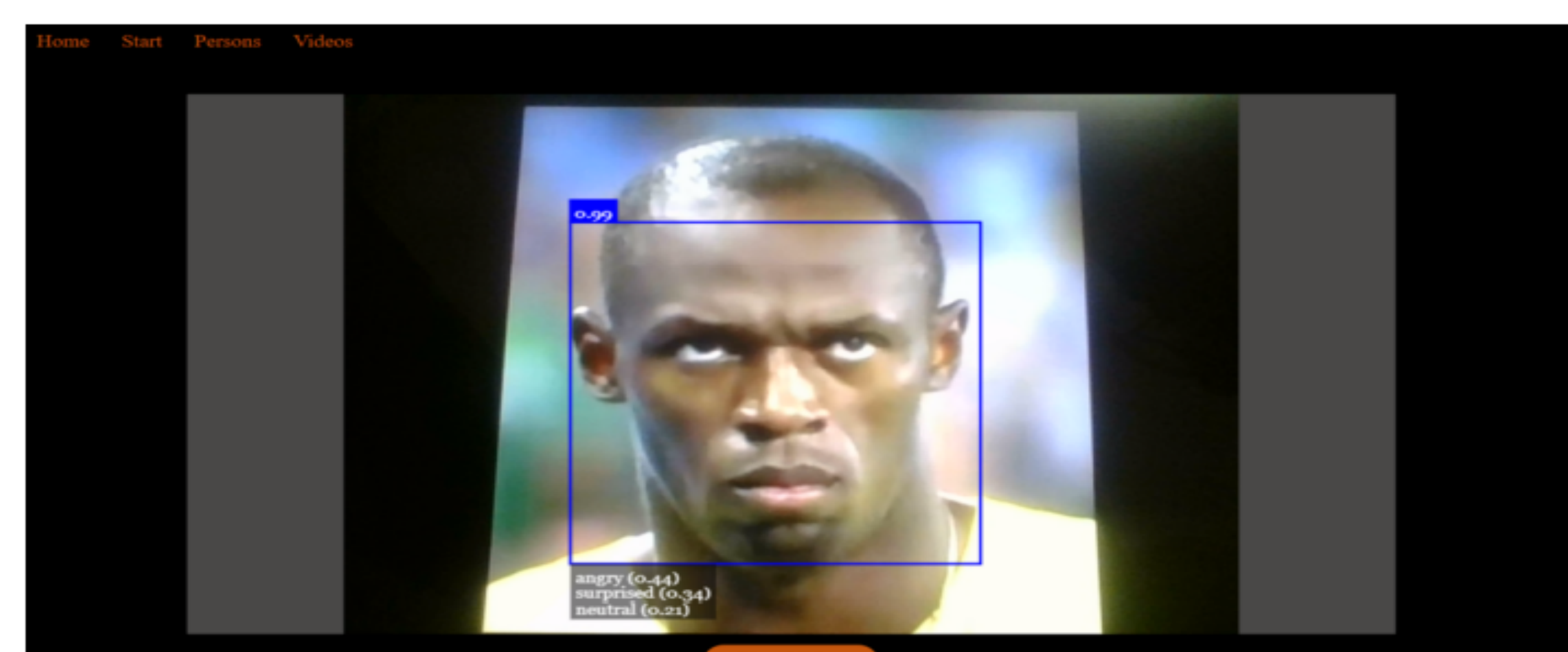
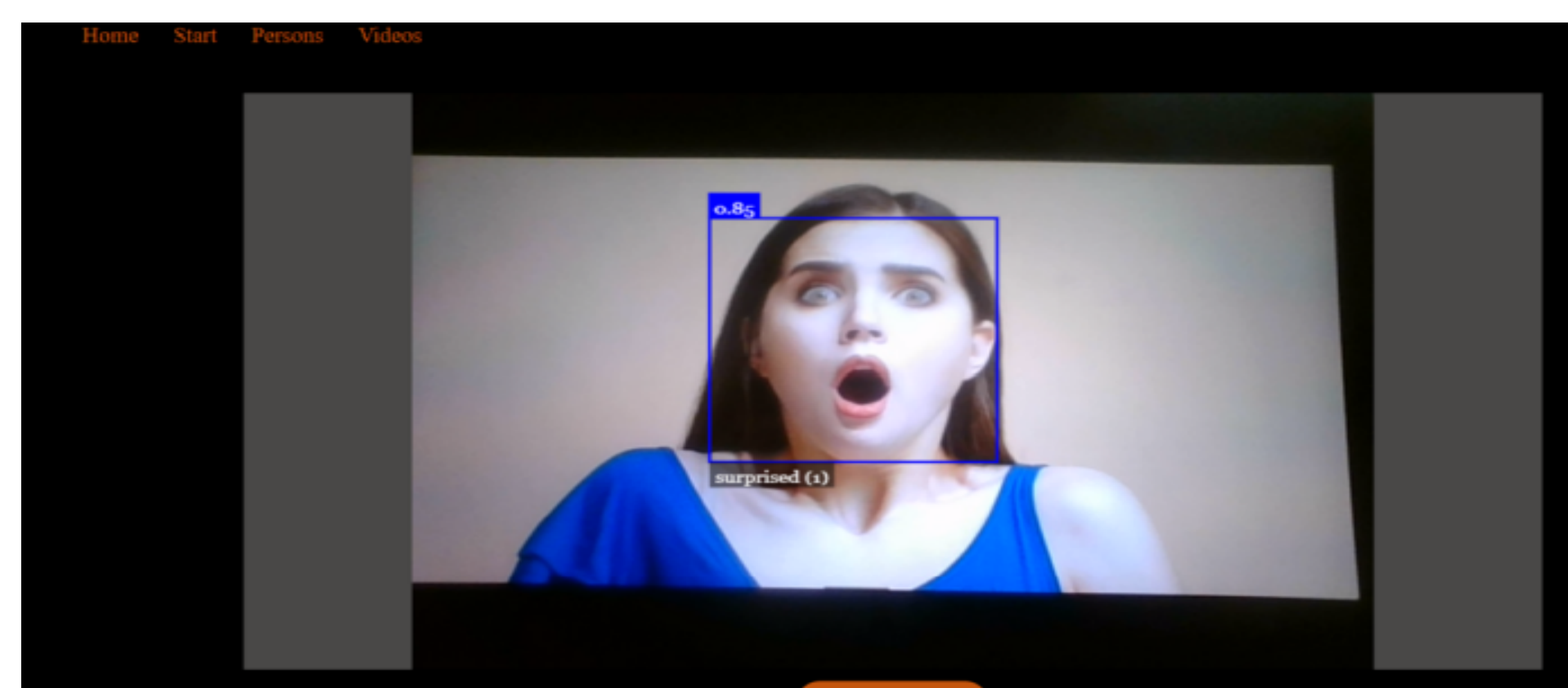


Figure 3: Surprised emotion test



Conclusion

Facial expression recognition for investigations (investigators' camera) is a project to identify expressive situations that a person shows feelings (sadness, happiness, ... etc.), which helps the investigator to detect a person's feelings during investigation faster and more. FERFI aims to help the investigation field to detect the feelings of the person who cannot show them, by revealing his feelings by opening the camera and starting the live video. The result will be shown through the live video relatively (0.99 happy, 0.88 angry....etc.). This project starts by turning on the camera to start the live video. When the live video starts, the face is determined and the result of the sentiment analysis is determined: happy, angry, surprised, sad, fearful, neutral, disgusted. The investigator can see the data of the person being investigated through the person's information page, where it displays the person's personal information, and the FERFI team has dealt with and faced artificial intelligence obstacles in dealing with live video, face aspects, and changes. Status (emotion) in time. The project can be developed later, adding other features, or using other languages to recognize faces or increase accuracy. This application is built using several languages: HTML, CSS, and JavaScript for web design. The site is linked to PHP to connect to the database.

Future Work

Due to the lack of sufficient resources for women wearing niqab in the future, it is possible to develop the system to increase the accuracy of detecting the feelings of women wearing the Islamic headscarf. Also, a website can be developed, where a summary of the result of sentiment analysis can be shown after the end of the video, and the live videos of the investigation can also be saved and reviewed through the site.

References

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- A. S. Patwardhan, "Multimodal mixed emotion detection," in 2017 2nd International Conference on Communication and Electronics Systems (ICCES), Oct. 2017, pp. 139–143, doi: 10.1109/CESYS.2017.8321250.