

Android Application for Smart Services in College Integrated With IOT and ML

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Abstract: An android application with which the students can have access to certain smart services related to college like canteen orders, Lost and found, Cleanliness, Library, Bus tracking using GPS, Applying for events and placements, etc. There are canteen admin, events admin, placements admin, etc to see the placed orders, post the events information and placements information which can be seen by students respectively. There is one ML module that helps in computing feedback given by students on food and converts that feedback into the rating. All the negative and positive feedbacks of each item can be checked by canteen admin which helps them to improve the quality of the food with more negative feedback. This model was trained using the RNN algorithm. The accuracy of this model is turned out to be around 94%. This model is integrated with android using the TensorFlow Lite file converted from the Keras model.

Keywords: RNN ML Algorithm, IoT software, Real- Time GPS, TensorFlowLite.

1. Introduction

Most of the colleges may have an app that only covers attendance, assignments, timetables, etc. Those apps do not have updated features like dark mode, Chatbot, health statistics, etc. and services like ordering food, Registering for events, Cleanliness, Lost and Found, Controlling Lights using phone etc in the app.

[1] Most of the applications look like legacy applications(Not a better UI)

[2] The existing apps do not get updated features according to the Android version

[3] The existing apps do not have important services of college like canteen, cleanliness, etc.

[4] The existing application doesn't give the user a better experience.

[5] The database used in the existing application is not quick enough.

This App named Smart campus helps the students to live a smart life by using all the services provided by the college in few clicks. The User Interface is made user-friendly. The user needs to login with google which promotes privacy as well as the user need not remember login credentials.

The ML model being discussed in this paper was trained on around 3lakh reviews using the SimpleRNN Algorithm and tested on around 1lakh reviews. The dataset used in this application is Amazon fine food reviews. These are further discussed in detail in the following sections.

2. Proposed System

As Smartphones are becoming more preferred companions to users than desktops or notebooks they can be considered to speed up the some services in college. We have come up with an idea that every individual will have his/her own account where he/she can sign in with the help of google account. Our idea is regarding an application which balances all the needs of campus like Place food orders, Event notification, Reporting lost and found items, GPA calculator, Placement Related Activities, Smart Library, College Bus Live Tracking, Cleanliness, Control lights, Virtual Assistant, etc.

The app also contains some privacy features like fingerprint authentication, Dark mode, Food statistics, Generating Most popular section from the feedbacks given by users on each item. The user needs to scan his fingerprint after opening the app and the dark mode is for enhancing the battery usage of the phone. The dark mode can decrease the battery consumption of the phone. The health statistics are the stats provided to the user which draws a pie chart between healthy food vs junk food. As per our analysis, junk food is something which has more than 18% of fats in it. The app also provides the total number of calories consumed and the time required to burn those calories by running and cycling only after successful payment for the order. After a successful payment, the order is sent to canteen admin and he can see that and prepare the food before he reaches the canteen itself which saves the time and also avoids the queue.

The app contains a Chatbot section in which if the user has any query he can chat with the Chatbot and if the query still persists the user can contact the team.

The app contains a Canteen section where the user can place the orders and complete the payment easily through GPAY and PAYTM.

The user can write feedback for the item they took which is converted to rating with the help of the ML algorithm. The RNN model was adopted for text classification. The proposed model was evaluated based on Amazon Fine Food Reviews Dataset, which achieved around 94% accuracy.

This ML model consists of three major parts:

[1] Sentimental analysis of feedback given by the customers using RNN.

[2] Integration of machine learning model in android application.

[3] Ranking each food item in the menu based on the feedback given by the users.

The references are mentioned at the end of the paper.

3. Methodology

A. System Analysis

This application is developed using Android Studio. Android is an open-source mobile operating system. Android studio includes an SDK file. SDK file contains many libraries. Android programs are written in Java and XML and run through a JVM that is optimized for mobile devices. Here java is used for the backend and XML is used for the frontend.

This application is integrated with ML and IoT devices. Jupyter Notebook and Arduino are used to write ML and IoT code (Embedded C).

Block diagram representing basic design of Smart Campus shown in Fig 1.



Fig. 1: Block diagram

B. Modules Description

The app also has a **Cleanliness** section which allows users to upload a picture of dirt in the application so that it is sent to cleanliness admin and he will take care of that situation.

The app has a **Lost and Found** section which allows users to upload his/her lost items in the college and if any other person finds it they can call, message, and WhatsApp them from the application itself.

The app contains a **Library** section which allows the students to scan the barcode on the book and after scanning all the required books the user needs to scan the barcode on the ID card so that the books are issued to him which helps in avoiding of queues.

The app contains a **Bus Tracking** module where the bus drivers open the app and shares his location which is stored in database and then retrieved to users. The location of bus driver is shared continuously which is called real time tracking.

The app contains **Events** section in which all the events are posted by admin with a link so that the users can register with that link and can attend it.

The app contains **Placements** section in which all the placements happening in and out of the college are posted by admin and is registered by the users and they can attend the drive.

The app contains **GPA** section which computes GPA of student and also speaks out the GPA.

The app contains **Notes** section in which the user can store import online class links, timetables, important pdfs, etc.

The app contains a **Canteen** section where the user can place the orders and take the food which helps in avoiding queues and the user can also provide feedback. The tflite is used to

integrate ML with android. The tflite file acts as a bridge between ML and android.

The app contains **Security admin** module which gives access to security guards in controlling lights of college through his phone.

The app contains **Canteen admin** module which allows canteen people to check the orders and deliver them, view the items and change the availability of the items and also upload the new items.

The app contains **Cleanliness admin** module which allows cleanliness staff to view the pics of dirt uploaded by the user.

The app contains **Events admin** module which allows events admin to upload and view the events.

The app contains **Placements admin** module which allows placements admin (TPO) to upload and view the placements or drives happening in and out of the college.

The app contains **Bus Incharge admin** module to upload bus driver details and also can send notifications to students regarding availability of buses.

The app contains **Bus Driver** module to share location of bus to students.

The app contains a **Chatbot** module to report any issues with the app and if the issue not mentioned in that section he can type the issue so that the issue is sent to Main Admin.

The user will login using his google account and after successful login, it will take to a prescribed page i.e., if that email with which user signed in is set as canteen admin in database the app opens canteen admin page and same with other admins. The students can use email provided by college.

C. Database

In any system storing of data is very important part. In this application for the storing data firebase connectivity is provided. In addition to this SQLite is also used to store some data in user internal storage. Firebase is an online platform to store data, documents like text, images, video file, PDFs, etc.

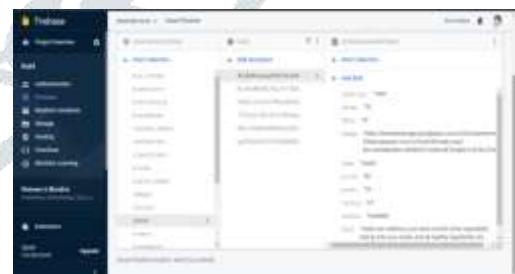


Fig. 2: Firebase Database

D. Machine Learning

The Dataset used for this project was Amazon Fine Food Reviews.

Out of the 5,68,454 reviews 3lakh were used for training the model. The ML model was trained using the Machine Learning SimpleRNN ML Algorithm on around 3lakh reviews and tested on around 1lakh reviews.

SimpleRNN(Recurrent Neural Networks) algorithm is designed for text classification. The activation function used for this project is tanh.

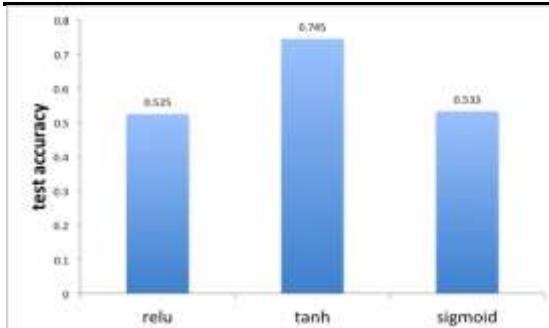


Fig. 3: Activation Function Comparison

tanh function has the highest test accuracy. Therefore, we chose tanh function in our best model.

The Amazon Food Review dataset has 568, 454 samples. Out of which

52268 reviews have a score of 1

29769 reviews have a score of 2

42640 reviews have a score of 3

80655 reviews have a score of 4

363122 reviews have a score of 5

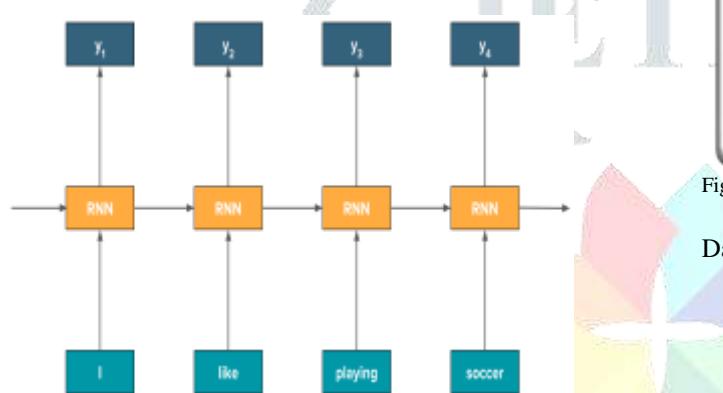


Fig. 4. Algorithm Diagrammatic Representation

TensorFlow Lite is an open-source Deep Learning Framework for on device inference.

The steps in TensorFlow Lite are [1] Train a model. [2] Convert TensorFlow model to TensorFlow Lite model. After converting, a new .tflite file is generated stored in local storage. Take the file and put that file in assets folder of android studio. So that it is not required to train the model every time which takes less time to perform computation and gives the output.

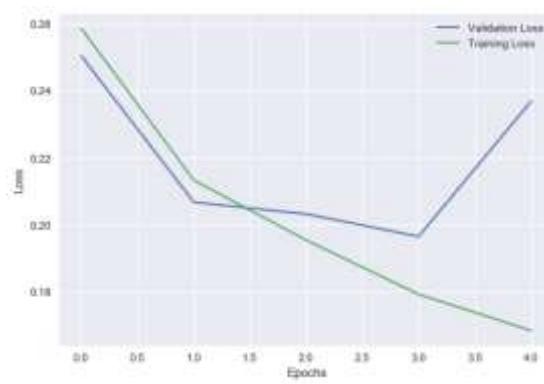


Fig. 5: Loss of the Machine Learning Model

The accuracy of this model is around 94% and it takes around 3min for each epoch.

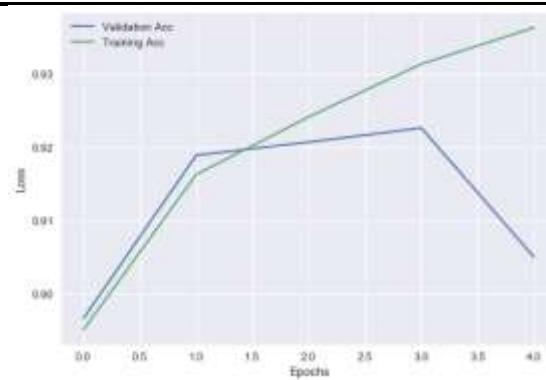


Fig. 6: Accuracy of the model

4. Results and Discussion

The user will login using his google account (Gmail account) and after signing it will take to the prescribed page i.e, if the given mail is canteen admin then it takes the user to canteen admin page and same for all other pages.



Fig. 6: Fingerprint Security

Fig. 7: Google Sign in
After Successful login the Student gets navigated to Dashboard.

Fig.8: Dashboard



Fig.9: Canteen Page

From the Dashboard we can see multiple modules and from the modules if the student selects Canteen then Fig.9 is opened. And From Canteen page if any item is selected then student can view health statistics of that item and price and rating of that item and he can also select the quantity and add them to cart and after payment the control is sent to Orders page which has two tabs i.e, Current orders and Previous orders.



Fig.10: Items info page



Fig.11: Current Orders

When the User navigates to previous orders he can give the feedback of the items which he ordered and delivered. After giving the feedback the positive percentage of the text is displayed.



Fig.12: Previous Orders



Fig.13: Review (Feedback)

The next module is Bus tracking where the user will have four options i.e, Track, Contacts, Timing, Updates. Whenever the user clicks on track it prompts for route no and then the map is displayed along with directions. And next contacts section has contact numbers of all bus drivers and the next one is Timing in which a pdf is displayed with routes and timings of each bus and the last one is updated in which notifications are displayed.



Fig. 14: Bus Tracking



Fig. 15: Notifications

The next module is Lost and Found which helps the users if they lost any items in the college. They can post their details and the item in the application so that if any other people find it they can call them, message them from the application itself.



Fig. 16: Lost and Found



Fig. 17: All Posts

The above modules are for students. The next modules are for admin purposes.

The first module is Canteen Admin who can view orders, add new items, View feedbacks of each item and Delete the items.

The Canteen Admin Page after successful login is shown below in Fig. 18.



Fig.18: All Items

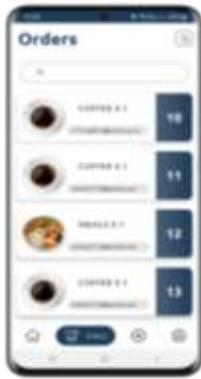


Fig.19: Orders

The next module is Security admin who can control the lights of the college from the application itself. The hardware used in this module is NodeMCU WIFI module ESP8266, Breadboard and LED. After successful login the app checks if the mail is security admin and if it is true it shows the console of security admin and they are provided with room numbers with floors for easy access as shown in Fig 20.



Fig.20: Security Admin



A Part from the above mentioned admins there are few more admins like Events Admin, Placements Admin, Cleanliness Admin, Bus Incharge, Bus Drivers etc whose activities are mentioned in the modules description section.

5. Conclusion

Our Study on this project revealed that the services like canteen, cleanliness, lost and found, Placements, GPA calculator, Controlling lights with phones, etc can make the users live a smart life. We are using Sign-in with Google which doesn't require any passwords to remember and also it promotes privacy. For payments through the app we are using PAYTM and GPAY which are considered to be the secure payment apps these days. The app also uses ML and IOT to generate the most

popular section in the canteen and control the lights respectively.

6. References

[1] Hirsch B, Ng JW (2011) Education beyond the cloud: anytime-anywhere learning in a smart campus environment. In: 2011 International conference for internet technology and secured transactions (ICITST), pp 718–723.

[2] Liu YL, Zhang WH, Dong P (2014) Research on the construction of smart campus based on the internet of things and cloud computing. *Appl Mech Mater* 543:3213–3217

[3] J Chen Z, Xia F, Cheng R, Kang J, Li C (2012) Oncampus: A mobile personal assistant for college students. In: ICCE, p 22

[4] Chandrashekhar, S. (2014). Android application for school of art and design. *Dissertations & Theses - Gradworks*, 23(2), 88-90

[5] Bo, P. (2008) Opinion Mining and Sentiment Analysis, Foundations and trends in information retrieval, 2(1–2): pp. 1–135. doi:10.1561/1500000011

[6] Mikolov, T., Karafiat, M., Burget, L., Cernocky, J., & Khudanpur, S. (2010, September). Recurrent neural network based language model. In *INTERSPEECH*, Vol. 2, pp. 3.

[7] Chung, J., Gulcehre, C., Cho, K., & Bengio, Y. (2015). Gated feedback recurrent neural networks. *arXiv preprint arXiv:1502.02367*.

[8] McAuley, J. J., & Leskovec, J. (2013, May). From amateurs to connoisseurs: modeling the evolution of user expertise through online reviews. In Proceedings of the 22nd international conference on World Wide Web (pp. 897–908). International World Wide Web Conferences Steering Committee.

[9] Rutuja Ekatpure & Devendra Ingale2016, “Android based Interactive Home Automation System through Internet of Things” International Journal of Science and Research (IJSR) Vol. 5, No. 4.

[10] N S. Tiwari and R. Gedam, “A Review Paper on Home Automation System Based on Internet of Things Technology,” *Int. Res. J. Eng. Technol.*, pp. 1187–1190, 2016.

[11] S. Sawidin, D. S. Pongoh, and A. A. S. Ramschie, “Design of Smart Home Control System Based on Android,” Proc. - 2018 Int. Conf. Appl. Sci. Technol. iCAST 2018, pp. 165–170, 2018, doi: 10.1109/iCAST1.2018.8751226.

[12] Sanket Anil Vora & Kendre S.S 2014, “Wireless Control System for Automating Home Appliances and Security Using Android Application” *International Journal of Engineering Sciences & Research Technology*.