**COMSATS University Islamabad,**

**Abbottabad Campus**

**SOFTWARE REQUIREMENTS SPECIFICATION   
(SRS DOCUMENT)**

**for**

**Video Surveillance System**  
Version 1.0

***By***

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**Revision History**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Date** | **Reason for changes** | **Version** |
|  |  |  |  |
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**Application Evaluation History**

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| --- | --- |
| **Comments (by committee)**  **\*include the ones given at scope time both in doc and presentation** | **Action Taken** |
|  |  |
|  |  |

**Supervised by**

**Dr. Saad Mustafa**

Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Introduction**

We are developing an AI system which ensures the safety of people by detecting the violence or suspicious activity. It divides video in chunks and the feed them into our Deep learningmodel which is trained on our dataset. Then our model process the video if it find any violence activity related to the classes we define like shooting and Explosion then it will notify the authorized user.

* **Purpose**

The aim of this System is to quickly detect violent activities as they happen, and inform the admin or security officials registered through admin access. The objective is to speed up the process, ultimately resulting in catching wrongdoers and saving lives and maintain security. As not everyone can afford to hire a dedicated security person to continuously monitor live camera feeds due to the high associated costs.

Thus, the suggested solution proposes an intelligent software system that automatically detects potential threats and informs the registered users without needing constant human oversight. This approach provides a more cost-effective and efficient way to strengthen security, reduce response times, and ultimately create a safer environment for the community

* **Scope**

The proposed project aims to develop a video surveillance application with violence detection. The primary focus of this project is to create system capable of identifying violent incidents as Shooting Explosion For handling user request like upload video detect violence and get notification we will use Django REST framework. For each domain we will have separate server that entertain the request for only that domain. To create a successful video surveillance application, it's important to understand the scope of the project, including what to do and what not to do

Our application should do**:** Admin should login and Sign up. Only Admin will authorize people to have access. Only registered users will see the abnormal activity detection in application. System should detect violent incidents. User should receive an alert Notification when there is some violent incident detected. Our System extract the violence frames and user can see these frames on their devices. User can also upload videos from gallery to detect violence in it.

Our application cannot do: Our AI model could not always accurately detect violence. Our AI model could not detect correctly footage having low light. Our AI model could not detect every abnormal event in the environment. Performance could vary based on the quality and positioning of camera. Changes in weather conditions or cluttered backgrounds could affect the accuracy of the AI model. Delay can occur due to sending every frame to AI model for processing violence detection.

**Overall description**

* **Product perspective**

The project represents the development of a relatively new and innovative product. While violence detection in videos is a known area, the combination of real-time violence detection and an Android app for user interactions represents a unique solution. In mostly surveillance system are work on manual detection of system by humans which can cause error and mistake while our approach is to detect violence automatically using deep learning model.

This project can be seen as a potentially new addition to a growing line of products or services related to video content analysis and safety. If successful, it could pave the way for further enhancements and features.

This project may serve as a replacement or an improvement for existing video analysis or security applications. It offers enhanced functionality, such as real-time violence detection and user interactions, making it a compelling alternative to existing solutions.

* **Operating environment**

The environment in which our system will be operate will be a mobile app containing an android operating system and the latest of its version. From deployment perspective our app will not upload on play store on any other platform. Our system is only operate in the specific organization who requested for the system, for authentication we are using Cloud Fire-store Database.

* **Design and implementation constraints**
* The system shall use Python as the programming language for developing the violence detection model.
* The system shall utilize an established machine learning library, such as TensorFlow for model development and training. PyTorch for building and training Visual Transformer models Image Processing Libraries: Libraries like OpenCV or Pillow can be used for image pre-processing tasks.
* To establish the connection between Machine Learning model and our application we will use Django python web frame work.
* The system shall require a GPU (Graphics Processing Unit) for efficient training.
* For user authentication and notification firebase haver to work properly otherwise system respond will not be as expected.
* Uploading and Response time is mainly depend on the size of a footage longer footage may slow the process.
* To build an attractive android application we will use Dart language with Flutter frame work.

**Requirement identifying technique**

* **Use case diagram**

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* **Use case description**
* **Add Users Use Case:**

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| --- | --- |
| **Use Case ID:** | **UC-1** |
| **Use Case Name:** | Add user |
| **Actors:** | Admin |
| **Description:** | Admin will add user by setting their credential which include email and password |
| **Trigger:** | This use case is triggered when an admin decides to create a new user account within the system |
| **Preconditions:** | PRE-1 Internet working  PRE-2 should be an Admin |
| **Post conditions:** | POST-1 User will added successfully |
| **Normal Flow:** | 1. Admin will go to add new user module. 2. Admin will set an email. 3. Admin will set a password. 4. User will be added in system. |
| **Alternative Flows:** | Admin we redirected to Add user module |
| **Exceptions:** | None |
| **Business Rules:** | New User will added to the easily. |
| **Assumptions:** | The system has all the capabilities to add user |

* **Remove users Use Case:**

|  |  |
| --- | --- |
| **Use Case ID:** | **UC-2** |
| **Use Case Name:** | Remove user |
| **Actors:** | Admin |
| **Description:** | Admin will remove user from authorized user list |
| **Trigger:** | This use case is triggered when an admin decides to remove an existing user account within the system |
| **Preconditions:** | PRE-1 Internet working  PRE-2 should be an Admin  PRE-3 User to be removed should be member of organization. |
| **Post conditions:** | POST-1 User will removed successfully |
| **Normal Flow:** | 1. Admin will go to remove user module. 2. Admin will select the user to be removed. . 3. Admin will remove the user |
| **Alternative Flows:** | Admin we redirected to Remove user module |
| **Exceptions:** | None |
| **Business Rules:** | User will removed from system easily. |
| **Assumptions:** | The system has all the capabilities to remove user |

* **Upload Video Use Case:**

|  |  |
| --- | --- |
| **Use Case ID:** | **UC-3** |
| **Use Case Name:** | Upload Video |
| **Actors:** | User |
| **Description:** | User we upload the video from the gallery in which user want to detect the  Violence. |
| **Trigger:** | This use case is triggered when user want to detect violence in a particular video |
| **Preconditions:** | PRE-1 Internet working  PRE-2 should be an authorized user  PRE-3 Video should be in proper format  PRE-4 video size should be in allowed range  PRE-5 Type of violence should belongs to any of four define classes |
| **Post conditions:** | POST-1 Video should be upload on the server  POST-2 server will send the response |
| **Normal Flow:** | 1. User will go to upload video module. 2. User will select the video from gallery. 3. User will click on upload video. 4. Video will converted into frames 5. Video will uploaded to server. |
| **Alternative Flows:** | System will ask user to recheck the size and format of the video and redirect to upload video module. |
| **Exceptions:** | None |
| **Business Rules:** | Video should be upload within one minute if user have stable internet connection. |
| **Assumptions:** | The system can accept video that have allowed size and format |

* **Notification Use Case:**

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| --- | --- |
| **Use Case ID:** | **UC-4** |
| **Use Case Name:** | Notification |
| **Actors:** | User ,Admin |
| **Description:** | Notification module will notify user and admin if any violence is detected by our model and also give what type of violence is detected. |
| **Trigger:** | This use case is triggered by server when any violence is detected by model the server will send the notification. |
| **Preconditions:** | PRE-1 Internet working  PRE-2 should be an authorized user |
| **Post conditions:** | POST-1 Admin and user will receive the notification of violence detection. |
| **Normal Flow:** | 1. Video will be uploaded to the server 2. Violence will be detected by model 3. Server will send the violence detection notification to user and admin. |
| **Alternative Flows:** | None |
| **Exceptions:** | None |
| **Business Rules:** | System will send notification to the user efficiently. |
| **Assumptions:** | When violence is detected server will send notification successfully. |

* **Violence Detection Use Case:**

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| --- | --- |
| **Use Case ID:** | **UC-5** |
| **Use Case Name:** | Violence Detection |
| **Actors:** | Server |
| **Description:** | Violence Detection model will detect the violence in the uploaded video and identify the class of the violence it belong to. |
| **Trigger:** | This use case is triggered by server to check any kind of violence in the video |
| **Preconditions:** | PRE-1 Internet working  PRE-2 Violence in the video should be belong to any of define classes. |
| **Post conditions:** | POST-1 Admin and user will receive the notification if violence detected. |
| **Normal Flow:** | 1. Video will be uploaded on the server 2. Model will take video as input from server. 3. Violence detector model will process the frames of video and give result back to the server. |
| **Alternative Flows:** | None |
| **Exceptions:** | None |
| **Business Rules:** | Model will try to accurately identify the violence in the video |
| **Assumptions:** | None |

* **Live Violence Detection**

|  |  |
| --- | --- |
| **Use Case ID:** | **UC-6** |
| **Use Case Name:** | Live Violence Detection |
| **Actors:** | Server |
| **Description:** | Live Violence Detection module will detect the violence in live footage. This footage will pass to the server in small patches and model we examine these small patch one by one and give result back. |
| **Trigger:** | This use case is triggered by camera to check any kind of violence in live footage. |
| **Preconditions:** | PRE-1 Internet working  PRE-2 camera should be working properly  PRE-3 There should be proper light |
| **Post conditions:** | POST-1 Admin and user will receive the notification if there is any violence activity in a patch. |
| **Normal Flow:** | 1. Live footage will divided into small patches and each patch will send on a server. 2. Violence detector model will process the frames of patch and give result back to the server. |
| **Alternative Flows:** | System ask user to check if camera is working properly or not and footage is divided into patches correctly or not. |
| **Exceptions:** | None |
| **Business Rules:** | Model will try to accurately identify the violence in the live footage |
| **Assumptions:** | None |

* **View History Use Case:**

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| --- | --- |
| **Use Case ID:** | **UC-7** |
| **Use Case Name:** | View History |
| **Actors:** | User, Admin |
| **Description:** | In View History module user and admin can view the patch of footage that contain violence. |
| **Trigger:** | This use case is triggered by user and admin to view the violence evidence. |
| **Preconditions:** | PRE-1 Internet working  PRE-2 Authorized User |
| **Post conditions:** | POST-1 Admin and user will view the violence history |
| **Normal Flow:** | 1. User or admin will login to system. 2. User will go to the view history module. 3. User will view the history. |
| **Alternative Flows:** | None |
| **Exceptions:** | None |
| **Business Rules:** | After violence detected it should be send back to application efficiently. |
| **Assumptions:** | System can save list of violence footages. |

* **Sign Out Use Case:**

|  |  |
| --- | --- |
| **Use Case ID:** | **UC-8** |
| **UseCase Name:** | Log Out |
| **Actors:** | Users, Admin |
| **Description:** | Users can log out of the Video Surveillance application. |
| **Trigger:** | The user selects the "Log Out" option within the application. |
| **Preconditions:** | PRE-1. Users must be logged in to the Video Surveillance application.  PRE-2. Users must be select the logout the option in the drawer of the Video Surveillance application. |
| **Postconditions:** | POST-1. The user is successfully logged out, ending the current session. |
| **Normal Flow:** | 1. Users navigate to the application settings or user profile.  2. Users select the "Sign Out" or "Log Out" option.  3. The system confirms the sign-out action and logs the user out.  4. The user is redirected to the login screen. |
| **Alternative Flows:** | -None |
| **Exceptions:** | -None |
| **Business Rules** |  |
| **Assumptions:** | - Users have successfully logged into the application before logout the application. |

**Functional Requirements**

**FR01-Add User:**

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| --- | --- |
| **Identifier** | **FR01** |
| **Title** | Add User Functionality |
| **Requirement** | Add user functionality allow admin to add new user to the system:  Admin can add new user by setting there credential like email and password |
| **Source** | Admin |
| **Rationale** | This requirement aims to provide admin with a simple, efficient, and flexible way to add new user to the system. |
| **Business Rule** | User should be member of that particular organization no outside person will allow to become user. |
| **Dependencies** | None |
| **Priority** | High |

**FR02-Remove Users:**

|  |  |
| --- | --- |
| **Identifier** | **FR02** |
| **Title** | Remove users Functionality |
| **Requirement** | Remove user functionality allow admin to Remove user from system. Only admin can remove user from the system. |
| **Source** | Admin |
| **Rationale** | This requirement aims to provide admin with a simple and efficient way to remove existing user from system. |
| **Business Rule** | None |
| **Dependencies** | None |
| **Priority** | Medium |

**FR03-Upload Video:**

|  |  |
| --- | --- |
| **Identifier** | **FR03** |
| **Title** | Upload Video Functionality |
| **Requirement** | User can able to upload video on the server from the gallery to check is there any violence in the footage or not. |
| **Source** | User |
| **Rationale** | This requirement aims to provide user a method from which user can upload the footage on the server from its gallery and check whether it contain any violence activity or not. |
| **Business Rule** | Upload video should only in allowed format and size |
| **Dependencies** | None |
| **Priority** | High |

**Module 4: Notification**

|  |  |
| --- | --- |
| **Identifier** | **FR04** |
| **Title** | Notification Functionality |
| **Requirement** | Notification Functionality will send notification to the admin and user if violence activity detected in the uploaded footage. Notification will be receive on user mobile app. |
| **Source** | Server |
| **Rationale** | This requirement aims to timely notify the user and admin about any violence activity. The will also save time and improve efficiency as user don’t have to view continuously for violence activity. |
| **Business Rule** | None |
| **Dependencies** | None |
| **Priority** | High |

**FR05-Violence Detection**

|  |  |
| --- | --- |
| **Identifier** | **FR05** |
| **Title** | Violence Detection Functionality |
| **Requirement** | Violence Detection model will detect violence activity in footages that are uploaded by user. Only if user provide video with same format and size. |
| **Source** | Server |
| **Rationale** | This requirement aims to detect violence in a footage automatically using a Machine Learning model so user don’t have to detect violence activities by its self. |
| **Business Rule** | Class of violence should be belong to the define four classes |
| **Dependencies** | None |
| **Priority** | High |

**FR06-Live Violence Detection**

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| --- | --- |
| **Identifier** | **FR06** |
| **Title** | Live Violence Detection Functionality |
| **Requirement** | Live Violence Detection model will detect violence activity in real time by taking footages from camera into small patches and then send them on server to detect violence activity. |
| **Source** | User |
| **Rationale** | This requirement aims to detect violence in real time to reduce the human error factor. Continuously monitoring can cause human fatigue and as a result important event will be missed. |
| **Business Rule** | Camera should be working proper and in correct position. |
| **Dependencies** | None |
| **Priority** | High |

**FR07-View History**

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| --- | --- |
| **Identifier** | **FR07** |
| **Title** | View History Functionality |
| **Requirement** | View History functionality will allow user to view the video frames that contain violence. This functionality is also use for evidence purpose. |
| **Source** | User |
| **Rationale** | This requirement aims to save video frames that contain violence activity. These violent frames can also use as video evidence against the criminals. |
| **Business Rule** | None |
| **Dependencies** | None |
| **Priority** | High |

**Non Functional Requirements**

**NFR01: Usability**

* **USE-1: User Interface (UI):**

The application should have an intuitive and user-friendly interface, allowing easy navigation for both administrators and registered users.

* **USE-2: Accessibility:**

The system should be accessible to all users ensuring that the registration process and violence detection results are easily understandable.

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**NFR02: Performance**

* **PE-1: Response Time:**

The system should provide real-time notifications, ensuring that authorized users receive alerts upon the detection of violent incidents.

* **PE-2: Throughput:**

The application should handle a reasonable (i.e 5 video at a time) of video uploads and processing simultaneously without significant degradation in performance.

* **PE-3: Scalability:**

The system should be scalable to accommodate an increasing number of registered users and uploaded videos without compromising performance.

**NFR03: Security**

* **SEC-1: Authentication and Authorization:**

User authentication and authorization mechanisms should be robust to ensure that only authorized personnel can access the system and receive notifications.

**NFR04: Maintainability**

* **MT-1: Modularity:**

The system should be modular, allowing for easier updates and maintenance of individual components without affecting the entire application.

**NFR05: Interoperability**

* **IO-1: API Compatibility:**

The system should support integration with external APIs for future enhancements or collaboration with other security systems.

* **IO-2: Data Exchange:**

The application should facilitate data exchange with other authorized security systems if necessary.

**Gantt chart:**

