Software Requirements Specification (SRS) Document

Computer Vision Application for Real-time Multi-modal Product Detection
Team 33

Aanvik Bhatnagar, Chetan Mahipal, Badarla Rohan Naidu
Rohan Rathee, Rohan Shridhar

Brief problem statement

The current application has technical complexities and lacks a user-friendly interface for product detection using CV algorithms. The problem deals with creating a premium **user interface** which is readily deployable and shareable. To address this, the usability and robustness of the app must be enhanced. The solution we propose is an updated version of the app with self-explanatory steps of usage, which would be error-free, readily demonstrable, and flexible to future changes in code and design. The scope of development also includes optimizing the user interface, ensuring a seamless and responsive experience. Leveraging cloud computing, the app would provide swift results to users parallel and concurrently. The primary objective is to make this powerful CV capabilities accessible through a user-friendly mobile platform. We also aim to create extensive documentation for future reference.

System requirements

Frontend

- React-Native
- Node.js
- NPM
- Javascript

Backend

- Python 3.8
- Pip or Pip3
- Flask
- Pymongo
- Numpy
- Opencv-python
- Pillow
- Sk-video
- Matplotlib
- Torchvision
- Yacs
- Scikit-learn scipy matplotlib
- Scikit-image
- Flask-Cors

Rendering on Phone

- ExpoGo

- Apk

Cloud Service

- DigitalOcean
- AWS

The client has not decided yet which to use.

Minimum JDK of 21.0 in mobile phones.

Users profile

The Users can be divided into 4 categories which are:

1. Potential Client: The very first user of the application will be the clients of our clients, to whom they are pitching their project. The mode will be for demonstration with explaining all the functionalities. This user will be deemed as one that does not have any technical background, thus will be an ordinary person who is interested in basic functionalities.

2. Retail Stores: The next category that the client is aiming at is retail stores. This app will act as an inventory management system which helps in keeping the stock updates and need for restocking when required. The main users in this category will be a few top managers of the stores, updating stock daily. These users are deemed the same as above with a little knowledge of software but are handy in using applications on mobile devices.

3. Delivery System Companies: This category of users are the officials who will keep a check at the quantity of the product delivered by delivery personnel. The delivery personnel will share the image of delivered items which will then be processed by the user to match the quantity with requirements. The users are ordinary people with little knowledge of the system behind the work. They are daily mobile users.

4. E-commerce Websites: The users will be the officials who are managers of each category of product on the website. This will be used for digital cataloging on the website. To update with range of products on the website. The users will have information about the systems and can use and modify app according to their needs.

The app's intended use is not for mass users. The app will be used by a few top officials. Apart from the above users, they all will be required to have 1-2 technical members for updating the support set images according to their use. So, the team should comprise at least one member with knowledge of the software systems used to make user-specific changes.

Feature requirements (described using use cases)

No.	Use Case Name	Description	Release*
A. User Management			
A1.	Create account	Users can create account by adding email, password, and username	R2
A2.	User Login	Users can go into the page with their login credentials, to experience this app	R2
A3.	Forgot password	User can change the password in case they forget	R2
B. Home Page			
B1.	Displaying objects in home page	In the home page, items are being shown which are scanned to easily access them	R1
B2.	Bookmark	For each item, bookmark button is present so that user can separate which are useful and which aren’t	R1
B3.	Filter	Users can filter with respect to ID or date or status for finding the item easily	R1
B4.	Search item	There is a search option in nav bar so that user can find item much efficiently than above	R2
B5.	Description of object	For each item, its properties also shown like its ID, created date and status of it whether it is detected or not	R1
B6.	Add Order	In the home page, there is an ‘+’ button, on clicking user can add object which they want	R1
B7.	Nav bar for the app	On every page, nav bar is shown with 5 items: Home page, search, scan, settings, profile	R1
B7.1	Settings	There is a setting page from which you can enhance your app responsive to you	R2
B7.2	Profile	Your information will be showed in this page like your name, email, account created on and logout	R2
C. Order Description			
C1.	Identified	Based on the CV Algorithm, display all the identified	R1

	Order(s) Table	orders, and their detected quantities in a tabular format	
C2.	Quantity Modification	User has the option to increase/decrease the required quantity of detected item(s)	R1
C3.	Quantity Status	Based on the required and detected numbers generated, display a status message for the user to understand easily	R1
C4.	Save Order Changes	If the user wants to make changes in any existing order details, and save them, app will save changes	R1
C5.	Share Current Order	User can share the order on multiple platforms outside the app	R2
C6.	Copy Current Order	User can create another copy of an existing order, and perform operations as required on the copy	R1
C7.	Delete Current Order	User can delete existing order and displayed items in the list	R1
C8.	Add Order Image(s)	User can scan more images for a particular order, and the newly scanned item(s) will also get appended in the existing order	R1
C8.1	Add From Gallery	User can add the image from the local device’s gallery	Opt
C8.2	Scan and Upload	Users can scan the items using the camera.	R1
D. User Settings			
D1.	Edit profile	Users can change their profile, like their name, email etc.	R2
D2.	Edit Items	User can edit any information about the item	R2
D3.	Logout	User can logout from the page	R2
D4.	Delete account	User can delete the contents which he/she thinks are unnecessary.	R2
D5.	Change Password	If the user wants to update their password, they can do so by selecting this option.	R2
E. Camera Page			
E1.	Camera Options	User can change the camera mode into photo/video	R1

F. Backend			
F1.	User Login	Facilitating smooth user login and updating database accordingly	R2
F2.	Addition of Support Set Images	Add support set images for computer vision algorithms to work on and produce results.	Opt
F3.	Updating Images	Update support set images for better results and outcomes of the app or in-case of removal of that product, delete the images.	Opt
F4.	Database	Addition of user profile data, and order specifications in the database.	R2
F5.	Deployment	Deploy the front-end and backend codebase on the cloud service provider (AWS).	Opt
F6.	User Authentication	Based on the email provided by the user during the time of login/sign up, it gets authenticated with the company's authentication software.	Opt

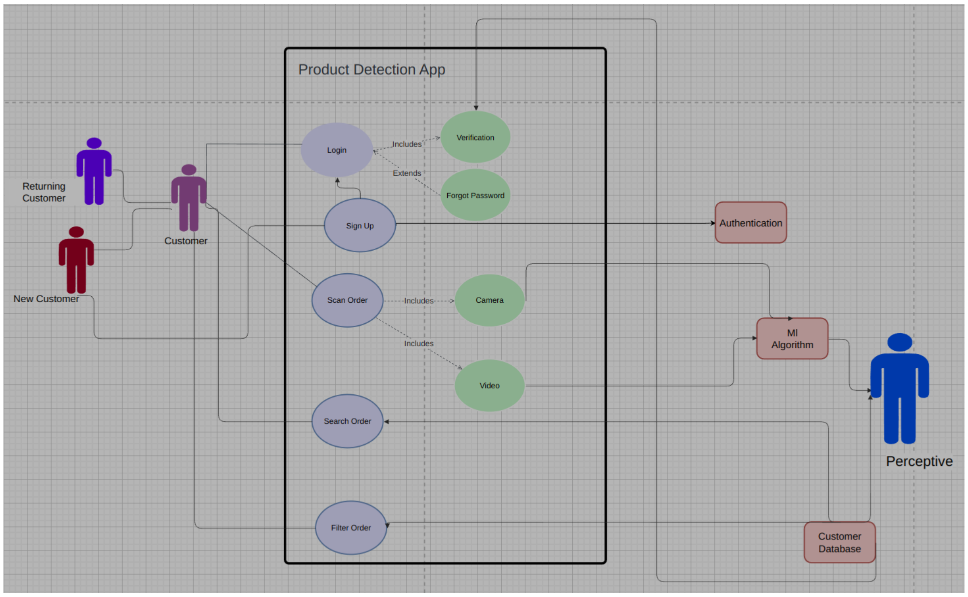
*R1: Release 1 (Mid-March); R2: Release 2(Mid-April); Opt: Optional

Main Flow:

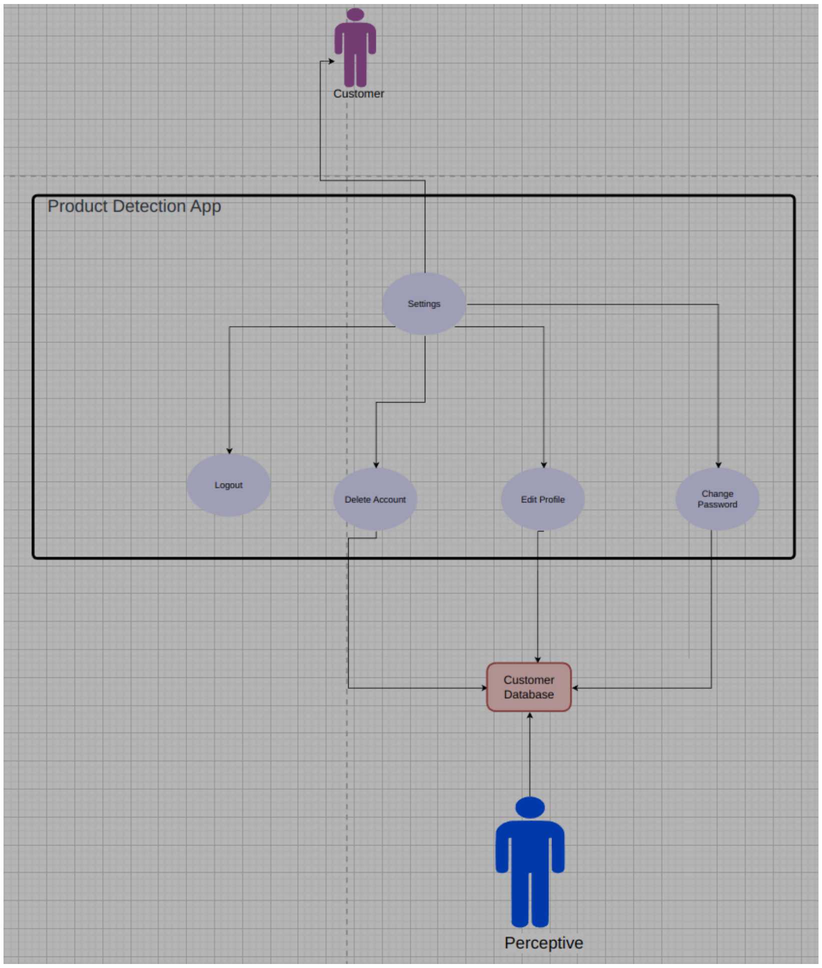
1. User logins by entering their username and password. It gets authenticated.
2. User enters the Home Page, where user can see their scanned or unscanned orders.
3. If the user wants to search from the existing scanned/unscanned orders, then they can click on the search button in the navigation bar and type the required order number.
4. If the user wants to filter from the existing scanned/unscanned orders based on certain criteria, they can go to the filter bar, select the desired option, and get the filtered order(s).
5. If the user wants to scan a new order, they can click on the Add Button on the top right corner, and a camera option will appear, where the user chooses whether to take a video or click a picture for order processing.
6. After the scan is complete, the order gets added onto the home page, and the user can see all the data collected from the CV algorithm in a tabular format.
7. When the user clicks on a particular order on the Home Page, they get directed to the order details, where they can see the options to adjust the required quantity of any item by either clicking on the arrows, or by entering the quantity by keyboard.
8. Users can also see the status of an item recognized based on quantity detected vs required by looking at the Status Option next to every detected item.

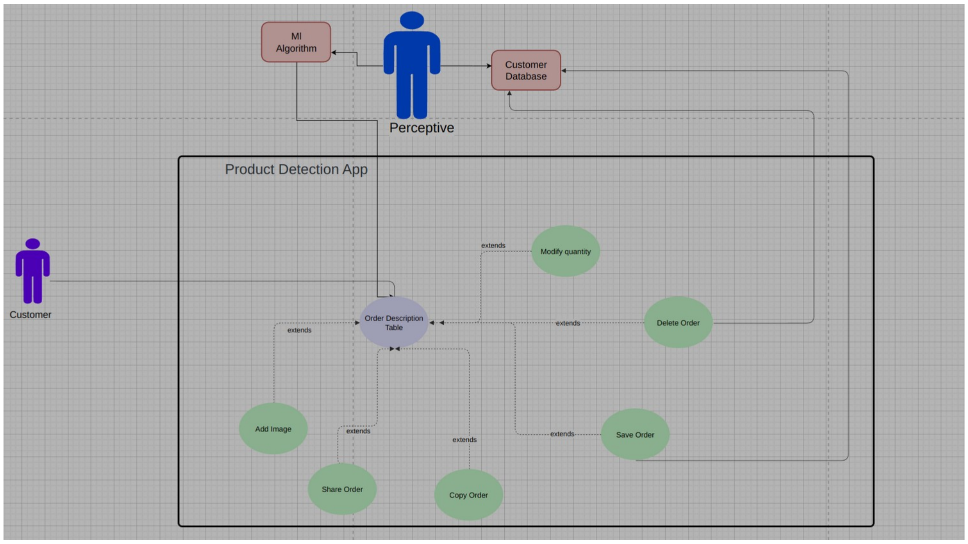
9. Users can copy the selected order, share the selected order, and save the changes made to the order by clicking on the respective buttons on the dropdown at the top right corner of the app.
10. From this page, users can be directed to adding a new image to the existing order and appending the changes by clicking on the Add Item button at the center of the navigation bar below.
11. Users can also be directed back to Home Page, Settings Page, and Profile Page by clicking on the respective buttons on the navigation bar.
12. Users can also view their details on the Profile Page.
13. After performing the required tasks, the user can log out by going to the Settings Page and clicking the log out option.

Use case diagram



Link to UML diagram: https://drive.google.com/file/d/15PLTYsBccX_1sA1KLnoH-opYAO2gOyvM/view?usp=sharing





Link to UML diagram: https://drive.google.com/file/d/15PLTYsBccX_1sA1KLnoH-opYAO2gOyvM/view?usp=sharing

Use case description

Use Case Number:	UC-A: UC-A1 to UC-A3
Use Case Name:	User Management: - Create Account - User Login - Forgot Password
Overview:	Users can create an account by entering their email, username and password, and later login with these credentials. Users also have an option to update their password.
Actors:	New Customer (Pitch Client of Perceptive Analytics), Returning Customer
Pre-condition:	E-mail should be authenticated by the company's server, and customers should know their username while logging in.
Flow:	Main Flow: 1. User enters the app, and Login Page will appear as the first page. 2. The user will log in with their credentials: username and password. 3. The username and password get verified; user enters the app.
	Alternate Flows: 1. Create Account 1.1. The user is not registered, they click on the sign-in button. Users enter their email ID, username, and password. 1.2. User's email gets verified using the authentication system of the company whose email ID was used. 1.2.1 (Opt) If the email ID provided by the user is not verified, they get redirected to the sign in page. 1.3. User now gets redirected to Login Page where he signs up again. 2. User Login 2.1. The credentials entered by the user are incorrect. Either the username is not registered, or the password for the username is incorrect, or both. 2.2. An error message gets displayed saying "Incorrect Credentials". Users get to input their credentials again. 3. Forgot Password 3.1. User clicks on the forgot password option, gets redirected to the Forgot Password page, where the user is asked to enter their e-mail ID. 3.2. The user enters their email ID registered with the app, and a

	verification code gets sent to their email ID. 3.2.1 If the email is not registered with the app's database, then an error message gets displayed "Email not found". 3.3. User enters the verification code; it gets verified, and the user goes to the Change Password Page, where he enters the new password. 3.3.1 (Opt) The verification code is incorrect. After 5 attempts, the user gets redirected to the Forgot Password page, where they enter their email ID again. 3.4. Password gets updated; user is redirected to the Login Page to enter their credentials.
Post Condition:	User enters the Home Page where all the orders are displayed.

Use Case Number:	UC-B: UC-B1 to UC-B7
Use Case Name:	Home Page: - Displaying objects - Bookmark - Filter - Search - Description of object - Add Order - Nav Bar (Settings and Profile Page)
Overview:	It is the basic page for the whole app. User can access the items much faster on this page using bookmarks, filter, and search. And the user can explore through all objects on this page. Additionally, they can access profile and settings from here too.
Actors:	Any Customers who logged in can access
Pre-condition:	You must be logged in with a valid account
Flow:	Main Flow: 1. Users can see the objects which they scanned with some brief details like ID, created date and status. 2. Users can go to Camera page. *3.* Users can find items using special options

	4. Users can also approach the profile page, where they can see their details like name, email etc. 5. Users can go to settings page, where they can make their app responsive according to themselves
	Alternate Flows: 1. User can add objects directly in the homepage with an alternative for camera 2. User can add bookmarks using bookmark option to prioritize some objects
Post Condition:	Now you can go to the items page, capture images, can do settings and can see profile, anything you want can be done from here. In other words, it’s a primary page

Use Case Number:	UC-C: UC-C1 to UC-C8
Use Case Name:	Order Description: - Identified Order(s) Table - Quantity Modification - Quantity Status - Save Order Changes - Share Current Order - Copy Current Order - Delete Current Order - Add Order Image(s)
Overview:	Details of a particular scanned item are displayed here. Users can modify the quantities of detected items from the CV Algorithm, and accordingly update the status of the order.
Actors:	Returning Customer, Backend Developer (Perceptive Analytics)
Pre-condition:	Successful login, camera permission given to the app on local device, support set images provided by the Backend Developer for CV Algorithm to operate on. App should also be given permission to access local device’s gallery.
Flow:	Main Flow: 1. When the user clicks on a particular order on the Home Page, they get directed to the order details, where they can see the options to adjust the required quantity of any item by either clicking on the arrows, or by entering the quantity by keyboard. 2. The user can also see the status of an item recognized based on quantity detected vs required by looking at the Status Option next to every detected item.

	3. Users can copy the selected order, share the selected order, and save the changes made to the order by clicking on the respective buttons on the dropdown at the top right corner of the app. 4. From this page, the user can be directed to adding a new image to the existing order and appending the changes by clicking on the Add Item button at the center of the navigation bar below.
	Alternate Flows: 1. Quantity Modification 1.1. The user wants to change the quantity required by a few increment/decrements; they can use the arrow keys on the side of the required number. 1.2. The user wants to change the required quantity by a huge margin, so they double click on the number field, and a form box gets opened, where user can input natural number values. 1.3. User has inputted the required quantity. Status message is updated. 2. Add Order Image(s): 2.1 The user wants to take more images/videos into the order, so they click the Add item option. 2.2 Users get a choice to provide input from the camera or from the gallery. 2.2.1 User provides input from the camera. Then the user gets two options: Camera or Video. 2.2.2 (Opt) User provides input from the gallery. App opens the gallery of the local device and uploads the image(s)/video(s). 2.3 The image(s)/video(s) get(s) uploaded and sent to CV Algorithm for processing. 2.4 The processed output gets appended to the existing order list.
Post Condition:	User's order gets saved, and user returns to the page they desire based on the option selected on the navigation bar. User's order gets saved on the Home Page.

Use Case	UC-D: UC-D1 to UC-D5

Number:	
Use Case Name:	Settings Page: - Edit Profile - Edit Items - Logout - Delete Account - Change password
Overview:	In this page, Users can change the properties of the certain sections if they want so. They can edit their profile by changing name or email, can change properties of items like changing the image or changing required no of items and many more. User can logout from this page and, he can delete the account if he wants so
Actors:	Any Customers who logged in can only access
Pre-condition:	You must be logged in with a valid account. You will enter this page from either the home page or items page.
Flow:	Main Flow: 1. In the edit profile, you can change your name, email, and password in case you want so 2. You can change properties of items too here like any change in images or to change required no of items or edit any items and its properties if you want so. 3. You can log out from here. For again accessing the app, please login. 4. By deleting an account, you are no longer eligible even if you login. You must again create the account and all your data will be erased
	Alternate flow: 1. Users can do any modifications to items here too if they are not able to change in items page. 2. User can change the screen from light to dark and vice versa
Post Condition:	Now you can check in the profile page or items page whether the information you changed is applied. Also, from logout/delete account you will be out of the app and must log in again.

Use Case Number:	UC-E: UC-E1
Use Case Name:	Camera Page:

	- Options to change mode - Capture photo/video and upload it
Overview:	In this page, users can capture the photo or video and can upload it and Items page will do its formalities
Actors:	Any Customers who want to add items can access this page
Pre-condition:	You must be logged in with a valid account. You will enter this page from the home page.
Flow:	Main Flow: 1. There will be three options – photo/video/upload. *2.* You can choose one of photo or video *3.* After that you can upload the image if you want so
	Alternate flows: 1.Users can access photos which they captured previously 2. Some additional camera options may also appear
Post Condition:	Now for this image, the ML code will access this image and will give the description of its properties. You can see all of its info for its corresponding item page

Use Case Number:	UC-F: UC-F1 to UC-F6
Use Case Name:	Backend: - User Login - Addition of support set images - Updating Images - Database - Deployment - User Authentication
Overview:	It involves facilitating user login and updation of the database quantities like user and order specifications. Addition and updation of support set images for the working of the computer vision algorithms also comes under the backend. It also involves deploying the front-end and back-end on a cloud service (AWS). User authentication is done through the company's authentication software.
Actors:	Backend Developers (Perceptive Analytics)
Pre-condition:	The CV algorithms work properly, the company has authentication software and a database on the cloud service.
Flow:	Main Flow:

	1. App user uploads an image 2. Developer accesses the database 3. Developer makes changes to the database through a database management system (DBMS). 4. The CV algorithm runs on the image and the results are stored 4. The changes are reflected in the cloud server.
	Alternate Flows: 1. App user enters username and password to login 2. Developer checks the credentials with the entries in the database through a database management system (DBMS). 3. Results of the comparison are shown to the user.
Post Condition:	The authentication software makes the required changes, and the CV algorithms use the new data to increase accuracy.