

Smart Shopping With Enhanced User Experience

Shanmugam. M^a, Dr. PrasannaVenkatesan. V^b, Shahanaz.A^c, Subathara.M^c, Palaniappan.S^c

^aResearch Scholar, Pondicherry University, Puducherry, India

^bProfessor, Department of Banking Technology, Pondicherry University, Puducherry, India

^cDepartment of CSE, SMVE college, Puducherry, India

Article History: Received: 10 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 28 April 2021

ABSTRACT: Artificial Intelligence is considered as both engineering and scientific method of producing machines with intelligence. AI is all about striving to create machines or software to imitate and eventually take over from human actions and intellect. Automation can or cannot be dependent on Artificial Intelligence. The grooming of automation has been changed to a middle progress in between the evolution of first and third revolution production in industry with automatic trying and organizes mechanisms, systematic effort, operating apparatus and the well-known computer systems. All of the nomenclatures of automation that have manifested surrounding us are conjugated by skillful programming and a set of laws. The current automation in the shopping experience has been a vast technology improvement used by people. But many of the basic requirements are not met. The existing system scans the product only for the price while some systems do not update user preferences. The age ranged recommendations are not taken into account. This process does not upgrade itself and is the same even if the preferences of people change. They only perform automating billing at the counter. Our system scans the face and detects the person's gender and age to show recommendations accordingly. The searching process for the needed product is made simpler by showing the location on the blueprint of the shop. Each person is assigned an ID and their previous purchases are stored. This information is used to train the system. The application is evaluated the following feature such as context aware, progressive, intelligent, non-human interaction and security. The app is useful for shop owners to improve the business. It also helps the customers to have an automated and happier shopping experience.

Keywords: android application, face recognition, object detection, online payment, product recommendations

1. INTRODUCTION

1.1 Artificial Intelligence

Artificial Intelligence (AI) is required because the work that we must do is growing day-to-day. So, it's a fine idea to automate the habitual work. This saves the manpower of the society and also increases yield. Additionally, through this Artificial Intelligence, the corporation can also get expert persons for its growth. Moreover, the companies today consider that they want to automate all the normal and routine labor. And they believe that they can mechanize those standard works through the easy program because, with the improvement of data science, automation becomes more universal.

The blast of business technology over the previous decade has been characterized by an extreme focus on automation and competence. This is contributed in large part by advances in artificial intelligence (AI).

1.2 Features of AI

In the most recent decade, Artificial intelligence has gone a scientific dream to a basic piece of ordinary life. Nowadays we are making use of AI frameworks to correspond with our telephones with the help of modern technical assistants like Alexa and Siri. Cars like Tesla's decipher has been break down to perceive their surroundings and insightfully drive themselves. Even Google chooses what sort of query items to give us depending on whom it thinks we are. Artificial intelligence is yet at another stage to start the work on the grounds to make a huge difference.

New Features of Artificial Intelligence to watch out in 2020 are:

- Artificial Neural networks
- Face recognition
- Deep Learning
- Quantum Computing
- Chatbots

1.3 Advantages of AI

- AI has a near to the ground error rate in comparison with people if calculated properly. It is very hard

to believe correctness, accuracy, and swiftness.

- AI-powered products are not disturbed by aggressive surrounding, thus capable of finishing hazardous tasks, discover in universe and manage problems that may harm us.
- The activities also include mining minerals and digging natural fuels which would be unsympathetic to humans.
- Replacing human being in repetitive, tedious tasks and various laborious work places.
- Judging the user's actions in advance with the history and memory of what they have typed, asked and searched. AI machines work as assistants to recommend predicted actions.
- The one of the best product examples that directs the user is the mobile phones.
- It can identify the frauds in card-based machines other possible systems in the near future.
- It can organize and manage the records.
- It can work together along with human beings for amusement or to pose as avatars.
- Another suitable product when a system interacts with the user is while playing video games.
- Robotic pets can increase interactivity with people.

2. EXISTING SYSTEMS

2.1 Smart shopping using android application

Author: Rajesh Kannan Megalingam, Suraj Vishnu, Swathi Sekhar, Vishnu Sasikumar

The development of Android applications around the world is extraordinary. Humans are attracted to technology to make their life more creative and easier to face day to day problems. In the case of shopping, customers feel difficulty standing for a long time in the billing counter in the form of a queue at supermarkets. The existing system came up with an Android application to be used as a smart Shopping Cart to provide a good shopping experience and to eliminate the dilemma. Our smart app mainly consists of two sections which mainly has focus for the navigation to the location of the item and automatic billing of the products at the counter that the user has purchased. Android Studio, open-source software is used as the platform for building the application. Product scanning is achieved by RFID readers. This paper reaches the outcome by using its proposed design and implementation. Though these products are scanned, it is not good at stale state.

2.2 Tourism management on shopping experience

Author: Heesup Hana, Hyoungeun Moon, Wansoo Kim

The international knowledge about the tourist inspected by considering the satisfaction emotional skill effect of self-image friendly atmosphere in shopping sites at tourist locations in South Korea. A survey at the site was performed and data that were collected are examined by structural equation modeling under variance metrics test. The empirical result proved that the self-image congruity was developed with constructs by the shopping location. Satisfaction and shopping value together with User experience was the important supporters for increasing the retention towards the same shopping location. A friendly environment has an inevitable impact on shopper confinement. Moreover, the satisfaction of the customers became the greatest influence on it. The proposed theory gives sufficient accounts for retention. However, it is implemented only at the tourist spots but not in the local supermarkets.

2.3 Consumer socialization process

Author: Thejus R Nair and S. Sreekumar

The intention of the study is to develop an attentive part of children's observation of online shopping and to discover the degree of its adoption within the retail segment. This study deals to explore the age role in the development of children's perception of online acquisition. Semi-structured consultations were conducted with 35 children aged between 8–15 years old and some 28 parents in some parts of Australia. A template investigation was conducted to study the information. The outcome of the survey concluded that any two age groups were not the same in their activity regarding online purchases. The outcome from the interviews shows that the children's

behavior differs and is controlled by the children's age, supervision of parents, effect of social networks and based on their peer groups. The data loss in the knowledge of cyberspace has resulted in the reverse-socialization and provided over- authority for children. Besides, social media became an increasing influence for socialization agent strengthened by unguided use of the Internet. In status of uniqueness, the study provides experimental verification relating to perceptions and behavior of children in the online environment remains under-researched in literature of marketing. Moreover, when the role of children's age was included, more insights will be obtained. Only applicable for children of specific age limit Sometimes stale products bought become an issue on children's health. It cannot compare different brands of products.

3. PROPOSED SYSTEM

3.1 Object detection

Object detection is associated with deals with detecting instances using computer vision and image processing of semantic rules of a meticulous classis in images and videos. Well-searched domains/departments of object detecting consist of the face detecting and the pedestrian detecting. Object detection has been used in many domains of computer vision, inclusive of image reclamation and the video supervision. Every object in a class has its own special quality that helps in classification of the class for all its instance. Object class detection uses the well-known identical features. For instance, while trying to find all the circles, objects that are at a precise distance from some amount is sought. Similarly, when trying to find squares, objects that are at a 90-degree angle at edges and should contain identical side lengths are required. An identical conceptualization is employed for face identification marks where nose, eyes and lips are found and features like complexion and a proper distance between eyes are calculated. Object detection means the perspective of computer and software systems to identify and locate objects in a scene and identify every object. Object detection is mainly used for face recognition, transport identification, people counting, security safe systems and automatic cars. Few ways where object detection is often exploited are in many fields of practice. Like any of the expertise, object detection will become the inevitable one from the efforts of software programmers and application developers. As shown in fig 1 the object name is obtained.



Figure1: Detecting Object name

3.2 Face Recognition

A face recognition system is a recent and advanced technology capable of identifying a personality from an image or a video frame using facial features. There are a number of options available where face recognition systems perfectly work, but as common, it works by comparison of the selected countenance of image from a given image from a stored database. It may also be known as Biometric AI-based system which will uniquely identify an individual by analyzing standard recognized patterns supported by the person's facial shape and texture. When a sort of computer application initially, it has seen a wider range in recent digital times on mobile OS platforms and other similar sorts of digital technology as robotics. They are primarily used as access control devices in security systems and may be compared to some another biometrics like eye iris or fingerprint recognition systems. Though the quality of the face recognition system like biometric technology is inferior than iris recognition and fingerprint recognition, it's widely adopted thanks to its contactless and non-invasive process. Newly, it has become democratic as a billboard marketing and identification tool. Other such situations where face recognition is needed are for advanced human- computer interaction, video surveillance and automatic indexing of images. As shown in fig. 2 the age and gender are calculated and predicted.

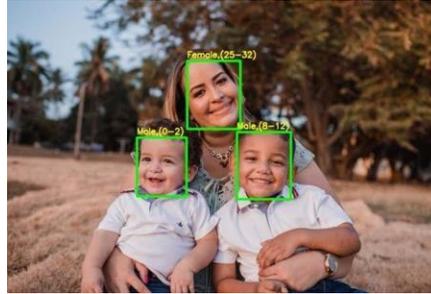


Figure 2: Detecting Gender and Age

3.3 Android

Android which is developed by Google is a mobile OS, maintained by the Linux and intended primarily for portable devices with touch screens like smartphones and tablets. The interface of Android is particularly suited for direct manipulation, using touch sensor gestures that loosely match to real-world actions, like touch, swipe and hold to regulate on-screen objects in combination with an in-built keyboard for text entry. In addition to touch screen mobile devices, Google has additionally designed Android TV, Android Auto and Smart Wear, each with an intentionally focused interface. Alternatives of Android devices are also used on the game console and other electronics. Initially developed by Android, which Google developed in 2005, Android was unveiled in 2007, in concurrence with the foundation of the Open Handset Alliance, an association of software, hardware, and telecommunication corporations which are committed to advancing open standards for mobile devices. Android has been the best-selling OS from the time of the year 2013 and running on the overwhelming mainstream of smartphones. According to May 2017, Android had two billion monthly dynamic customers, and it was the most vital installed base of any Operating System. Android's ASCII document is issued by Google with an open-source license, although all the Android devices finally transported with a mixture of free and open-source and proprietary software, including proprietary software required for accessing Google services. Android is a smart technology that provides a ready, comparatively cheap and customizable OS for high-technology devices. Its open environment has encouraged an outsized society of developers and enthusiasts to use the open-source code as an establishment for community-driven projects, which deliver updates to older devices, give some of the advanced features or transport Android to systems with other OS. The wide-ranging difference of hardware systems in Android devices causes noteworthy delays for software upgrades and defense patches typically taking months before reaching consumers, or sometimes not within the least time possible. The attainment of Android OS has made it an opportunity and an objective for needed rights and copyright litigation between technology companies. As in the given fig.3 shows the Android stack, the technologies used for Android mobile.



Figure 3: Android Stack

3.4 Flutter

Flutter is an open-source mobile development SDK (software developer kit) used for developing cross-platform applications for both Android and iOS. This was created by Google and is also the primary technique of creating applications for Google's latest OS Fuchsia. Applications designed and developed in Flutter are capable of delivering the wonderful brand-first plan and can come very helpful in developing shopping, food and e-commerce applications. Apps that also wish to look like the Stock platform will get superior treatments using Flutter. As shown in fig 4 the working of flutter is explained.

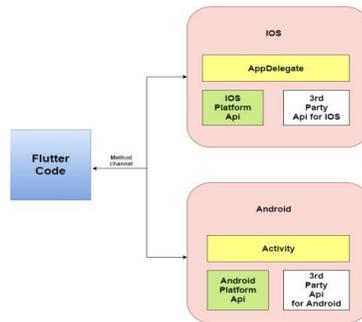


Figure. 4 Working of Flutter

URL for us that points to our actual information. Straightforward view tracking is also provided for those QR Codes. We may include entering a Google Analytics provided Tracking ID for highly developed tracking facility. The mentioned service is obtainable fully with free of cost without regulation. As shown in fig 5 the QR code is scanned to have the blueprint.



Figure 5 Scanning QR Code

3.5 QR scan

Likewise, the other scanned products which are not expired will be added to the bill generated for that particular customer. During the payment, the user can pay by cash or through online transactions. Once the payment of the user is confirmed, the connection is disclosed. Then, the user can log out of the application.

4. ARCHITECTURE

A QR Code can be defined as an advanced version of barcode which is represented as the two-dimensional barcode that's understandable by most of the smart phones. It enables the programmers to develop over 4000 characters during a two-dimensional barcode. QR Codes are very potential to be used to display text to the user or customer, to open an embedded URL link, save a person's contact to the address book or to compose text messages from it. The data of a QR Code can't be changed once generated. The one which is sometimes mentioned as a Dynamic QR Code, could also be a QR Code pointing to a static URL that hosts the concrete information. The hosted content is often altered after the QR Code has been converted to hard copy. When signed

in with already-had Google Account, the site insists the user on Dynamic QR Codes to be updated with information. They will be handled exactly like our regular QR Codes. It automatically creates a static Android OS is employed on smartphones, netbooks, tablet computers, Google TV, and other devices. the most hardware platform for Android is that the ARM architecture. Flutter is an open- source framework to make top quality, high- performance mobile applications across mobile operating systems. TensorFlow is that the second machine learning framework that Google created and want to design, build, and train deep learning models. In all the given graphs, nodes are used to represent mathematical operations, when all the sides represent the statistics which are usually given as multidimensional arrays or tensors, to communicate between represented edges. MySQL, a database language, is Open Source (does not need payment or license) Relational SQL management System. MySQL is considered as the simplest RDBMS used for most of the development in various web-based software applications. MySQL was formed, developed, publicly marketed and supported by MySQL AB, one of the famous Swedish company.

Dark, a recent language on the block, pegged to form coding 100x easier maybe a holistic programming language with a structured editor and infrastructure for building backend web services. Currently, within the alpha format, it's aimed toward frontend, backend, and mobile engineers. A plugin may be a software add-on that's installed on a program, enhancing its capabilities. The tflite plugin wraps Tensor Flow Lite API for iOS and Android. It implemented native code for feeding input and extracting the output of popular models. Flutter is employed for building a responsive app for both IOS and Android devices. The recommender system is build using Python. Firebase used because of the database for

Storing and retrieving the info of the user. As shown in fig 6 this proposed system will overcome the drawbacks of the existing system

4.1 Workflow

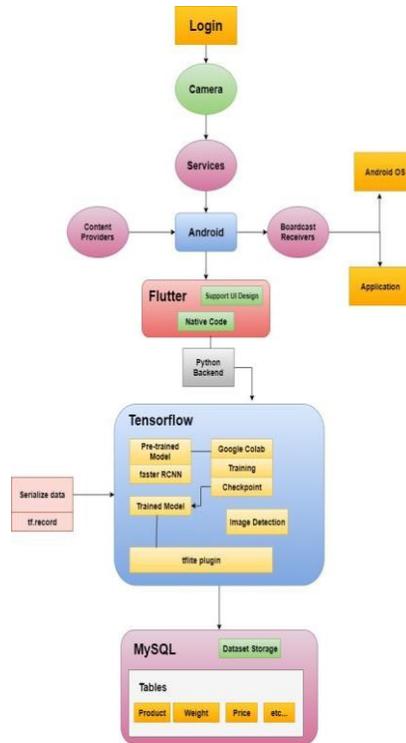


Figure. 6: Proposed System Architecture

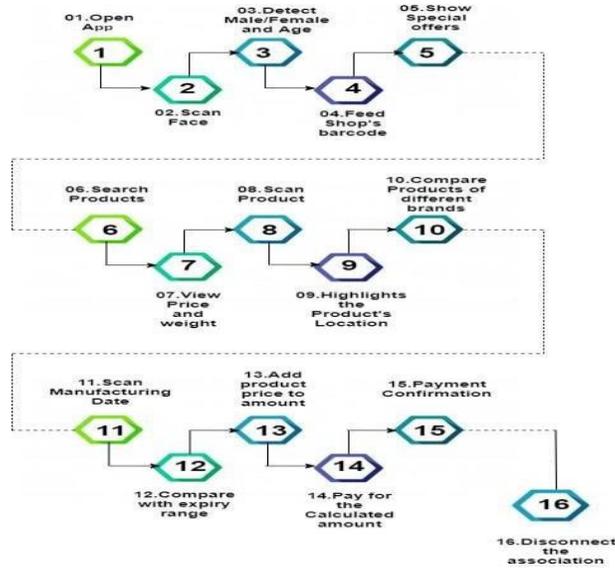


Figure. 7: Flow of Process

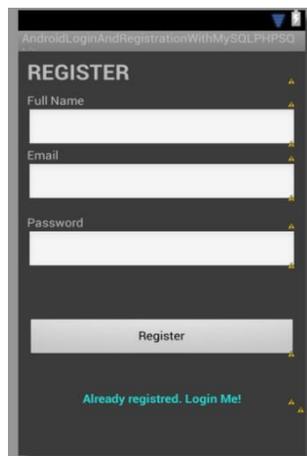
The following are the steps of how the workflow gets processed, the steps are as follows:

- First, we need to install this android application which provides enhanced user experience.
- The next step is detecting and capturing the user's face for authentication purposes.
- Including capturing face, it also determines the user's gender and age. This is mainly for the future recommendation of the user interested products again when they visit the shop.
- The next step is to scan the barcode in which the blueprint is already fed into the application, this is used for product navigation.
- The next step is searching for the product, with the help of the blueprint which is shown in the app.
- The product gets highlighted. Once we reach near the expected product, the various products are shown, through scanning of the product, the product image is detected and with the help of the size, it predicts cost which is already stored in the database.
- Finally, this application checks the manufacturing data of the product which is also stored in the database. The major advantage is if the date expires, we cannot able to add that product to the cart.
- If the date didn't expire the product is added to the cart. We can add various products as per the users wish
- We can see the total cart amount instantly; this enables the user to check they have the amount or not.
- Once the order is confirmed, you can pay the cash to the shop.
- After successful completion of the purchase, the application gets disconnected and in fig 20 the entire workflow is explained.

5. MODULES

5.1 Registration page

The registration page is required for using the application. Most of the apps require this process, where the user has to enter their identity to login to his/her account to handle Login and Registration data from the given identity. User is going to be ready to register using his Name, Email, Age and Sex. Upon a successful registration, user credentials are stored in the Database at backend provided server. Hence, there will be some connection between the already registered user to Application Login Screen to authenticate. As shown in fig 8 and fig 9 the sign-up and sign-in page are designed for authentication purposes.



REGISTER

Full Name

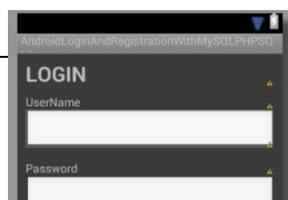
Email

Password

Register

Already registered. Login Me!

Figure 8: Sign Up



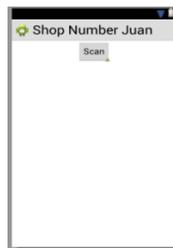
LOGIN

UserName

Password

Figure 9: Sign In

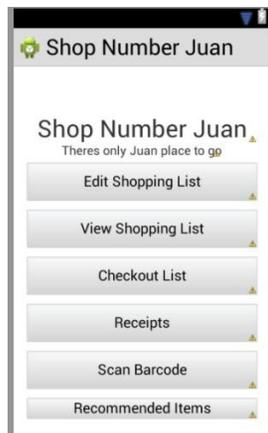
5.2 Scan face

**Figure 10:** Scanning Face

This app will scan all the faces and It gives you the age, gender information. This app is face detection, that provides fast and accurate features of facial features detection. As shown in fig 10 this page is used to scan the customer face for authentication purposes.

5.3 Shop's barcode

A barcode is the encoded data displayed with black and white lines with differing width that contains needed information easily readable by a machine. Barcodes store data with help of symbols that may vary from lines to dots within the matrix format bar-coding. It gives details of searching for products. As shown in fig 11 through the list of options the customer enters the scan barcode option.

**Figure 11:** List of Options

5.4 Blueprint

A blueprint is a design for creating map or pattern for a building. The literal meaning of a blueprint can be a paper that has plans for a building architecture. It can highlight the merchandise in the shop searched by the user.

5.5 View price and weight

After scanning the product it'll show the worth and weight of the product and again it chooses the simplest product among the list scanned if we'd like to continue, we will continue the merchandise it'll increase the cart as item1, item2, item3, item4, etc..., eventually it'll show the entire amount. From fig 12 to 13 the screenshots are attached as processed in the workflow.



Figure 12: Viewing the product details

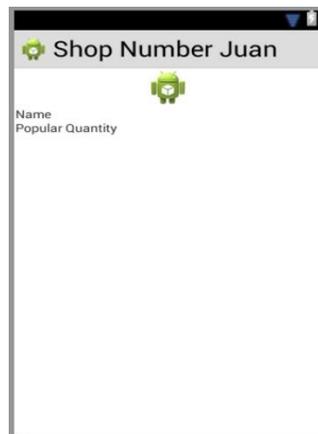


Figure 13: Showing the weight

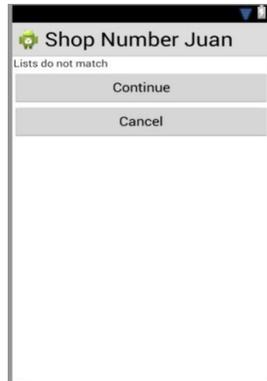


Figure 14: Prompt to continue shopping

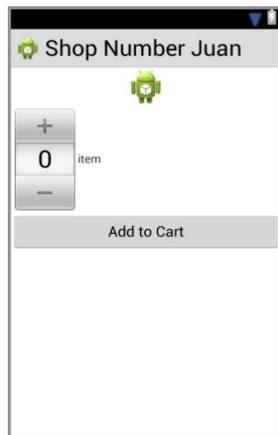


Figure 15: Asking the product count

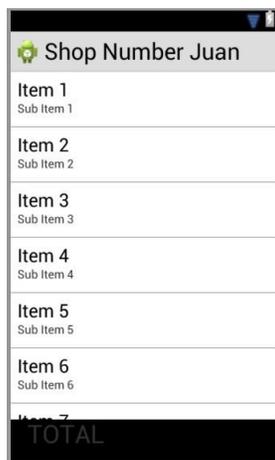


Figure 16: Displaying the items added to the bill

5.6 Scan manufacturing

Before adding to the cart, it'll again scan the manufacturing data. For the previous Handheld scanning products, the primary 5 digits of the serial number designate the manufacturing date. The primary 2 digits are the

year of manufacture, and therefore the next 3 digits are the Julian date. As shown in fig 17, the manufacturing date is checked for enhanced user experience.

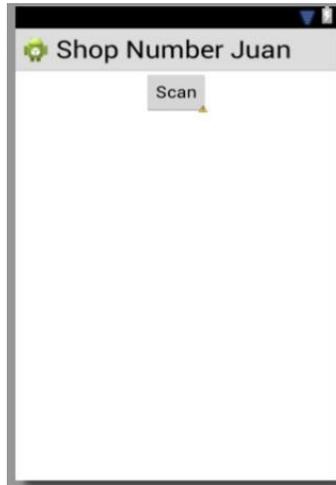


Figure 17: Scanning the manufacturing date

5.7 Add product price to amount

After scanning the manufacturing date it'll increase the cart as item1, item2, item3, item4, etc..., eventually, it'll show the entire amount. At last check the total. As shown in fig 18 the bill is generated and in fig 19 the payment gets confirmed and in fig 20 the application gets disconnected.

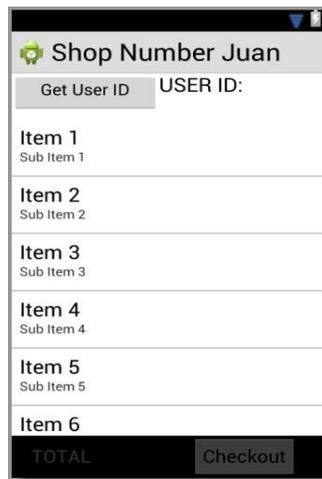


Figure 18: Confirming the purchased products

5.8 Payment confirmation

The bill payment for the purchase is done either through cash or online payment at the bill counter. The user identity is confirmed by checking the connection to the store's server using the user ID and IP address. Once the user is verified payment will proceed.



Figure 19: Sending feedback for knowing userexperience

5.9 Disconnect the association

After the payment process is completed, the user can log out of the application. The logout process takes place automatically if the application is inactive for a few minutes after the payment is completed.



Figure 20: Logging out the application

6. ANALYSIS &REPORT

6.1 Methods of evaluation:

According to Cranach’s alpha the levelof theproject:

- a) The level of SD value 0.00<n<=0.40interval scale is not reliable
- b) The level of SD value 0.40<n<=0.60interval scale the reliable is low
- c) The level of SD value 0.60<n<=0.80interval scale is the reliable is quite good
- d) n value is 0.678accepted as reliableproject

Based on the customer feedback the theproject reliable has been calculated:

1 =very bad; 2= bad; 3= neutral;4=good; 5=very good

Implementation of the project has handle age in between 19 and 25: Calculating the Standard Deviation

=0.638

$$\sigma = \sqrt{\frac{\sum (xi - \mu)^2}{N}}$$

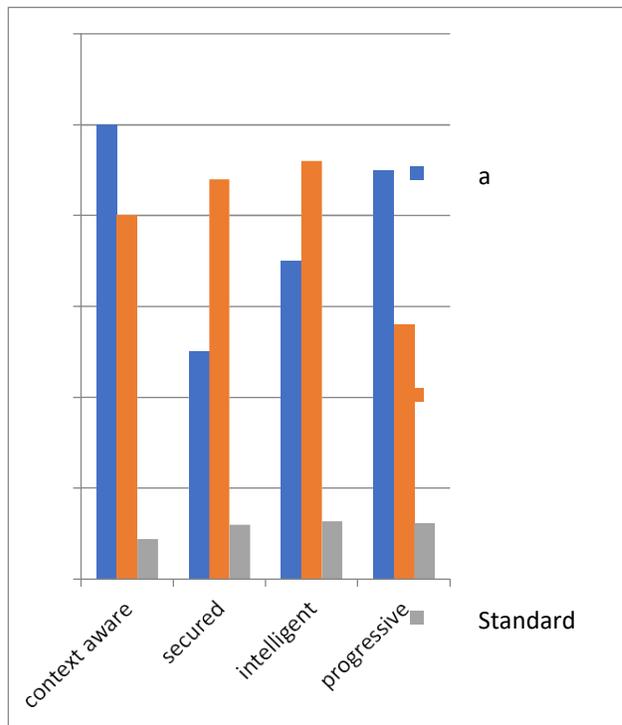
σ =standard deviation Xi=each value of population μ = population mean

n =size of population

Table 1: SD Calculation table

Features	Age of 19 people		Age of		Standard deviations
	Min	Max	Min	Max	
Context aware	3.29	5	3	5	0.445
Secured	2	5	2	5	0.600
Intelligent	1	5	3	5	0.638
Progressive	1	4	4.33	5	0.619

Graph:



Graph 1

Reports:

To eliminate the disadvantages of the existing system, we have proposed a system as an Android application. The reason for choosing the Android application is to make sure that the product reaches the end-users to the maximum extent. The existing systems do not have a feature of face recognition. Thus, it may not know the users' gender and age to show the recommendations. There are still apps that are developed for shopping but limited to shopping

shops. It does not the expiry dates to make sure that the user does not buy a stale product. We have a proposed system that would remove all the drawbacks of these existing systems. We have chosen the minimum SDK for developing the Android application to make sure that all the old version mobiles can use the application. The application can scan the face of the user to show recommendations age and gender.

FEATURES	EXISTING SYSTEMS			PROPOSED SYSTEM
	Smart Shopping	Shopping Using Barcode & Coupon	Shopping Mall Application	Shopping Application with Enhanced User Experience
Simple and seamless on boarding (progressive)		*		*
Easy in-shop navigation	*		*	*
Shopping Cart and Order Summary	*	*		*
No spam notifications			*	*
Minimized product search effort				*
Detailed product descriptions		*	*	*
Shop Blueprint			*	*
QR-Code / Barcode based interactive shopping		*	*	*
AI-Driven product recommendations				*
Secure and easy in-app payments				*

Table 2.features based report



Graph 2

The user has to login to the application for the first time. This process serves the need for authentication and authorization. Once the user got signed in for the first time, he/she can log in with ease.

This application can be used for even the smallest shopping market. The blueprint of the shop showing a product and their places the particular shopping mall or a shop can be displayed on the application by just scanning the QR code of the shop. There will be also a search box to type and search the products we need. The product-based search e blueprint shown on the application so that it will be easy for us to locate the needed product.

This helps the user to save the time spent on searching the products through the aisle. the app also provides a feature of scanning the product to view its size and weight. In this way, the product of different can be compared easily. So, the customer can choose a product with satisfaction. The important thing that most of us don't do his checking the expiry date of the product. The manufacturing date and the period for which the product is not spoiled are mentioned in an unclear manner and small size on the product. To make this process easier for the user, the app can be used to scan and check whether the product is fresh or not. If the scanned product is not expired it will be added to the bill of the concerned customer.

Likewise, the other scanned products which are not expired will be added to the bill generated for that particular customer. During the payment, the user can pay by cash or through online transactions. Once the payment of the user is confirmed, the connection is disclosed. Then, the user can log out of the application

Features	Existing system	Score	Purposed system	Score
Context aware	Nil(0/5)	0/5	Available	5/5
Progressive	Nil	0/5	Available	5/5
Secured	Moderate	2/5	Highly secured	5/5
Non-human interaction	Not defined	NIL	Future work	NIL
Intelligent	Not define	0/5	Present	5/5

Table 3 score of features

7. ADVANTAGES

- Online searching allows the user to find products from a place without enabling the user to search and roam for a product.
- It suggests the best of all products.
- Manufacturing date checking is a great plus for the customers
- It suggests the user-related products if the user visits the shop again.
- Every age group person can shop according to the user's needs.
- The camera capturing the products helps in finding the price of products ranging from smaller size to larger size products.

8. FUTURE SCOPE

- Before using this application, one should know how to operate this app, because some old age people don't know how to use it.
- It should have a proper network connection.
- A shop blueprint should be available.
- Proper cost and manufacturing date should be available.
- One major risk with IoT devices is the attack risk through which the data are collecting. If it is hacked, it's possible to misguide the device about the information it collects, resulting in wrong behavior of devices.
- Issues can be rectified in the future.

9. CONCLUSION

Thus, by making this online shopping application, it can be used to buy any of the products required for the user. The project is a combination of various online apps. This project is made to ease the customers by providing them all in one place. The project will be more convenient for users since it can be used to buy all sorts of things. The project also contains a recommender system that stores the previous purchase data of the users and recommends new things based on it. At the same time, it eliminates many of the disadvantages of the existing systems like lack of recommendation and age limit, feature of non human interaction want to improve in the future work. This project can be implemented along with virtual reality and augmented reality to make the user experience more interactive.

References

- 1) Souraj Vishnu, SwathiSekhar, Rajesh KannanMegalingam, Vishnu Sasikumar, Sreekumar S and Thejus R Nair” (2019) Design and Implementation of an Android Application for Smart Shopping” International Conference for Communication and Signal Processing. India
- 2) Heesup Hana, HyoungunMoonb, WansooKimc, (2019) "Tourism Management on Shopping Experience" Journal of Hospitality and Tourism Management 41(2019)101–109
- 3) Park Thaichon, (2017) “Consumer socialization process: The role of age in children's online shopping behavior” Journal for Retailing and Consumer Services 34 38– 47
- 4) Dylan Hicks, Byron J. Gao, Kevin Mannix, Hannah M. Bowles, “SmartMart: IoT-based In-store Mapping for Mobile Devices,” in Proc.9th IEEE International Conference for Collaborative Computing: Networking, Applications and Work sharing, Austin, TX, USA
- 5) ReeteshV. Golhari, AshwiniManusmare, Prasann A. Vyawahare, PavanH.Borghare,” (2016) Design and Implementation of Android base Mobile App for an Institute” at International Conference for Electrical, Electronics, and Optimization Techniques (ICEEOT), Chennai, India
- 6) Deepali Bajaj, AshaYadav, DinikaSaxena, Bhawna Jain, Deeksha Sharma, DikshaTewari, DishaSahni, Preetanjali Ray,” Android Based Nutritional-Intake Tracking Application for Handheld Systems” 8th International Conference for Computing, Communication and Networking Technologies (ICCCNT), Delhi, India
- 7) ZhenhaiMu, LizhenJiang, "Online Book store Management System Based on Android”, at International Conference for Virtual Reality and Intelligent Systems 2018 at Changsha, China

- 8) Pronunciation Test with Android Studio”, in 2016 International Electronics Symposium (IES), Denpasar at Indonesia
- 9) [https://searchenterpriseai.techtarget.com/ definition/AI-Artificial-Intelligence](https://searchenterpriseai.techtarget.com/definition/AI-Artificial-Intelligence)
- 10) https://en.wikipedia.org/wiki/Artificial_intelligence
- 11) <https://flutter.dev/>
- 12) <https://medium.com/flutter>
- 13) <https://www.tensorflow.org/>
- 14) <https://www.guru99.com/what-is- tensorflow.html>
- 15) <https://en.wikipedia.org/wiki/TensorFlow>
- 16) <https://developer.android.com/>
- 17) <https://support.google.com/android/?hl=en>