



# INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

## LEVERAGING EDUCATION THROUGH MOBILE APP AND CHATBOT - SKYLANOT

Dr G R Karpagam, Ms. Swathi J, Anantharoban B R, Balasarath B S, Sneha Sridharan, Tharani Ganesh M, Yuvakiruthika P

Professor, Assistant Professor, Student, Student, Student, Student, Student  
Computer Science and Engineering Department,  
PSG College of Technology, Coimbatore, Tamil Nadu, India

**Abstract:** In today's environment, technology is becoming increasingly significant. One such technology is digital magazines which help teachers and mentors to enhance the learning experience of the students. This technology takes its form in a range of new smart devices and mobile applications which have become extremely useful in the field of academics. In this pandemic situation (COVID-19), right from learning to money transactions, everything has become online. The AIR (Artificial Intelligence & Research) Lab of PSG College of Technology offers to show the infrastructure and works of the students and professors through a mobile app 'Skylanot' which helps students to take up projects in the field of Computer Science even in this pandemic situation.

Enormous developments have been made in the field of Artificial Intelligence today. Chatbots have gained great attention from researchers and developers. Chatbots are software applications built using Artificial Intelligence (AI), Natural Language Processing (NLP) and Neural Networks (NN) that can simulate a conversation in natural language with the user. Students can learn everything online through various learning environments. One such learning environment is an ML chatbot called Ava which is integrated in the mobile application that helps students learn about Machine Learning. The chatbot 'Sebastyan' is also integrated with Skylanot which serves as a virtual assistant to clear the doubts of students regarding AIR Lab. This provides a new and interesting way to learn about Machine Learning which the students would love to do.

The Machine Learning Chatbot 'Ava' developed by the students of Assam Engineering College is an interactive chatbot which can provide knowledge to the users about Machine Learning. It answers the queries pertaining to Machine Learning by providing insight on various algorithms in ML, the areas where they can be applied and the projects for which applying Machine Learning would be of actual benefit.

Platforms are frameworks of services that application programs depend on for performing standard operations. The platform that was used to build the mobile application 'Skylanot' is Android Studio. It is an Integrated Development Environment that is used to build mobile applications for android devices. It is developed and maintained by Google. Google's Dialogflow is the platform that was used to develop the Chatbot 'Sebastyan'. It is a Natural Language Processing platform that is used to develop chatbots and to integrate the conversational queries of the mobile app with the chatbots.

**Keywords – Mobile Application, Chatbot, Machine Learning, NLP, Learning, Pandemic necessity**

### I. MOTIVATION

In this pandemic situation, having a physical learning environment seems almost impossible. However, technological advancements have paved the way for continuous access to knowledge through mobile devices. Since Mobile devices make ubiquitous mobile learning possible through mobile applications, it opens up wide opportunities for different communities of people. Since the students are continuously adapting to smart devices, the educators are also adapting their teaching methodologies as an integral part of the students' educational experience. The utilization of these new technologies in support of m-learning, encourages the students to learn and improves their confidence and ability. The different needs of the people motivate the idea of creating one's own mobile apps for different purposes like teaching and learning.

## II. LITERATURE SURVEY

According to Yu-Chang Hsu et.al, in his paper on “Mobile App Design for Teaching and Learning: Educators’ Experiences in an Online Graduate Course” [13] proposed a Mobile app design for teaching and learning as mobile technologies for learning improves user mobility and connectivity. Since appropriate and relevant apps are not always available, teachers can only judge apps by reviews, which is the main reason that led to the needs and benefits of creating their own mobile apps for teaching and learning. App Inventor (AI) encouraged the educators to develop Android mobile apps through visual block-based programming language by drag-and-drop actions.

The limitations of the system are,

- a. It is difficult to get a complete view of all blocks at once when there is a need to skim through and identify the problems
- b. The layout of interface components allows only negligible control over the placement of components on the development screen

According to Tolgay Karanfiller et.al, in his paper on “A Mobile Application Design for Students Who Need Special Education” [14] proposed a mobile app design that will serve as a teaching aid for students who need special education. The application developed shows the students different images and explaining the selected concept with audio instructions. The basic concepts taught are quantity, width, length, and size. It was designed to teach the skills of identifying the quantity as less and more, width as thick or thin, length as long and short, and the size as big or small, based on objects. There are two methods known in educational software development which are branching programming and linear programming. In this software "branching programming" methodology is used. It tests the student after teaching a concept, and then in case of false answers, it is repeating the teaching.

The limitations of the system are,

- a. The concepts are very limited
- b. The effectiveness of the developed software is not verified
- c. The program must be used as supporting material to teachers to enhance their teaching activity but, the effect of the program in teaching is not tested yet

According to Arnold Pears et.al, in his paper “mJeliot: ICT Support for Interactive Teaching of Programming” [20] proposed a system to address the student learning difficulties related to computer programming. It was proposed that a tool that uses active learning and visualization can be used to achieve improved learning. The system is used to enhance the learning of program construction and testing which enhances active student engagement with code development in the classroom. It addresses three interesting areas where student understanding is typically weak, i) Ability to use an intuition-based understanding of von Neumann computer architecture abstractions to reason about program execution is underdeveloped in many students, ii) Students focus on syntactic elements of the language, and fail to see larger patterns and structures, iii) Debugging is a poorly understood activity, students are having less understanding about testing and debugging.

The limitation of the system is that there is no live program development to contribute lines of code and to interact with the teacher.

According to Solomon Sunday Oyelere et.al, in his paper on “Design, development, and evaluation of a mobile learning application for computing education” [19] proposed a mobile learning application, which enhances Computer Science learning on mobile devices. The MobileEdu was developed to improve direct engagement and interaction among the learners and the educators in the Nigerian Higher education since, higher strength of the students in undergraduate computer science. The teachers face the challenge of giving attention to hundreds of students in an undergraduate program. The different modules of the system are as follows,

- a. My Class module supports various courses, activities of users, such as selecting courses and identifying classmates for discussion, and a quiz system for assessment
- b. The library module gives access to open-source electronic learning materials, notes, slides, and an option for learners to turn in tasks, such as assignments and homework
- c. Messages module supports collaboration activities and private messages among learners and instructors
- d. Friends module is responsible for enabling social networking and the choice of friends for communication purposes
- e. Groups module is another social networking and collaboration function, where students are grouped to complete learning activities
- f. Blogs module supports information and the sharing of ideas among learners
- g. Announcements module provide updates on upcoming activities

The limitations of the system are,

- a. Problems with internet connectivity issues, poor network reception to download and upload files
- b. Cost of using the application
- c. Incompatibility of the app to operating systems other than Android

According to Ivica et al., in his paper on “Teaching and learning computer science sorting algorithms with mobile devices: A case study” [9] proposed the development of an android-based smartphone app to support the learning of sorting algorithms. Students were observed a whole semester by using smartphone devices in engineering education. The study discovered that students are motivated to use technology for learning, and the use of mobile devices prolonged learning. The four main components of the app are, the interactive sorting module, the scaffolding module, the motivational module, and the graphical user interface module, each having a distinct role in helping students in learning sorting algorithms. This research included data collection with two

surveys, collected exam results, and recorded application usage data. Analysis of the collected data showed that the approach is an effective way of learning sorting algorithms.

According to Fernando Moreira et.al, in his paper on “Teaching and Learning Modelling and Specification Based on Mobile Devices and Cloud: A Case Study” [18] proposed an application that supports the teaching of requirement engineering through mobile devices. This is an app focusing on the requirements engineering course through mobile learning by adopting the Lucidchart application for systems modeling with UML on mobile devices. The modeling is done in the following sequence of steps: i) Presentation of theoretical concepts, ii) Review the catalog of requirements, iii) Modelling the different diagrams, iv) Models verification and validation. The student’s performance for the effectiveness of this learning activity was evaluated for forty-five students, in the conception of three UML diagrams - Use Case, Class, and Sequence diagrams. 90% of the students obtained a positive impact in the final exam.

The limitations of the system are,

- a. It is an arduous task for teachers who transmit the knowledge and to students who have to understand and save this same knowledge.
- b. The static nature of this approach could be enhanced if it is scaled to a larger group of students

According to Cuauhtemoc Luna-Nevárez et.al, in his paper on “On the Use of Mobile Apps in Education: The Impact of Digital Magazines on Student Learning” [15] proposed a system to access the course material using mobile devices that is more readily available, and the ability of students to directly communicate with faculty is not restricted to office hours or a designated location on campus. Flipboard is a personalized magazine app that provides extended access to digital news across a wide range of topics and publications. It was originally launched as a tablet-based app in 2010 and in 2017, the app introduced the concept of smart magazines leading to greater levels of personalization. The students were required to sign up for a Flipboard account and subscribe to the curated class magazine (created by the professor) to access the articles. Thereafter, students were expected to read the weekly posted articles and participate in class discussions or prepare written submissions.

According to Guo et.al, in his paper on “Learning mobile security with android security labware” [8] made an observation from various academic institutions regarding the plan to integrate mobile security into their computing curriculum and concluded few challenges. One of the challenges is the unique characteristics of mobile security, which is a new and evolving paradigm. The well-known security threats, such as malware or social engineering, are growing in this new environment when adapting to a new platform. In addition to that, new technologies like Global Positioning System (GPS) and other services in mobile devices introduce new and unique threats. Another challenge is the insufficiency of learning materials when compared to learning materials that are available for general computer security, web security, and network security. Hence, there is a definite need to address mobile security from the perspectives of mobile devices (smartphones and tablets) and mobile applications (apps).

According to Olutayo Boyinbode et.al, in his paper on “A Mobile Learning Application for Delivering Educational Resources to Mobile Devices” [10] proposed a system where lectures are recorded to provide flexibility on when and where it is played back and in turn empowering students to self-pace their learning. The system claims that the distribution of lecture resources as podcasts for listening to before and after class may enhance student engagement of lectures and will foster student-student and student-lecturer, and student-content interactions. There are situations where the mobile device is continuously connected to the internet, and situations when no connection is available. Therefore, all needed learning contents must be downloaded to the mobile device beforehand in anticipation of a period of limited or no connectivity. The app developed allows the students to watch and listen to the open cast lectures on their mobile devices. Students who are shy to ask questions during face-to-face lectures can make use of this application. This mobile app enhanced learning among higher education students.

The main limitation of this system is that the app is not supported on a wide range of mobile devices and also the Internet availability is limited.

According to Chao Mbogo et.al, in his paper on “A Mobile Scaffolding Application to Support Novice Learners of Computer Programming” [17] proposed the development of an application that scaffolds the construction of programs on a mobile phone. The application scaffolds the program construction on a mobile device by using 5 stages of framework: i. Representing a program in small sub-parts. ii. Restricting a learner to complete a program by following a particular order. iii. Enabling the program construction one part at a time. iv. Providing instructions, steps, hints, default code, examples, and error prompts wherever appropriate. v. Fading the scaffolds once the learner progresses from a successfully completed program to the next. This app uses the Ideone API for the compilation and running of programs.

The limitations of the system can be addressed as follows,

- a. Reduction of textual information in the code editor
- b. More pronounced instructions on first use
- c. The usability of the code editor needs improvement
- d. It should be possible to load a saved program in order to reuse it

According to Siri Vinay et.al, in his paper on “RoboRun: A gamification approach to control flow learning for young students with TouchDevelop” [22] proposed a system for the students to write code in a touch-enabled interactive maze game. The game platform provides touch input devices for algorithm sequence ordering, coding and learning conditional programming. The game allows the students to experience coding skills such as logical reasoning and problem solving. When a student completes a maze,

they are presented with the code generated by TouchDevelop hence, enabling them to examine the syntax. Students are provided with the features to modify the generated code directly in the TouchDevelop environment. Further programming features from the platform can be used by the students.

According to Saeed Deshpande et.al, in his paper on “Mobile learning app: A novel method to teach clinical decision making in prosthodontics” [12] proposed a Mobile learning app to teach clinical decision-making in prosthodontics. Prosthodontics – involves the replacement of missing teeth and the associated soft and hard tissues by prostheses such as crowns, bridges, dentures. Since many materials and techniques are available, the clinician's decision regarding the appropriate selection of prosthesis is very important and demands critical thinking abilities. Students of this domain don't have exposure to a wide variety of cases, resulting in their lack of development in clinical-decision skills. So to overcome this, an app was designed which collects the opinion of many practitioners using a 5 point questionnaire to conclude the final decision.

The limitation of the system is that the analysis was made only in a particular institution and with a small set of 120 BDS students, A bigger sample size including interns from different institutions and regions would give better efficiency.

According to Ramakrishna Kumar et.al, in his paper on “A Review on Chatbot Design and Implementation Techniques” [16] proposed a methodology to develop a state-of-the-art chatbot application that can be personalized easily according to customer needs. Chatbots are Artificial Intelligence (AI) based systems used for conversation that can process human language through Natural Language Processing (NLP) and Neural Network (NN). The chatbot can be implemented using tools such as DialogFlow, Android Studio, TensorFlow, and Firebase. Initially, the DialogFlow is used to handle the NLP, training, intent classification, and text generation. The text generation responses are improved by using Tensorflow and also by integrating it with DialogFlow. Then, Firebase, which is a real-time database is used to create the database. Further, Android studio is used to develop the application and helps to integrate with the other tools. Finally, the app is accessed in two ways: i) An Android Application – Android users, ii) An external API like Facebook Messenger and WhatsApp - iOS users

According to Florian Peters et.al, in his paper on “Design and implementation of a chatbot in the context of customer support” [21] proposed a system to address the issue of 24X7 customer support in order to improve the customer experience. Customers who are having issues contact customer service through one of the supported communications such as e-mail, social media, website chat, etc., creating a ticket. Tickets are a special data structure that has the conversation between an agent and a customer as well as the time and date of the messages, the language of the conversation, tags used for filtering tickets, etc., The messages will be analyzed through the Zendesk tool so that they can generate automated replies called macros. We can find certain patterns of behavior from the messages sent by users. Hence, such patterns could be explored and analyzed to easily automate certain aspects of customer support and alleviate part of the workload to a conversational agent.

According to Petter Bae Brandtzaeg et.al, in his paper on “Why people use chatbots” [11] presented their view on why people are using chatbots. The current interest in chatbots is due to the recent developments in the field of artificial intelligence (AI) and machine learning (ML). Companies like Google, Facebook, and Microsoft view chatbots as the next popular technology. Chatbots are seen as a means for direct interaction between the customers and customer service through text messaging for marketing purposes. It also overrules the need for special-purpose apps or web pages. The motivation for the use of chatbots are: i) Ease, speed, and convenience, ii) To obtain help and information, iii) For entertainment, iv) For social and relational purposes, v) The novelty of chatbots.

The study could be further scaled up to analyze how the motivational patterns are linked to age and gender and different chat platforms, as well as analysis of specific chatbots being used.

### **Observations**

In this technological era, everyone has their own mobile devices in many forms. The use of mobile devices as an instructional resource is helping educators to reformulate their traditional educational methods to the digital learning environment of the 21st century. Using these devices and with easy internet access, interaction can be done with people from anywhere in the world, irrespective of time and place people can exchange information with each other. The term “mobile” stands for “mobility” that is, in other words, the ability to move freely and easily from one place to another. Mobile learning refers to the usage of mobile devices in any branch of study. The features of mobile technology such as portability and information accessibility play a major role in the enhancement of the current learning methods. The main characteristic of M-Learning is the discretion of the learner. It gives full freedom in the hands of the learner to decide upon the place and time for the learning process.

When the different research studies are examined, the development of Personalized apps according to the specific needs and requirements solves the purpose for which it has been created. Because Specific purpose apps, greatly enhance and improve the efficiency of the Information gain from them. Hence, it becomes critical that educators from all disciplines begin to adopt this behavior and embrace the new norm of technological lifestyles.

Chatbots potentially represent a new paradigm in people's interaction with data and services in the future. There are many motivational factors related to the use of conversational interfaces. Chatbots had a lot of weight put on their shoulders since they're labeled as "The New Apps". There is still a long way for conversational agents to be completely unsupervised. The future holds promising results in the field of Natural Language Processing since new methods are born every day and older methods are enhanced every day. Hence, the development of chatbots for specific purposes and their integration with its mobile app will serve a full-pledged experience to the users.

### III. CASE STUDY – AIR LAB

The Center for Artificial Intelligence Research Lab (AIR Lab) of PSG College of Technology is a place that brings creative ideas to life, enhances the knowledge of teachers and students, and fosters research and development. Skylanot is the app which portrays the activities and achievements of this lab to the outside world. The main objective of this app is to describe the real-world projects and research in the AI and Security domain that are implemented in this lab, the faculty involved, MoU signed, collaborators and funding details. The specifications of the infrastructure available are showcased and students are encouraged to take up complex projects. The app also highlights the numerous papers and publications of the well-trained and dedicated faculty.

### IV. CONCEPTUAL ARCHITECTURE

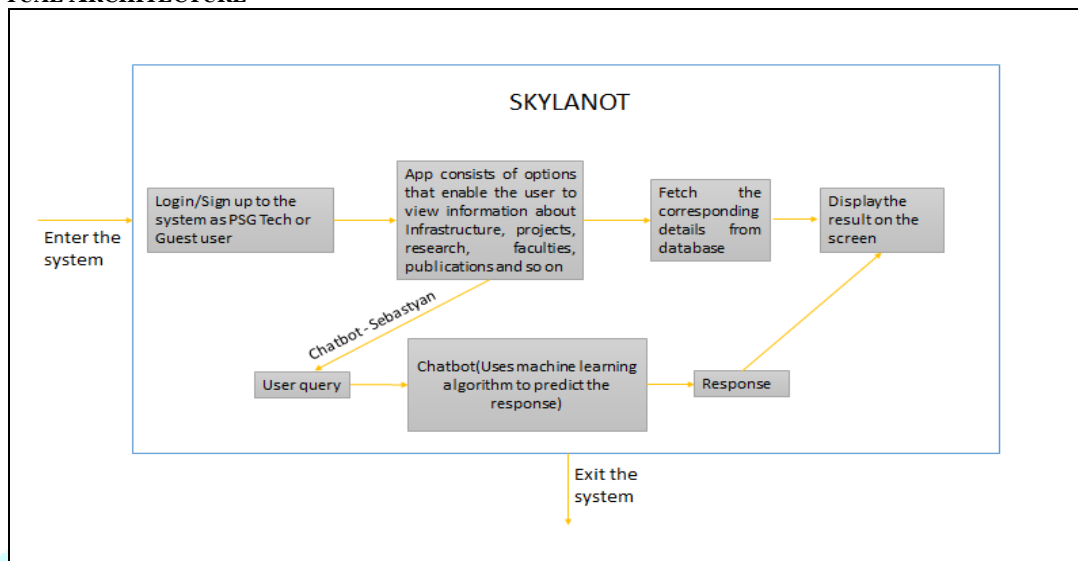


Figure 4.1 Conceptual Architecture

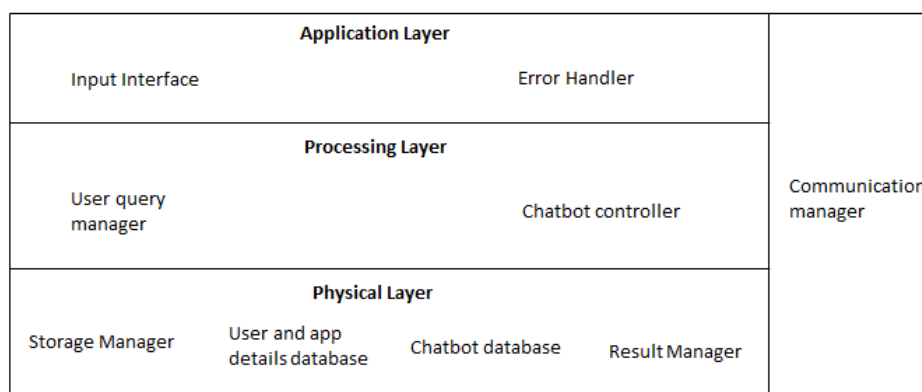


Figure 4.2 Layered Architecture

The conceptual design of the project is modeled as a 3-layer architecture. The layers are as follows.

#### 4.1 Application Layer

This layer consists of all the modules related to real-life application of the project. It consists of the following modules.

- a. Input Interface - It is an interface that enables user interaction with the mobile app through a Graphical User Interface(GUI)
- b. Error Handler - This module helps us to report any kinds of errors or exceptions that the program may face while it is being executed.

#### 4.2 Processing Layer

This layer consists of all the modules that help in processing the data obtained from the application layer. It consists of the following modules.

- a. User query manager - This module helps us to handle user queries in the mobile application. Each action will be handled by the system and a corresponding response will be provided. For example, a click on a particular tab in the mobile application should be handled and the user should be directed to the respective page.
- b. Chatbot controller - This module is an API that is useful for sending request messages and getting a response message back to and fro from mobile application to chatbot.

#### 4.3 Physical Layer

This layer contains all the modules that help in the storage and maintenance of the reports obtained from the processing layer. It consists of the following modules.

- a. Storage manager - The storage manager helps to store the reports in various databases.

- b. Cache database - The most frequently used contents are stored in the mobile database and updated periodically for faster access of data.
- c. User and app details database - The user credentials and other app related information such as staff details, conference details, journal details are stored in this database. Firebase is used for this purpose.
- d. Chatbot database - This database consists of several indents (question and its corresponding answer). These details will be used by the Machine learning algorithm of the Google dialogflow to train the model.

### V. DESIGN OF SKYLANOT

UML diagram is a standard diagrammatic tool for designing. It is a graphical language that is used for defining, visualizing, constructing and reporting the artifacts of software systems. It helps in better understanding of the software or system or product to be developed among developers and customers. It views the system in several aspects like use-case view, logical view, implementation view, process view, deployment view.

USE-CASE DIAGRAM focuses on the identification of functional requirements of the system under consideration.

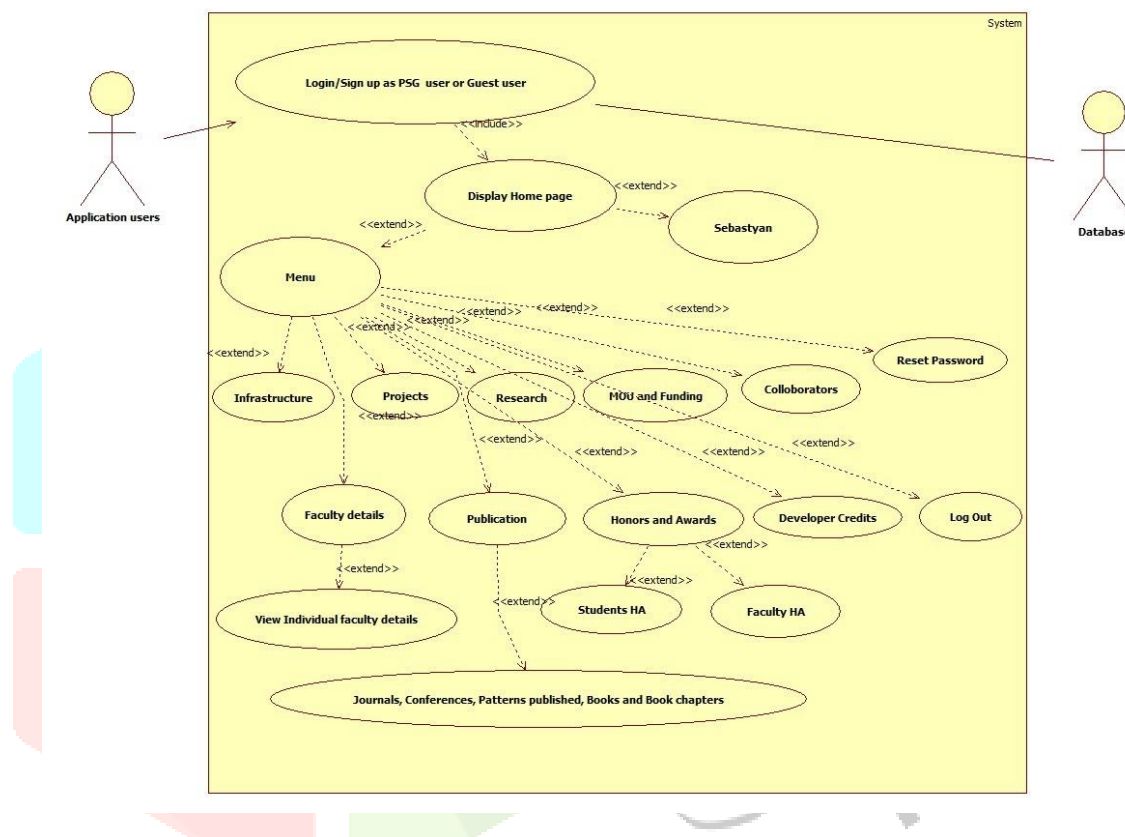


Figure 5.1 Use Case Diagram

ACTIVITY DIAGRAM focuses on sequential and parallel activities in each functional requirement of the system.

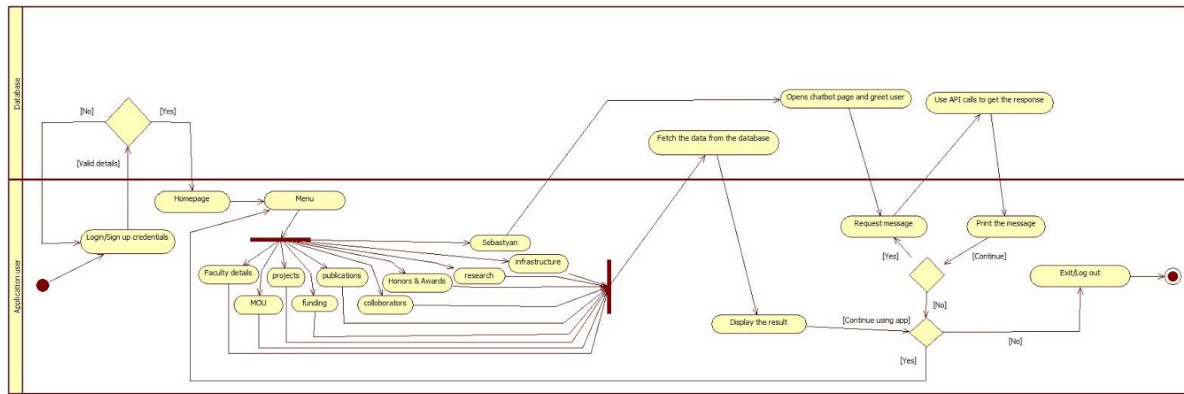


Figure 5.2 Activity Diagram

SEQUENCE DIAGRAM portrays the objects involved in the scenario as well as the sequence of messages that are exchanged between them in order for the functionality to be carried out.

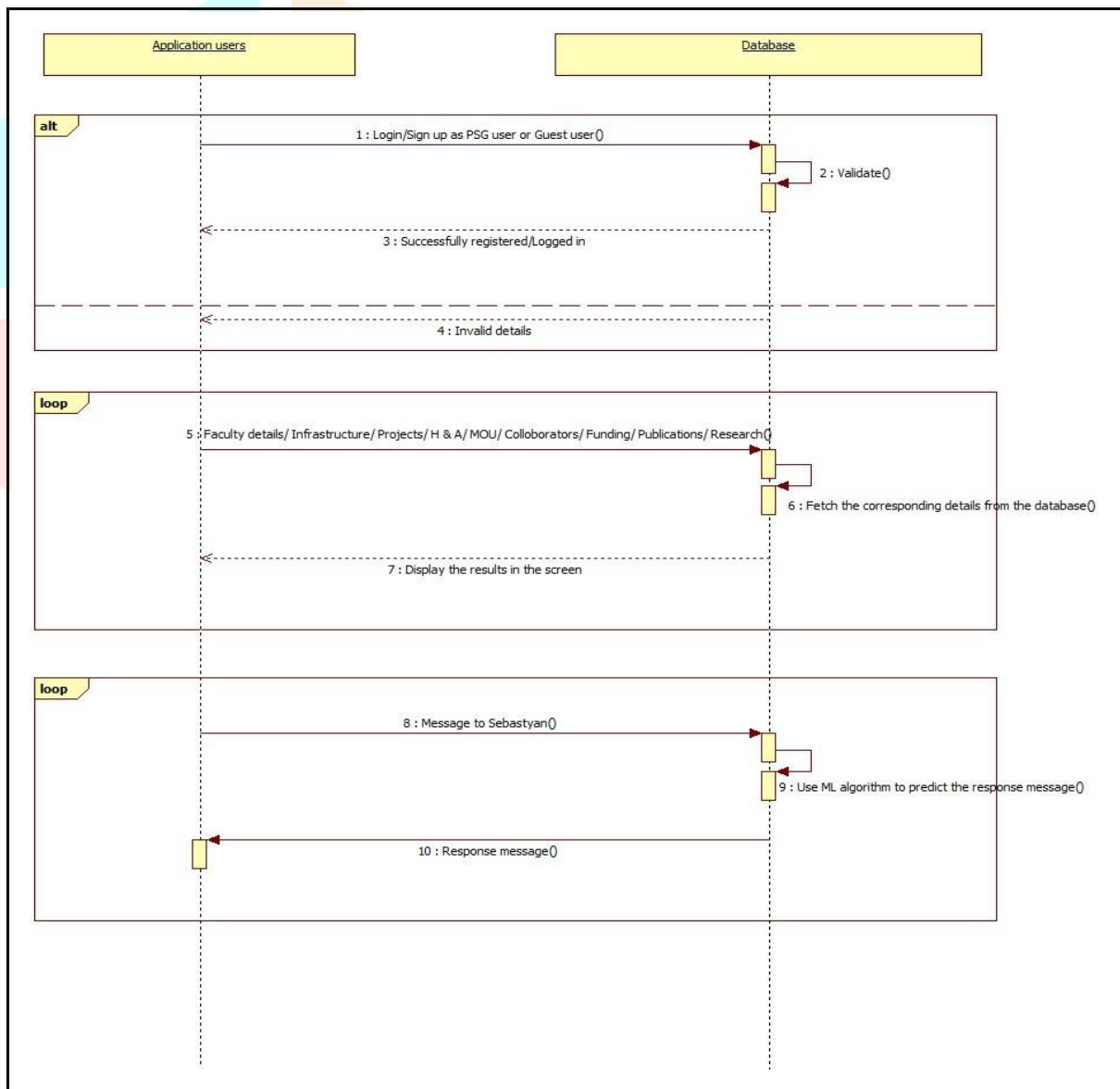


Figure 5.3 Sequence Diagram

COMMUNICATION DIAGRAM shows the interactions between the objects using sequenced messages in a free-form arrangement.

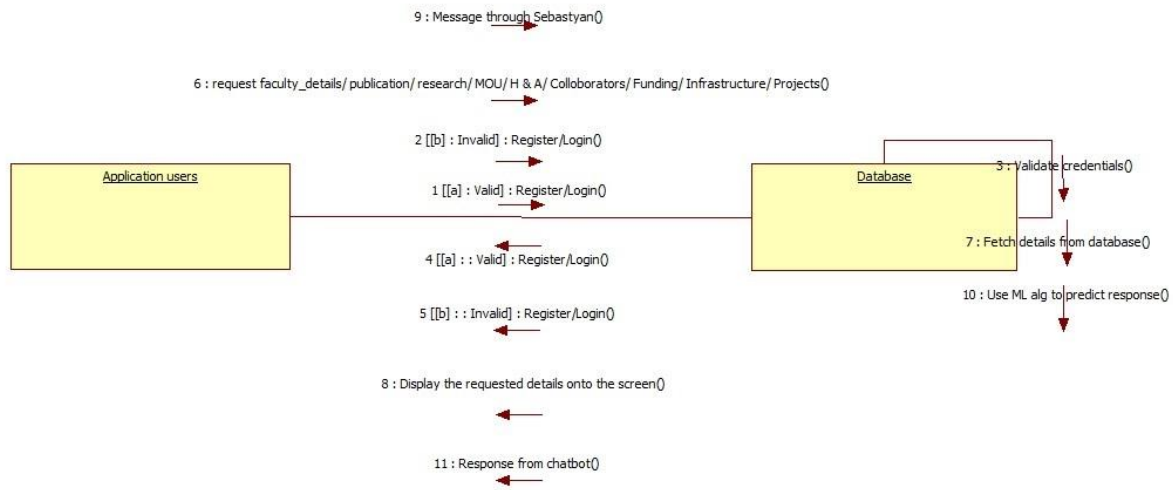


Figure 5.4 Communication Diagram

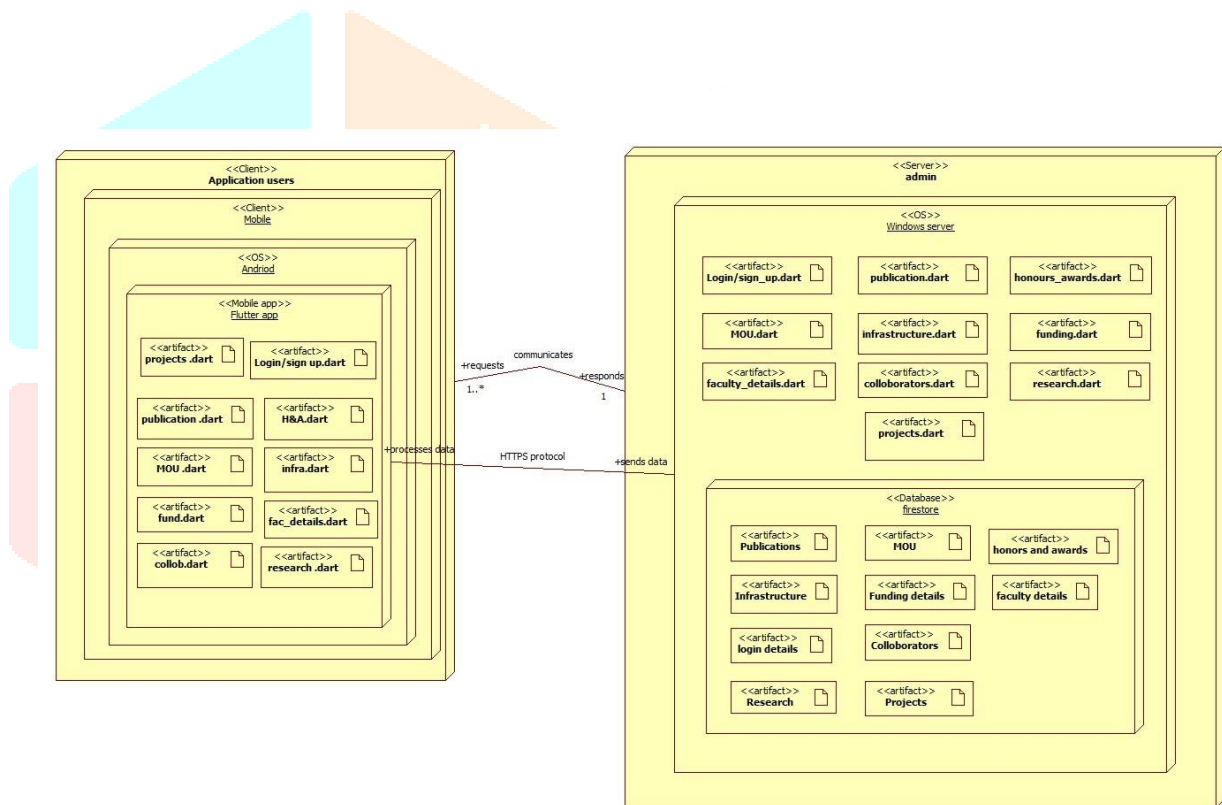


Figure 5.5 Deployment Diagram

DEPLOYMENT DIAGRAM is mainly used to describe the hardware components involved in the system where the software components are deployed. Its purposes are

- a. Visualise the hardware topology of a system
- b. Describe the hardware components that were used to install the software.
- c. Describe the runtime processing nodes

In the software development process, four different engineering approaches are used: forward engineering, reverse engineering, re-engineering, and round-trip engineering.

Forward Engineering is a process of creating an application starting from the requirement specification stage. Most of the modules in Skylanot were built using Forward Engineering technique.

Reverse Engineering is the reverse process of Forward Engineering. The information is gathered from an already existing application. In the process of developing the chatbot, the tokenization of entities was carried out after the intents were created.



Re-engineering is the process of redesigning the systems and organizational structures to achieve a significant improvement in performance. In order to improve the user experience of the mobile application, FAQ interface can be developed.

In Round Trip Engineering, the code generation and reverse engineering are carried out simultaneously in a dynamic environment. Both the phases are integrated to enhance the ease of use. The introduction of ML chatbot in Skylanot was planned only in the coding phase, hence the ML chatbot was redesigned thereafter.

Table 5.1 Application Layer Description

Layer	Software Components	Responsibilities	Languages and Frameworks and Editors Used
Application Layer (Mobile App)	Front end display layer Interaction with Database layer	Design the layout and appearance of the app Define the ways to interact with database.	Flutter, Android Studio
Backend Database Layer	Data Storage layer	Storing data needed by the app. Designing the database schema by splitting them into collections and tables for easy access of data	Google Firestore
Chatbot Layer	Chatbot Layer Integration of AVA ML Chatbot Layer	Answering all the queries of the users regarding the AIR Lab AVA Chatbot is integrated into the app which answers all queries related to Machine Learning	Google Dialogflow Python

## VI. IMPLEMENTATION

Skylanot includes a number of pages namely registration, login, home, menu and Sebastyan (Chatbot). In addition, the menu page covers a variety of options which will be explained in detail below.

**Registration:** The user has to register with their official email id if he/she has an PSG official email id. Otherwise, he/she can register using his/her personal email id in the Guest Users registration page. He/she should create a password for their account. An email will be sent to his/her mail to verify the email id before which he/she cannot sign in to the app.

**Log in:** The user has to enter the correct email id and password to log into the app. If he/she forgets his/her password, he/she can click on 'Forgot Password' to change his/her password. A reset password email will be sent to his/her email id which will contain a link to change the password.

**Skylanot:** Splash Screen is the first screen visible to the user when the application is launched and it is displayed for a few seconds. The user has to select 'PSG User' if he/she is a student or professor at PSG. Otherwise, he/she has to select 'Guest User'. The user has to register if he/she hasn't registered already; Otherwise, he/she has to log in to the app. After the user has logged in, the home page will be displayed which contains the mission, vision, objectives and contact details of the lab. There is a bottom navigation bar that consists of three options – Home, Menu and Sebastyan (Chatbot). If the user clicks on 'Menu' option, a page containing a list of choices will be shown.

**Menu:** Infrastructure contains a description about the various infrastructure available in the lab and a lab resource manual. Projects include the title, company, mentor and the students involved in all the projects implemented using the resources of AIR lab. A facility to view the description and domain of the projects is given to PSG users only. Research contains the title, concepts applied and name of the candidate of each of the ongoing and completed research papers. A facility to view the description and domain of the research papers is given to PSG users only. Faculty consists of the list of all the professors who are members of the AIR lab. The role, designation and other details of a faculty can be viewed by clicking on that faculty. Publications contain options such as books, book chapters, international journals, national journals, international conferences, national conferences and patents published. MoU (Memorandum of Understanding) Signed contains the details of the MoUs approved and signed between PSG Tech and the reputed companies. Funding Details has the details regarding the funds received. Honours and Awards includes the achievements and accolades received by the faculties and students of AIR Lab. Collaborators contain information about the companies that collaborated with PSG Tech. Developer Credits gives details regarding the team of developers of the app. Reset Password is an option used to reset the password. A link will be sent to the user's email id to enable resetting the password. Log Out helps the user to log out of the application.

### 6.1 Chatbot - Sebastyan:

The GUI of the mobile application enables the user to interact with the chatbot. Firstly, the user needs to enter the search query in the text field provided. The query message will reach Google's Dialogflow chatbot through an API and the chatbot which makes use of the Machine learning algorithm responds to the user query. This response will be sent back to the mobile application through the same API and will be displayed on the screen.

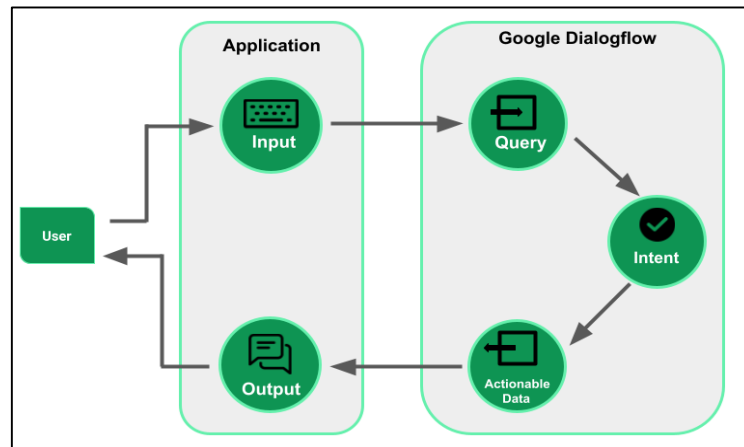


Figure 6.1 Working of Sebastian

## 6.2 ML Chatbot:

ML Chatbot aims to develop an interactive chatbot which can provide sufficient knowledge to its users related to Machine Learning. The chat bot created will answer all the questions pertaining to Machine Learning by providing insight on various techniques/algorithms in ML, the areas where they can be applied, the projects for which applying Machine Learning would be of actual benefit. This chatbot was developed by the students - Sanjoy Pator, Jeherul Islam, Rhythm Kumar Das, Abishek Gupta, Dikshita Sarmah, Prettimallika Deori of Assam Engineering College as part of the internship.

### 6.2.1 Training Data:

Intents (Queries and its answers) are stored in a json file upon which the model will be trained.

### 6.2.2 Preprocessing:

The following steps are involved to train the ML model

- The dataset is cleaned i.e., splitting dataset into words and handling punctuation and case using the python library Natural Language ToolKit (NLTK).
- Developed a list like words, classes, documents, etc., tokenized the questions for using as intents and put the tokens in list 'words'.
- After sorting, lemmatization to avoid duplicate words from the system and lowercasing all the words.

### 6.2.3 Training the ML model:

- Keras sequential python package used to build a deep neural network.
- Keras sequential model is a linear stack of three layers where each layer has exactly one input tensor and one output tensor. The first layer has 128 neurons, the second layer has 64 neurons and the third layer has a number of neurons equal to the number of intents used to predict output intent with softmax.
- Variation of gradient descent called stochastic gradient descent is used. since, it has large amounts of data.
- Rectified linear activation function is used in the first and second layers. It overcomes the vanishing gradient problem, thereby, allowing models to learn and perform efficiently.
- The softmax function is used in the final or third layer of the neural network to normalize the output of the network to a probability distribution over predicted output classes.
- Dropout is used to ignore units during the training phase of a certain set of neurons which is chosen at random.
- The Model is trained for 200 epochs and the accuracy obtained is between 70-75 %.

The chatbot model is integrated with Heroku which is a platform that helps the developers to build, execute and control applications in the cloud. An android application is built with UI and calls the API from Heroku to test the chatbot with queries. Fig 6.2a and 6.2b show the Ava Chatbot's User Interface.

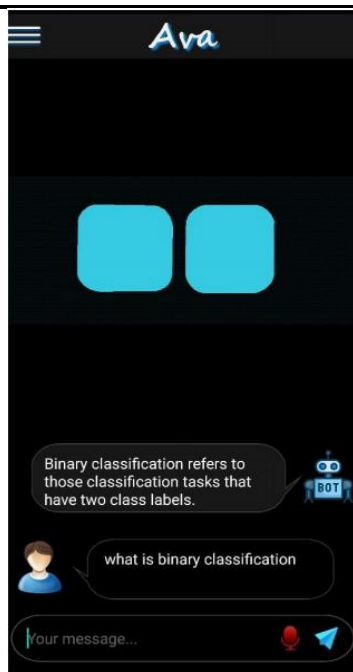


Figure 6.2a Technical Query

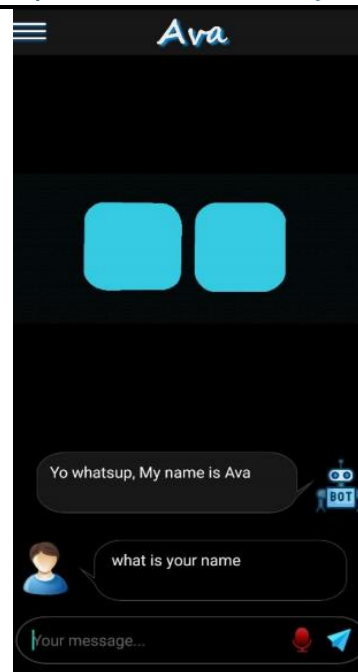


Figure 6.2b Non-technical Query

### 6.3 Steps in Accessing the AIR Lab through Skylandot

In order to utilize the resources of AIR LAB online, the following steps need to be followed:

- User Registration:** On successful registration with the user name, password and other instructions needed to access the resources online will be provided via e-mail.
- Request the resource using permitted URL
- Enter the login credentials sent to the registered Email Id.
- The list of resources requested appears in the home page.
- From the available resource, one can utilize the required infrastructure (cloud based).

#### Instance Creation:

- Select Compute -> Instance. Launch Instance
- Select Boot Source and the required capacity for work.
- Using the configuration tab Launch Instance Button.
- After creation of instance, assign a floating IP for the instance that is created.
- Allocate, Associate, Launch and connect.

## VII. TESTING – SEBASTYAN CHATBOT

Sebastyan chatbot testing is divided into three categories: testing during the testing, integration testing, and system testing.

**Testing during the training:** Every time a new intent is trained, this process is repeated, with verification of the trained data taking place only at that time. Additional training phrases are needed if the testing answer does not fit. This training testing, as shown in figure 7.1a, illustrates the training testing.

**Integration testing:** When Dialog flow is incorporated with the Skylandot, integration testing is performed. It's a good idea to double-check if each intent training in the Dialog flow is done correctly. The Skylandot app is incorporated into the Dialog flow in this step.

**System testing:** The system testing will determine whether Sebastyan's built system performs to an appropriate standard; all intents and entities will be verified during the system level testing. Figure 7.1b depicts the system testing in Skylandot.

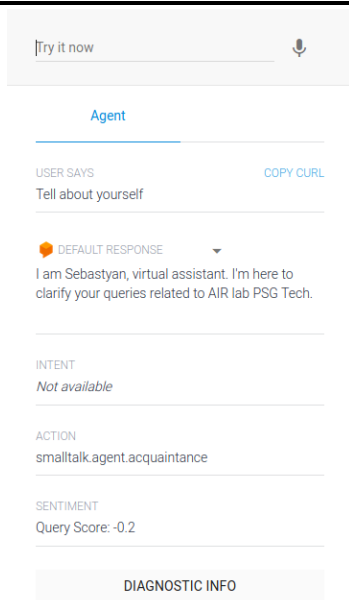


Figure 7.1a – Testing during the training

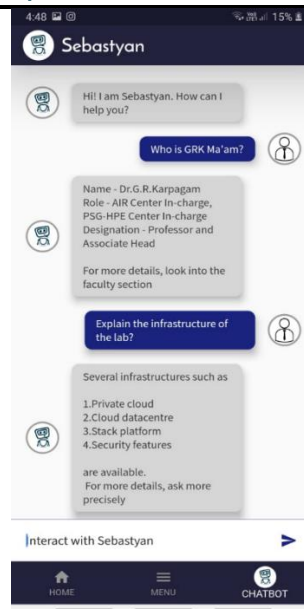


Figure 7.1b – System testing

**VIII. CONCLUSION**

Skylanot is an application that helps users to get complete information on the Artificial Intelligence Research Lab in PSG College of Technology. This application motivates the students to utilize the resources available in the AIR lab and expose students to the vital technology that influences the future.

The Sebastyan chatbot, an auto AI-based AIR lab information and interactive framework, is integrated with the Skylanot application. Sebastyan has been given all of the required AIR lab details as well as daily conversations. All the information can be accessed in a conversational or instant messaging format. The bot will function without the need for human interference once it has been trained.

This application can be further developed in future by providing an interface to apply AIR lab resources directly avoiding the need to move outside of the application. In addition, a FAQ page can also be developed where each query will be answered by the AIR lab officials. These future developments can enhance the user experience in the application.

**IX. ACKNOWLEDGEMENT**

We would like to thank the Artificial Intelligence and Research Laboratory (AIR lab), Computer Science and Engineering department, PSG College of Technology for their support and help throughout the project.

**X. ANNEXURE**



Figure 9.1 Splash Screen



Figure 9.2 User Type Selection



Figure 9.3 Register Page

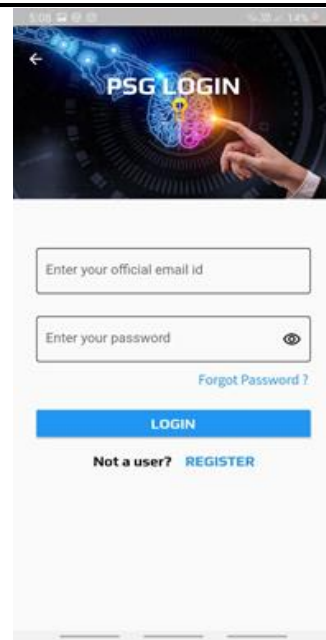


Figure 9.4 Login Page

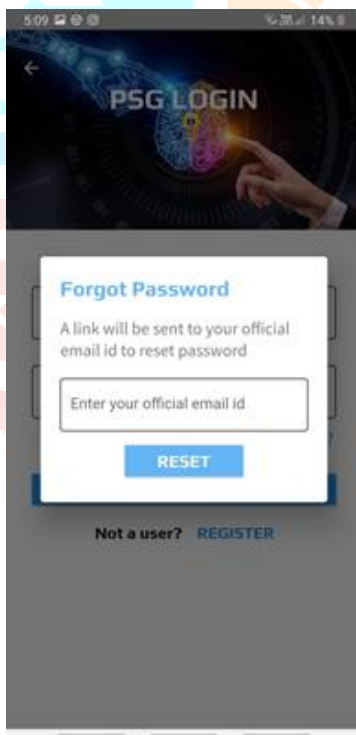


Figure 9.5 Forgot Password Page



Figure 9.6 Home Page

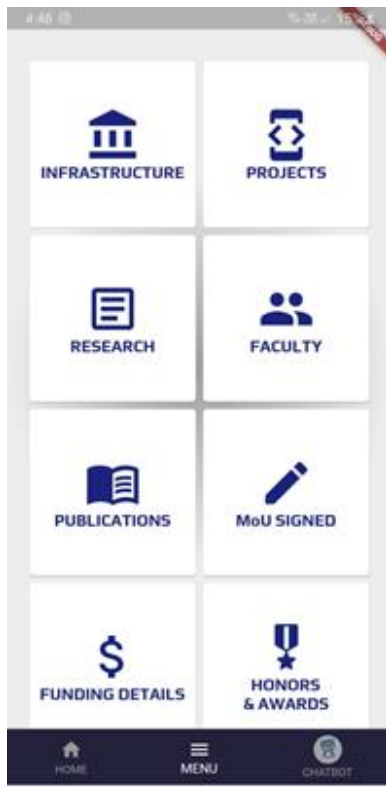


Figure 9.7 Menu Page

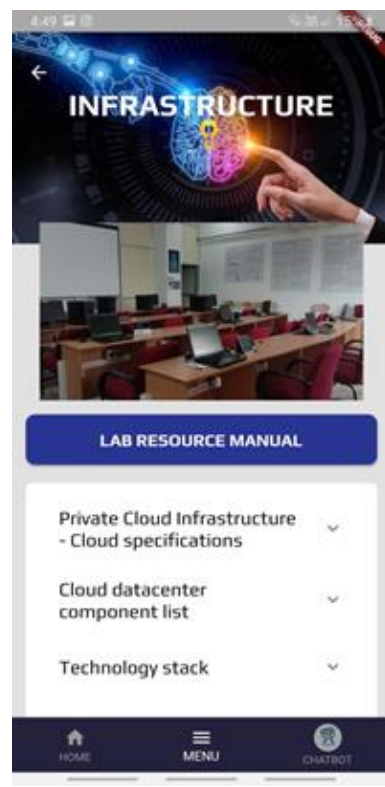


Figure 9.8 Infrastructure Page



Figure 9.9 Publications Page

## XI. REFERENCES

- [1] Android Studio - <https://developer.android.com/docs>
- [2] AVA (ML) Chatbot - [https://github.com/ji5225/PSG\\_Internship\\_AVA-chatbot](https://github.com/ji5225/PSG_Internship_AVA-chatbot)
- [3] Dialogflow - <https://dialogflow.cloud.google.com/>
- [4] Dialogflow Guide - <https://cloud.google.com/dialogflow/docs>
- [5] Ali, A. 2001. Macroeconomic variables as common pervasive risk factors and the empirical content of the Arbitrage Pricing Theory. *Journal of Empirical finance*, 5(3): 221–240.
- [6] Bhatti, U. and Hanif. M. 2010. Validity of Capital Assets Pricing Model. Evidence from KSE-Pakistan. *European Journal of Economics, Finance and Administrative Science*, 3 (20).
- [7] Basu, S. 1997. The Investment Performance of Common Stocks in Relation to their Price to Earnings Ratio: A Test of the Efficient Markets Hypothesis. *Journal of Finance*, 33(3): 663-682.
- [8] Bhattacharya, Prabir & Yang, Li & Guo, Minzhe & Qian, Kai & Yang, Ming. (2014). Learning Mobile Security with Labware. *Security & Privacy, IEEE*. 12. 69-72. 10.1109/MSP.2014.6.
- [9] Boticki, Ivica & Barisic, Ante & Martin, Sergio & Drljević, Neven. (2013). Teaching and Learning Computer Science Sorting Algorithms With Mobile Devices: A Case Study. *Computer Applications in Engineering Education*. 21. E41-E50. 10.1002/cae.21561.
- [10] Boyinbode, Olutayo and Bagula, Antoine and Ng'ambi, Dick (2012) A Mobile Learning Application for Delivering Educational Resources to Mobile Devices, *Proceedings of IEEE International Conference on Information Society (i-society)*, 25-28th June, London, 120-125.
- [11] Brandtzaeg, Petter & Følstad, Asbjørn. (2017). Why People Use Chatbots. 10.1007/978-3-319-70284-1\_30.
- [12] Deshpande S, Chahande J, Rathi A. Mobile learning app: A novel method to teach clinical decision making in prosthodontics. *Educ Health (Abingdon)*. 2017 Jan-Apr;30(1):31-34. DOI: 10.4103/1357-6283.210514. PMID: 28707634.
- [13] Hsu, Y.-C., & Ching, Y.-H. (2013). Mobile app design for teaching and learning: Educators' experiences in an online graduate course. *The International Review of Research in Open and Distributed Learning*, 14(4). <https://doi.org/10.19173/irrodl.v14i4.1542>
- [14] Karanfiller, Tolgay & Göksu, Hüseyin & Yurtkan, Kamil. (2017). A Mobile Application Design for Students Who Need Special Education. *TED EĞİTİM VE BİLİM*. 42. 10.15390/EB.2017.7146.
- [15] Luna-Nevarez C, McGovern E. On the Use of Mobile Apps in Education: The Impact of Digital Magazines on Student Learning. *Journal of Educational Technology Systems*. 2018;47(1):17-31. doi:10.1177/0047239518778514
- [16] Mahmoud, Maha & Kumar, Ramakrishna. (2020). A Review on Chatbot Design and Implementation Techniques. *International Journal of Engineering and Technology*. 7. 2791.
- [17] Mbogo, Dr Chao & Blake, Edwin & Suleman, Hussein. (2013). A mobile scaffolding application to support novice learners of computer programming. *ACM International Conference Proceeding Series*. 2. 84-87. 10.1145/2517899.2517941.
- [18] Moreira, Fernando & Ferreira, Maria. (2017). Teaching and Learning Modelling and Specification Based on Mobile Devices and Cloud: A Case Study. *International Journal of Technology and Human Interaction*. 13. 33-49. 10.4018/IJTHI.2017100103.
- [19] Oyelere, Solomon & Suhonen, Jarkko & Sutinen, Erkki & Wajiga, Gregory. (2018). Design, development, and evaluation of a mobile learning application for computing education. *Education and Information Technologies*. 23. 467-495. 10.1007/s10639-017-9613-2.
- [20] Pears, Arnold & Rogali, Moritz. (2011). mJeliot: ICT Support for Interactive Teaching of Programming. *Proceedings - Frontiers in Education Conference, FIE*. 10.1109/FIE.2011.6143119.
- [21] Peters, F.. "Master thesis : Design and implementation of a chatbot in the context of customer support." (2018).
- [22] Vinay, Siri & Vaseekharan, Manoj & Mohamedally, Dean. (2013). RoboRun: A gamification approach to control flow learning for young students with TouchDevelop.

Leveraging Education Through Mobile App And Chatbot – Skylanot