

Sentinel WatchGuard: Emotion and Fall Detection

Mohamad Homsy
Jalal Ghannam
Bilal Jibaly

Fawzy El Muzayin
Sara Baassiri



Content

- Introduction
- Problem Statement
- Our Mission
- Where can Sentinel Detection be used?
- Current Implementations
- Contribution
- How Sentinel Detection Works
- Demonstration
- For the Future
- Conclusion

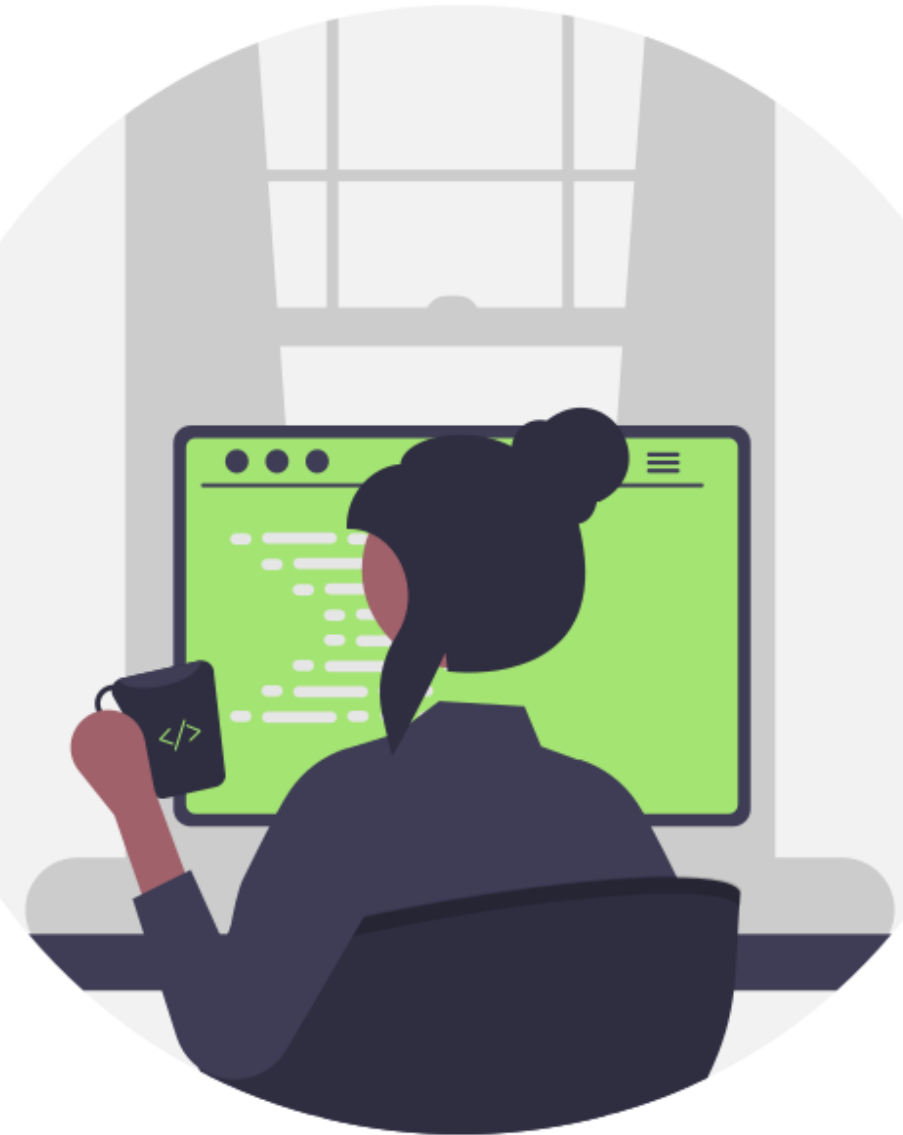
Introduction

Do you worry about the safety of your loved ones going in public places by themselves?

Have you ever worried on leaving your elder relatives alone knowing they could lose balance anytime?

Isn't collecting reviews of users a hassle? by having to collect all data manually not knowing if they are even truthful or honest.

Did you ever fear going to the ATM machine alone or at night fearing that you might get robbed?



Problem Statement

How can these issues be solved to improve the safety and the comfort of well beings?

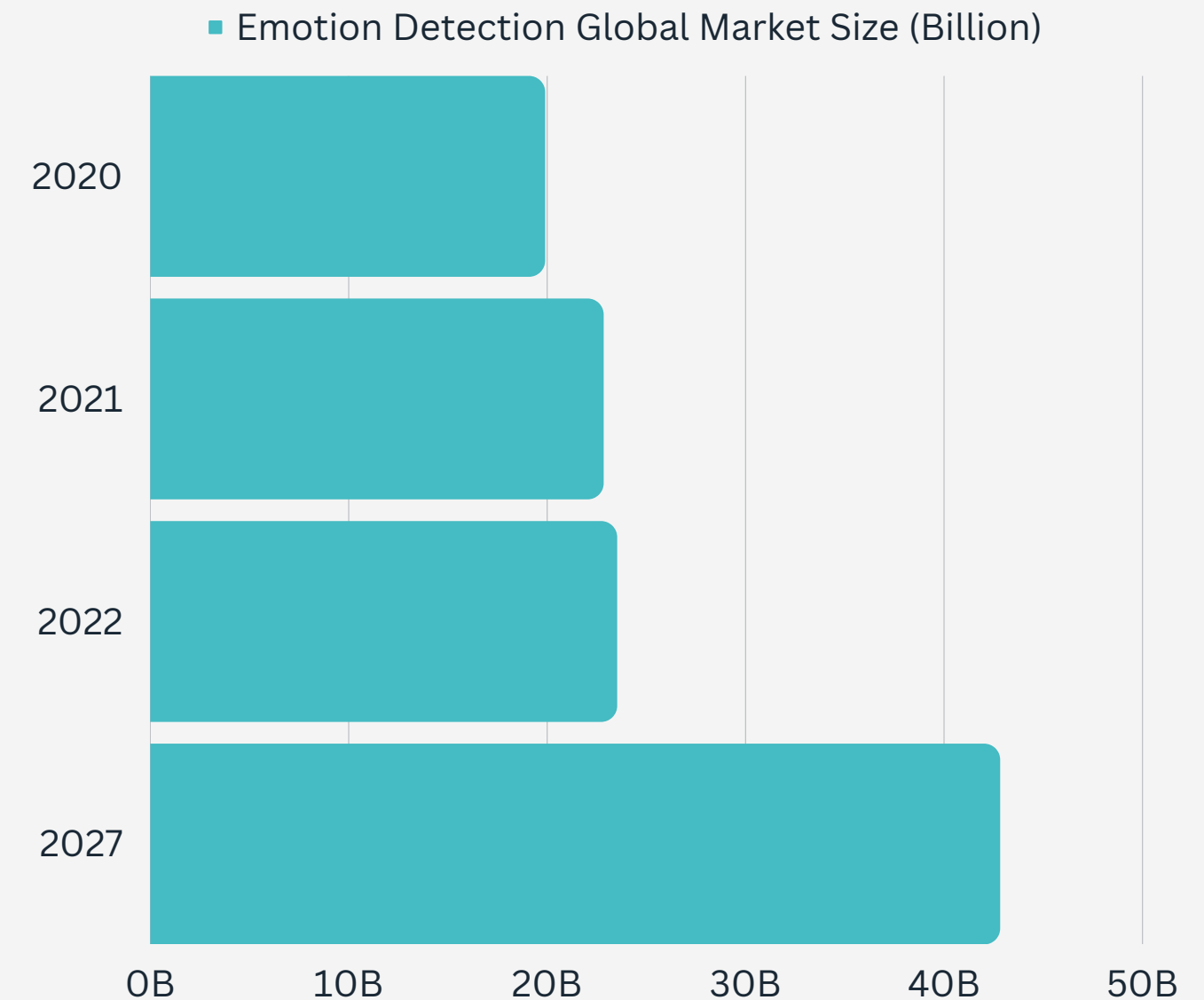
By addressing the limitations of current fall detection methods and the underutilization of emotion detection technology in real-life implementations

- Emotion Detection
- Fall Detection

Problem Statement

Emotion Detection

- Emotion detection is not widely used in real-world applications because existing algorithms are inaccurate, unreliable, and not tuned for specific applications.
- This creates significant challenges in promoting the safety and well-being of individuals.
- Because of that it is important to improve the accuracy and reliability of emotion detection techniques and adapt them to specific applications.



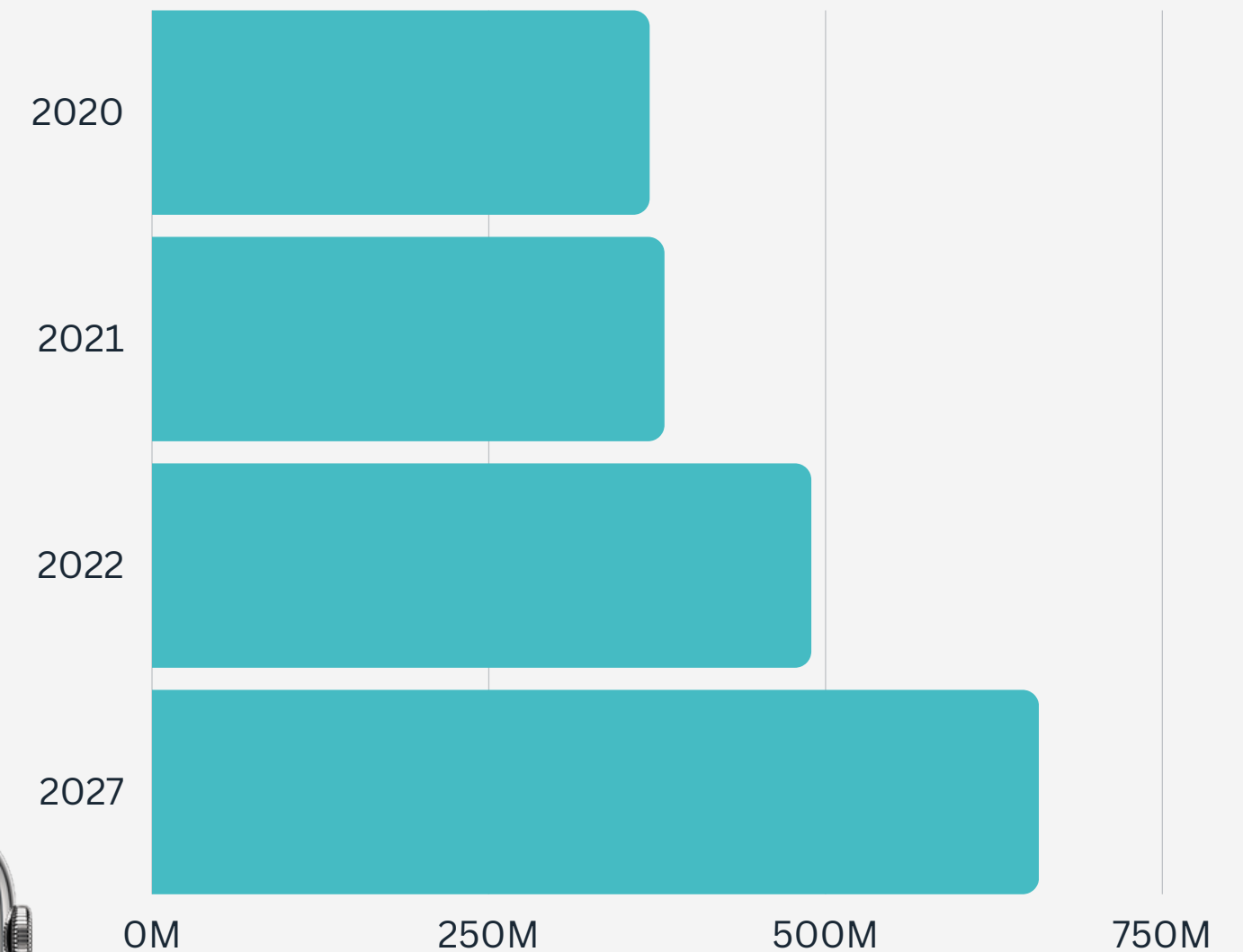
Problem Statement

Fall Detection

- Falls are a major public health concern in addition falling is the leading cause of injury-related death for people ages 65 and older, and wearable fall detection devices have limitations such as inconvenience, discomfort, and they are expensive.
- That's why there is a need to develop new fall detection solutions that address these limitations and promote the safety and well-being of people from all ages.



■ Fall Detection Global Market Size (Million)



Our Mission



Contributing to the advancement of Safety and assistive technologies by providing a practical and effective solution for fall detection and emotion detection, with the potential to improve care, intervention, and support for individuals in various settings.

The primary goal of an emotion detection algorithm is to automatically and objectively determine the emotional state of an individual, providing insights into their affective experiences.

For example, it can be used in healthcare, protection, marketing, advertising, entertainment, etc.

Where can Sentinel Detection be used?



Where can Sentinel Detection be used?



Current Implementations

Fall Detection

- Pose Estimation-Based Fall Detection: Uses pose estimation algorithms to detect changes in body posture indicating a fall. Sends alert to caregiver or emergency services.
- Machine Learning-Based Fall Detection: Uses machine learning to recognize patterns associated with falls in real-time camera footage.
- Sensor Based Fall Detection: uses sensors, accelerometer and gyroscopes to detect the speed and position of the body falling.

Emotion Detection

- Affectiva is a software that uses computer vision to analyze facial expressions and detect emotions. It can be integrated with cameras on laptops, tablets, and smartphones to measure emotional responses.
- Emotient is a facial expression analysis software that uses deep learning algorithms to detect emotions. It can be used with cameras on smartphones, laptops, and tablets.
- FaceReader is a software that analyzes facial expressions to detect emotions. It can be used with cameras on laptops, tablets, and smartphones.

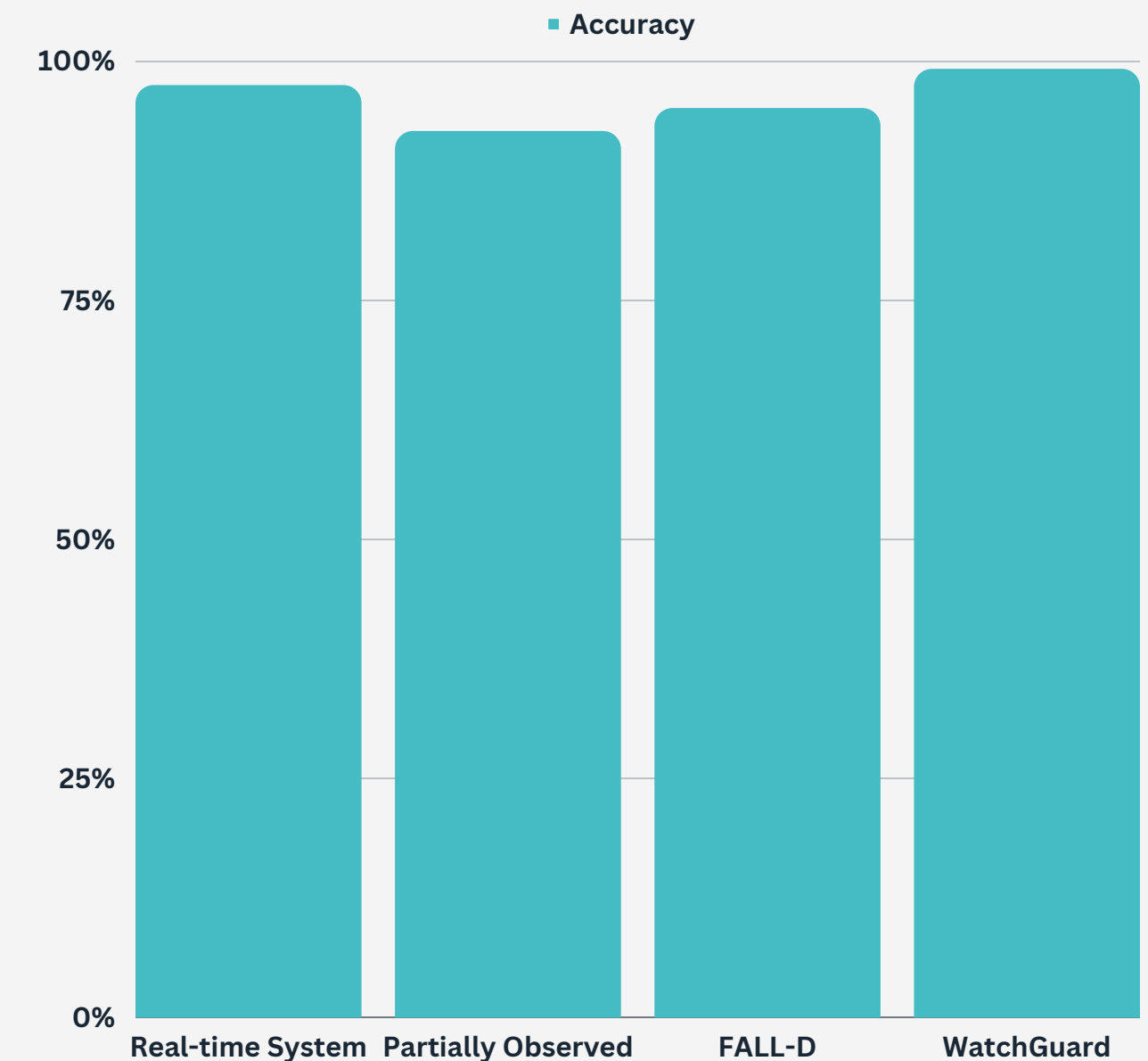
Contribution

- After some research, we discovered that the best way to get higher accuracy for fall detection is to build over the currently available implementations, therefore, we used 3 models instead of 1, which led us to have an accuracy of 97.8%.
- In the case of emotion detection, we collected multiple datasets from the internet and trained a model based on those which allowed us to have higher accuracy.
- Tweaking the previous algorithms to achieve the results we want and reduce false alarms and detections.
- Combining Both Detections which have never been done before, in which we call it Sentinel Detection.
- Creating a user-friendly GUI that incorporates both emotion and fall detection with the addition of Sentinel Detection.
- Built a Simple website which will display our project so that it would be available for the public to subscribe and use.

How it Sentinel Detection Works

Fall Detection

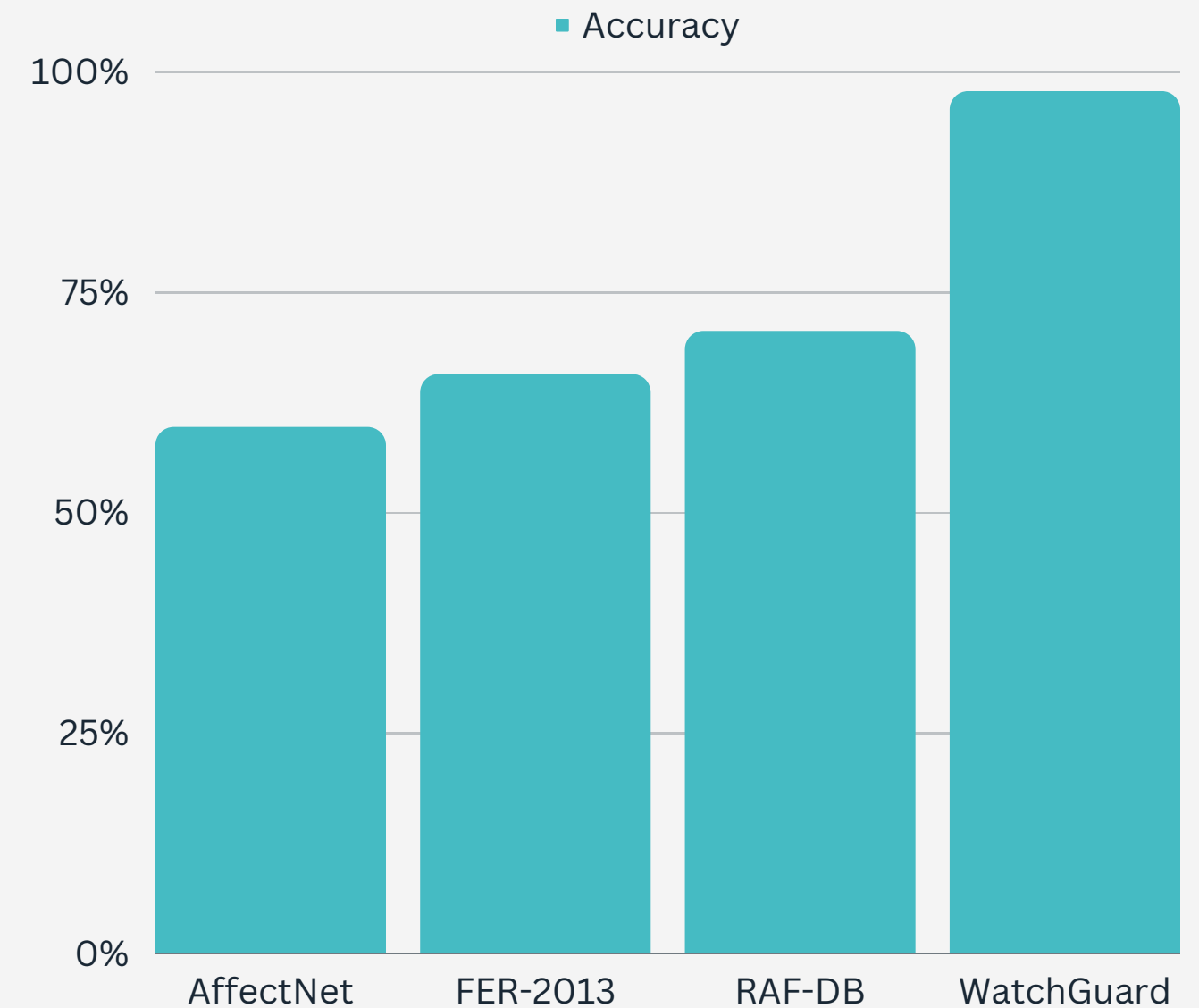
- The first step is to collect a dataset of videos of people falling down. The videos should include examples of people falling from different angles and in different lighting conditions.
- The videos are then preprocessed to extract individual frames of each video. The frames are resized and normalized to a standard size for input to the machine learning model.
- A convolutional neural network (CNN) is trained on the dataset of falling down videos. The CNN learns to recognize patterns in the images that are associated with a person falling down.
- Once the model is trained, it can be used to detect when a person is falling down in real-time. The video feed from a camera is fed into the model, which outputs a prediction for each frame of the video. If the model detects that a person is falling down, it sends an alert to the user.



How it Sentinel Detection Works

Emotion Detection

- First, the Haar Cascade which detects objects by identifying patterns with rectangular features called Haar-like features, that method is used to detect faces in each frame of the webcam feed.
- The region of image containing the face is resized to 48x48 and is passed as input to the CNN.
- The network outputs a list of softmax scores for the seven classes of emotions.
- The emotion with maximum score is displayed on the screen.



Demonstration

Demo 1
Not Sentinel

Demo 2
Sentinel

Demonstration

Demo 1
Not Sentinel

Demo 2
Sentinel

For the Future

- Implementing on the most known CCTV systems as an extension.
- Providing this technology for everyone to use, for example malls, small businesses, nursing homes, ATMs, etc.
- Developing our own fully secured CCTV system.
- Add more emotions to be more precise.
- Implementation on Infants for their safety at homes and in schools.

Conclusion

The Fall Detection and Emotion Detection System has the potential to revolutionize healthcare and assistive technology in the future by utilizing cutting-edge technologies to provide a novel solution for improving human safety, wellbeing, and quality of life.