Mobile App to Manage and Advertise Innovation, Research and Development Activities at IIIT Delhi

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BTP Track: Engineering

BTP Advisor
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Indraprastha Institute of Information Technology
New Delhi

Student's Declaration

I hereby declare that the work presented in the report entitled "Mobile App to Manage and Advertise IRD (Innovation, Research and Development) Activities at IIIT Delhi" submitted by me for the partial fulfillment of the requirements for the degree of Bachelor of Technology in Computer Science & Engineering at Indraprastha Institute of Information Technology, Delhi, is an authentic record of my work carried out under guidance of Dr. Pushpendra Singh. Due acknowledgements have been given in the report to all material used. This work has not been submitted anywhere else for the reward of any other degree.

New Delhi, 18/04/2017

.... Place & Date: .....

....(Saloni Gupta)... ….(Simran Saxena)....

Certificate

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

..... Place & Date: .....

...(Dr. Pushpendra Singh)...

Abstract

There has been an increasing need to have access to everything on Mobile phones due to the ease of access and portability. With this aim, we decided to bring the Innovation, Research and Development (IRD) Activities being carried out at IIIT Delhi on a common mobile platform. We're building an Android Application that would be responsible for managing and advertising various IRD Activities at the Institute like being able to see the details of the Weekly Seminars and add them to Google Calendar in one click; follow the various accomplishments of people from the IIIT Delhi family through Research News updates; post and search for job openings (BTP/IP/Internships) in the field you're interested in; get details of faculty and staff using the Directory; upload Seminar and Event Posters and view posters uploaded by other users. Our App aims to successfully achieve all these goals apart from few more enhanced features.

Keywords: Mobile Computing, Android Application, Human Centered Systems, JSoup, RecyclerView, Java, Android Studio, Prototypes, User Testing, Firebase

Acknowledgment

It is our privilege to express our sincerest regards to our project advisor, Dr. Pushpendra Singh who has given us this opportunity to work on this project. We would also like to thank him for his valuable inputs, guidance, encouragement and wholehearted cooperation throughout the duration of our project.

We are also grateful to IIIT Delhi for giving us this opportunity to carry out our B.Tech. Project.
We take this opportunity to thank all our lecturers who have directly or indirectly helped our project. We would also like to acknowledge all the users who have helped us test and improve our App through their invaluable feedback.

Work Distribution

The work was jointly done by both the students. Initially, Material Design Principles of Android Programming were studied by both the students to gain an extensive knowledge of layouts and latest design guidelines from the Android Documentation and various other tutorials and sources. Then the prototypes based on the proposed solution were prepared and feedback of a few potential users was taken. Changes were incorporated and the design was implemented using Android Programming on Android Studio. Prototyping and Designing was done collectively by both the students. Both the students were responsible for the front end as well as back end programming of the App. We got to learn the basics of RecyclerView and various other Layouts. We have been able to fetch the data directly from the IIIT Delhi website and display the data on our App in specified format using JSoup library. The users can view the details of the seminars and add them to their Google Calendars in a single click with the 'Add to Calendar' feature.

Designing of UI Pages:

Saloni Gupta:Login Screen, Research News, Research Openings, Events(Upload), Search Directory
Simran Saxena:Main Welcome Screen, Seminars, My Events, Events(Download), Directory

During this semester, time was spent by both the students to understand the principles and working of NodeJS as none of them had any prior experience with it. We modified the UI after getting more feedback to make it more user friendly. A lot of changes were made in the server side of the code. Other suggested features were incorporated as proposed.

Contents

Chapter 1

Introduction

The project aims to successfully build an Android Application which would serve as a single platform to view all IRD Activities at IIIT Delhi with some added features. It makes use of Android Studio, Java Programming, JSoup Library and a few APIs to implement the features so far. The server of the App was shifted from Firebase to a Virtual Machine using NodeJS. Once the app is tested, the cloud based services will be shifted to IIIT Delhi Servers to make the app self reliant, scalable and secure.

Chapter 2

Problem Statement

Build a Mobile App to manage and advertise the Innovation, Research and Development (IRD) Activities at IIIT Delhi. Develop a single platform for all Research related queries. The idea is to keep everything separate on the Mobile App, without any interference from the WebSite. The App must be robust, user friendly and self reliant. It should be connected to Cloud to enable Information transfer. Create it as an 'In-house App' that is accessible by all people associated with IIIT Delhi.

Chapter 3

Target Audience

The app is meant to cater to people associated with IIIT Delhi. Outsiders will not be able to access the contents of the Application. All users will be authenticated against a valid IIIT Delhi user Id (Domain name xyz**@iiitd.ac.in**).

Chapter 4

Work Done So Far

Semester 1:

For the Summer Semester of 2016, we started with understanding the latest Design Principles of Android and learnt how to deploy them to make our App at par with the latest Android Standards.

Firstly, we have used Google Authorization to validate our User base. The app can be accessed by anyone with a valid IIIT Delhi account. This includes Faculty as well as Students. The app also includes a Sign Out option placed on the top right of the Main Welcome Screen.

We have built the feature to fetch the latest Seminar details from the IIIT Delhi Website https://www.iiitd.ac.in/research/seminar. To deploy this feature we made use of the JSoup Library which provided a convenient API to extract data from real-world HTML pages. Relevant information was then taken from the extracted data and displayed in the App using RecyclerView and CardView. Then the Google Calendar API was used to add any particular Seminar to one's Calendar.

The plus icon on the *Seminars* page when clicked, adds the Event of the Seminar to the Google Calendar of the account from which the user had logged in. Information of the event like Date, Time, Venue, Title, Description are automatically fed by the App into the Create Event Dialog. The information from our App to the Google Calendar API is sent through Intents. Once the event has been created, the user will be notified one hour before the starting time of the Seminar. If the user wishes, the notification can be clicked to reach Google Maps, which will lead the user to the venue of the Seminar.

Once the Seminar has been added to the user's Calendar, the Seminar is also reflected in the My Events Tab. This tab keeps track of all the seminars attended by the user. In future, if we extend the App to cover more events, even they will be shown in this tab.

The pages for Research News and View Research News Details have been created. The website needs to be modified according to the tabs we need. Once the IT department makes the appropriate tags, JSoup Library will again be used to fetch the latest Research News from the https://www.iiitd.ac.in/research/rs15 and display all the details.

The Research Openings essentially comprise of three sections: Posting a new Job Opening, Viewing all the current Job Openings, and Browsing through the User's customized feed. The pages for the same have been created. The linking of the input to the cloud will be done in the coming Semester. This data would be used to provide filter options to the users. The data will then, be fetched from the Server.

Semester 2:

For the Monsoon Semester of 2016, we started with understanding the Cloud services for Android and started working with Firebase as our Server. (Later to be shifted to the main IIITD server)

The App is currently Cloud based. All the data pushed by the Users onto the App goes directly to the Firebase Server and is fetched from there when the App loads. All this happens in Real time and changes can be observed within a few seconds. Earlier, we used *Web Crawling* to parse the IIITD website and get data, but the response time was very slow. Also, the format of the tables had been changed and the Crawling no longer worked. Using Firebase helped improve the response time and a significant reduction in time taken to load a page can be observed.

We have added a new feature of allowing the user to add any relevant Seminar or Research based Event Posters to the App. Username of the uploader is recorded along with a short description of the respective posters to avoid inapt posts. Posters can be Zoomed in place to provide better readability, by clicking on the picture. Also, on clicking on the image of the poster, another page opens where where the poster can be viewed in full screen and zoomed as well.

The App has a new Tab called 'Events' where all the posters can be viewed and new ones can be added by clicking on the floating button. The new poster then goes to the Database Storage and on refreshing, gets displayed on the same page.

Another feature added is the 'Directory'. This contains details of the Faculty and Administrative Staff along with all relevant and emergency contacts. A database was prepared for the contacts of various different services available at IIIT Delhi. The database was made with the help of the data available under the Directory tab on the institute's website. The aim was to have an easy access to the email ids, room number, landline numbers and extensions of professors and staff. The App includes a direct Call and Mail feature button, which can be clicked to directly call or mail the respective faculty member. The App asks for permission before calling so as to avoid mistakes. The whole directory has been segmented into four parts, namely Faculty, Facilities, Academics, and Labs.

We have built a search feature for the Directory for easy access to particular member. The Search tab searches the whole directly and returns names 'On-the-fly' basis, i.e. as the user keeps on typing letters, suggestions change based on the new information. The database can be searched on the basis of Names, Designation, Phone Number, Room Number, and Email Id.

Few bug fixes were made in the app and few changes were made to improve user experience. For instance, all the Seminar posts have a picture associated with them. This image is fetched from the database depending on keywords present in the title. If the title doesn't fit any of the classes provided, then a default image is supplied. Also, the filtering algorithm of the app to search for projects was improved to give better results.

Semester 3:

For the Winter Semester of 2017, we started with the implementation of features and UI changes that were suggested in the previous presentation session. This acted as another round of Evaluation/Feedback to make the App more Human Centered. We made few users actually use the app for a few days and used their valuable feedback to correct the minor bugs and tweak some UI, like changing the Plus button in the Seminar page. That button was not very intuitive for clicking, so that was changed.

Minor tweaks like this were also done. In addition to the adding of Seminars in Calendar directly from the App, an extra feature to add the meetings in a similar way was suggested. To make the UI seem more interactive and easy to follow, we combined the three options, namely - Add Poster Event, Add Seminars and Add Meetings in one float button that opens up to create a list of items. This UI change was done on a new Events tab. An intent is passed for the selected option and their individual activities/fragments come into view for carry on that particular task. In this tab, the users can view all their upcoming/attended events in one glance. In the Seminars sub-tab, the attended Seminars or Seminars that one had added to Calendar can be seen.

The main aim for this semester was to incorporate the suggested minor changes to improve the UI and have perfect interaction between pages on screen. The App is now, more intuitive and more efficient in the sense that traversing takes lesser time and swiping from one activity to another is faster. Major changes in the server and backend were also done.

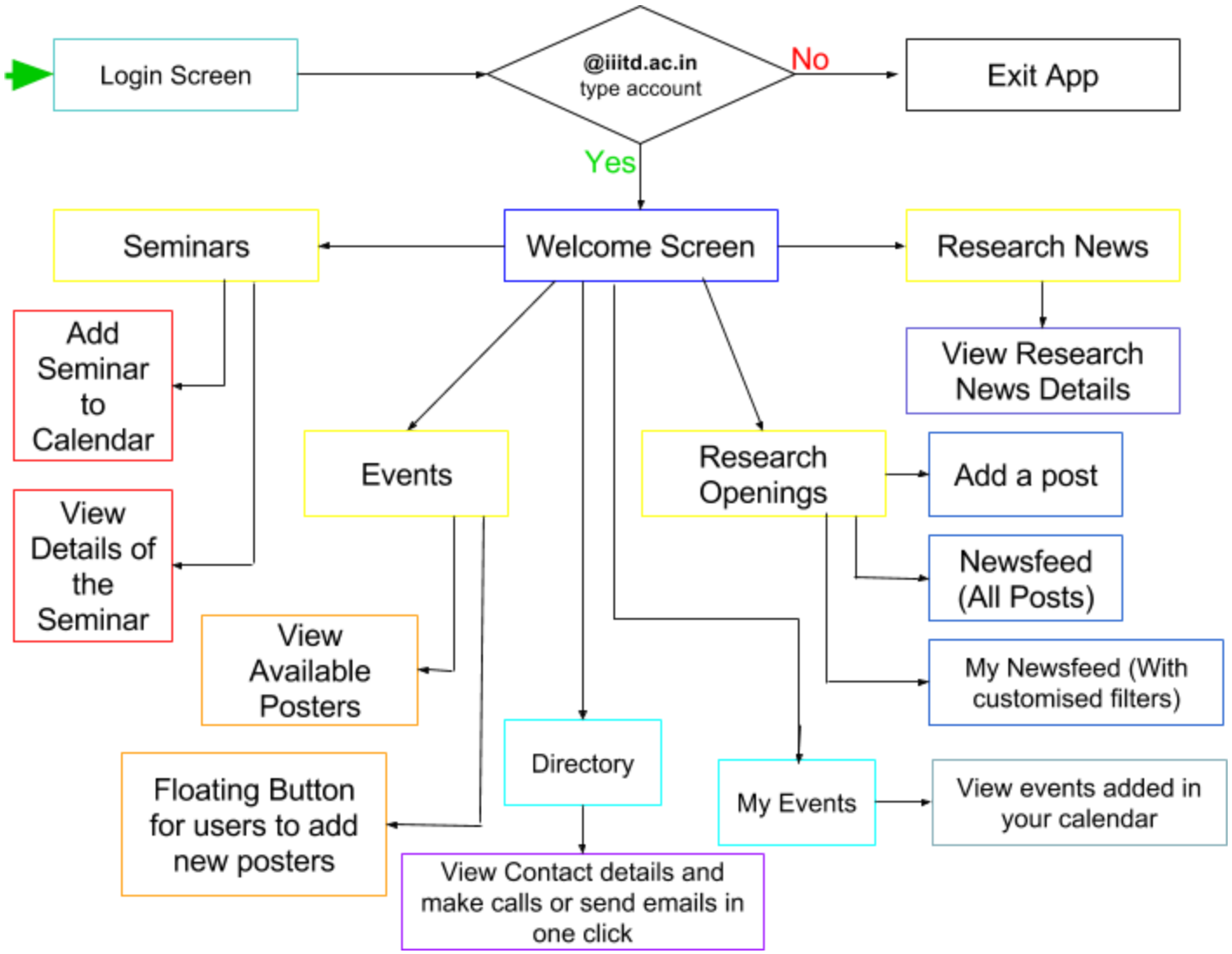
Also, we now have improved user profiles. The individual profiles made for all users of the app contain every person's data saved individually. The directory data items, that were earlier fetched from the server, are now saved with the Android app itself. This step was done to eliminate the few seconds of waiting time for the directory to load. The provision for update is there to manually request for any updates directly from the server. This is done so that no time is wasted in fetching the data from the server since the directory remains more or less constant throughout. Also, we have used web crawling for the seminars that are updated daily because they need regular updates.

Apart from the frontend changes, major backend changes were done, like shifting the server from Firebase to a NodeJS server. Since none of us had worked with NodeJS framework before, some time was spent to study and experiment with the framework. The user registration/sign in process was changed from Firebase to NodeJS.

Chapter 5

Architecture

Flow of Control of the Application



Chapter 6

Design

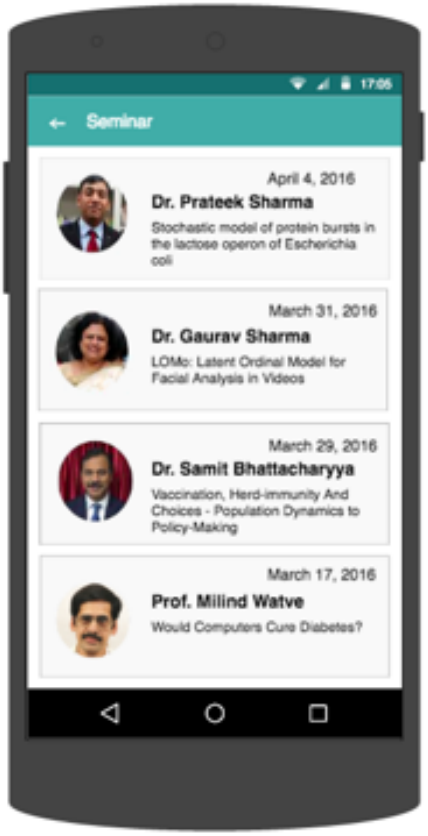
We prepared a few prototypes on paper, and did our first iteration of User Testing with some of the students from IIIT Delhi. We received valuable inputs on how to make the interface look better and more User friendly. This was followed by creating actual prototypes, along with animation and color scheme to simulate how the actual App would look like. After conducting our second iteration with the users, we started reading about Material Design Principles of Android Programming to gain knowledge on various designs and layouts that can be implemented.

[Below are the Screenshots of the proposed App : Prototypes from Iteration 2]

1. Login Screen

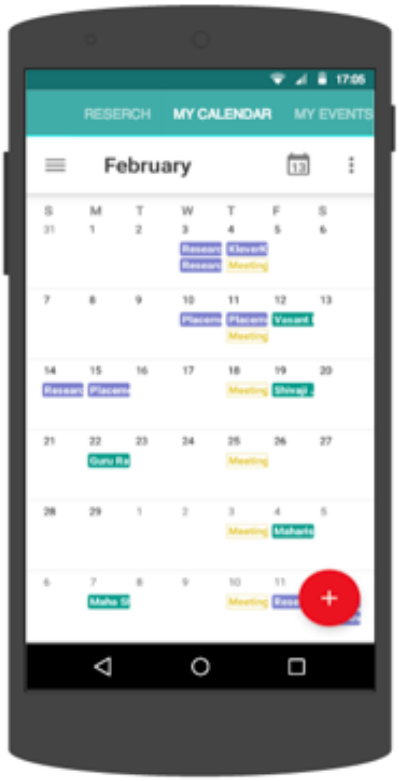
2. Welcome Screen

3. Seminars

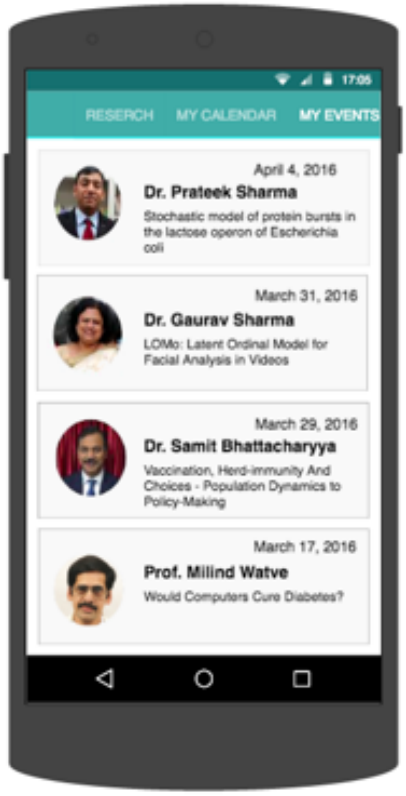


4. Seminar Details

5. My Calendar



6. My Events

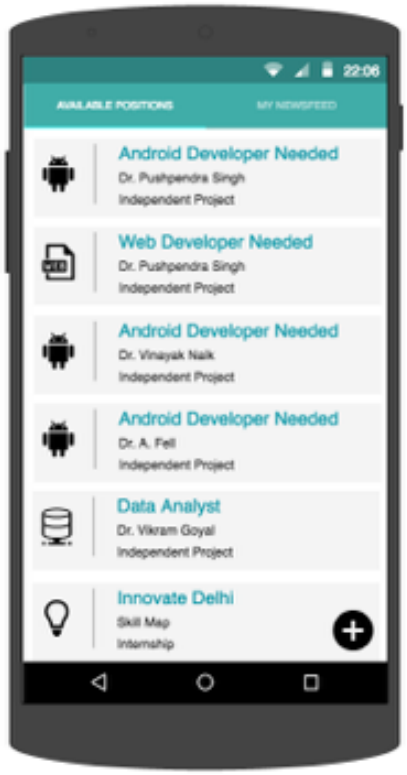


7. Research News

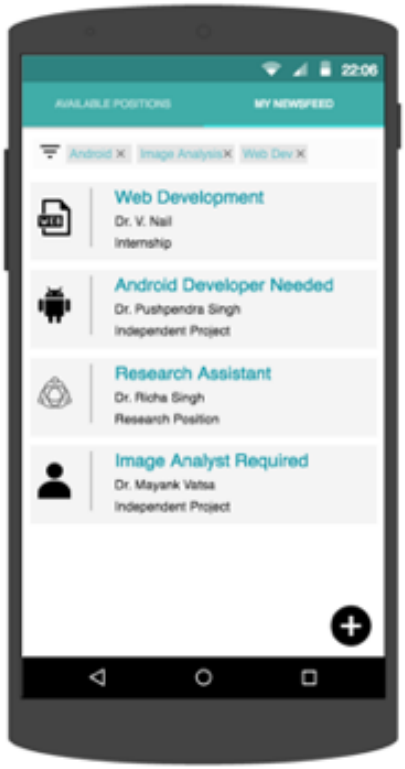
8. Research News Details

9. Modified Welcome

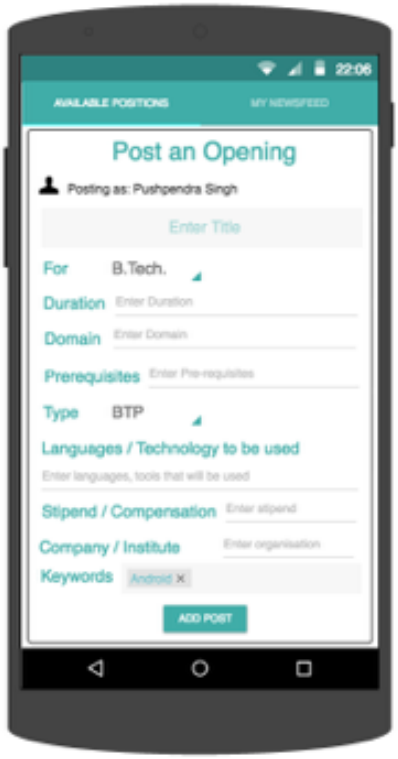
10. Research Openings



11. My Newsfeed



12. Post a Job Opening



Chapter 7

Implementation

1. ***LogIn Screen:*** We have used Google Authentication to validate Gmail IDs and used an additional check for authorizing only those people who have a IIIT Delhi account (Domain name **@iiitd.ac.in**).

2. ***Welcome Screen:*** We've used RecyclerView to specify various Research sections which when clicked, open a new activity. Also, there is a Sign Out option located on top right (Action Bar).

3. ***Seminars:*** This screen uses JSoup Library to fetch the list of Seminars and details about them from the Institute's website https://www.iiitd.ac.in/research/seminar. The data is fetched in real time and displayed using RecyclerView and CardView Layouts. All these cards have two possible functionalities: Add the Seminar to your Calendar if you're interested in attending it; click on the card to view various details about the Seminar you're interested in.

4. ***Seminar Details:*** The various cards in the Seminars tab can be pressed to open another card to display various details about the Seminar like Title of the Seminar, Speaker, About the Speaker, Abstract of the Seminar, Date, Time and Venue.

5. ***Calendar:*** On the Seminar page, there is a float button which allows the user to add that particular seminar event into their Google Calendar directly. The details are filled by default, and the User gets an option of modifying the Event details before saving the changes.

6. ***My Events:*** This page consists of a list of Seminars that the User was interested in, i.e. the Seminars added to the Google Calendar. This is a custom list and specific events can be deleted on choice.

7. ***Research News:*** This tab displays the latest accomplishments of people from IIIT Delhi in the Research Field. It will be like a Newsfeed featuring various papers that have been accepted at conferences, various Grants that have been awarded, posters that have been presented etc.

8. ***Research News Details:*** This page will open once any Research News Card is clicked. It displays detailed information about that particular Research News.

9. ***Modified Welcome Screen:*** After getting the suggestion of adding events to the Google Calendar instead of embedding another Calendar into the app, we were left with two basic tabs (fragments) on the Main Research Screen.

10. ***Research Openings:*** This page will display all the latest Job Openings posted by people. The posts will be displayed based on the timestamp.

11. ***My Newsfeed:*** Users can select their preferred domain, instructors they would like to work with, project type, and languages they are proficient in. This can be done using the given filters. The users will then receive a list of all such positions available.

12. ***Post a Job Opening****:* On clicking the PLUS floating button, a form will open up where the user can enter various details about the BTP/IP/Research/IS/UR/Internship etc opportunity at the Institute.

13. ***Events****:* On this page, the users can view the various posters have have been uploaded by other people. This would include posters of events and seminars taking place in and outside the institute. Along with the poster, a short description of event and the username of the person who has uploaded it will also be displayed. The picture can be zoomed as well.

14. ***Add new posters (floating button)****:* On clicking the PLUS floating button, an option of capturing an image will be provided, where User can click a picture using the camera and write a short description about the said event. The User can then upload it and can view it on the 'Events' page.

15. ***Directory****:* This contains details of the Faculty and Administrative Staff along with all relevant and emergency contacts. The aim was to have an easy access to the email ids, room number, landline numbers and extensions of professors and staff. The App includes a direct Call and Mail feature button, which can be clicked to directly call or mail the respective faculty member.

16. ***Search Directory****:* The search bar on top searches the whole IIITD Directory and returns profiles based on the keywords entered. As the user keeps on typing letters, suggestions change based on the new information. The database can be searched on the basis of Names, Designation, Phone Number, Room Number, and Email Id.

17. ***Events Tab****:* A new tab was added in the home screen. Option to view all the attended and added seminars, as well as the option to view the posters of upcoming events are available in these fragments. Floating button was added in this tab. Options to Schedule a Meeting, Add a Seminar and Upload Posters of events were added to the floating menu.

Chapter 8

Validation

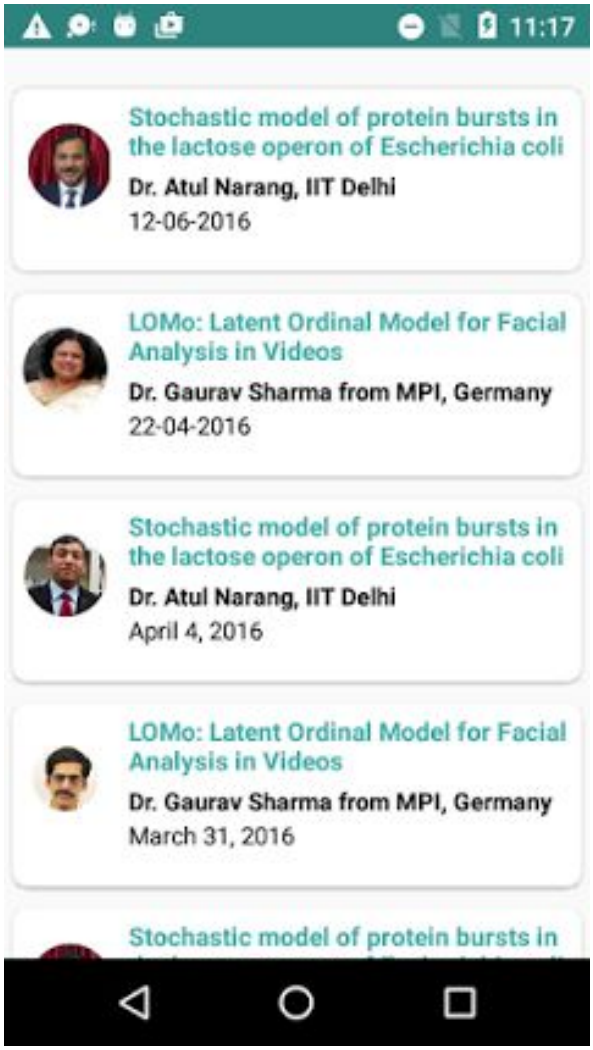
Following are the Screenshots of the App that we've developed so far based on the Prototypes proposed and Feedback received.

1) Welcome Page

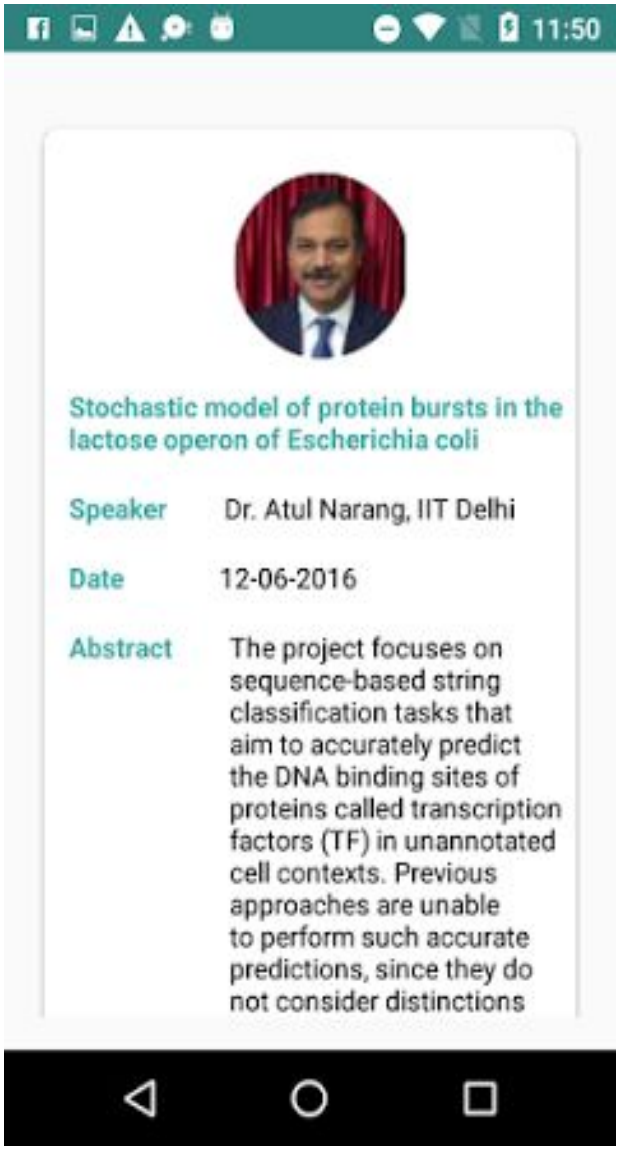
2) Research News Page

3) Sign Out Button

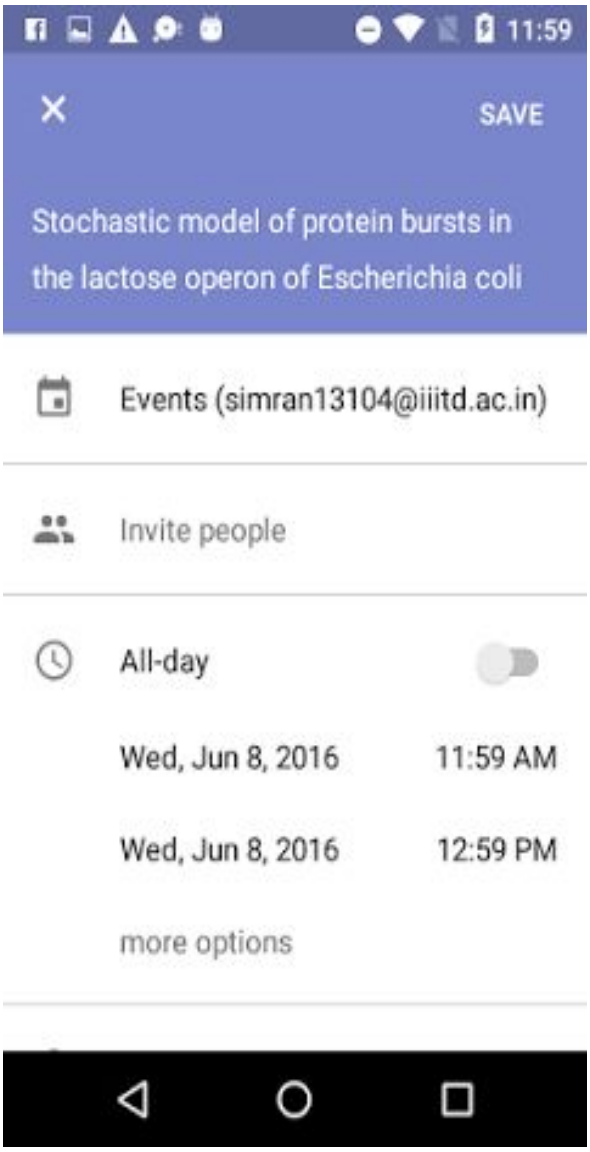
4) Seminars



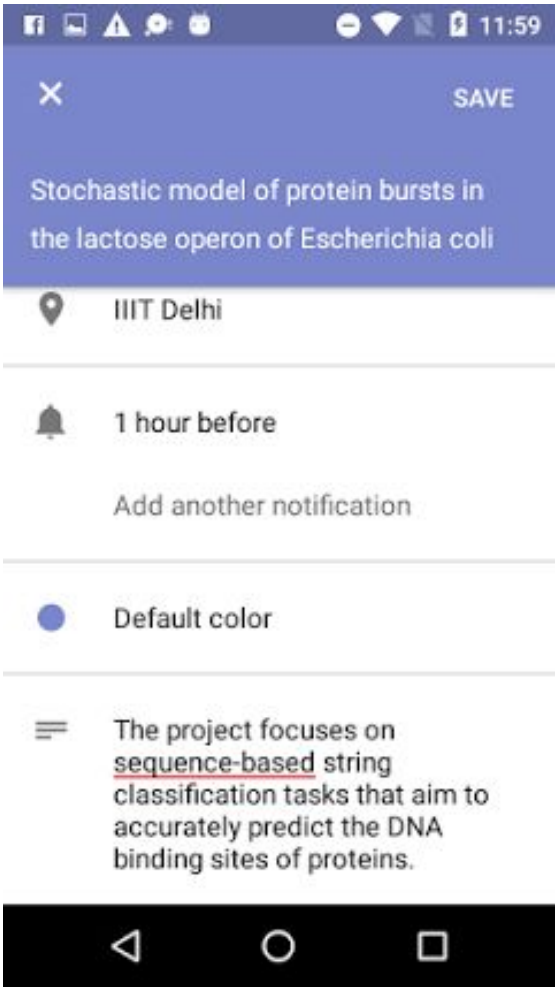
5) View Seminar Details



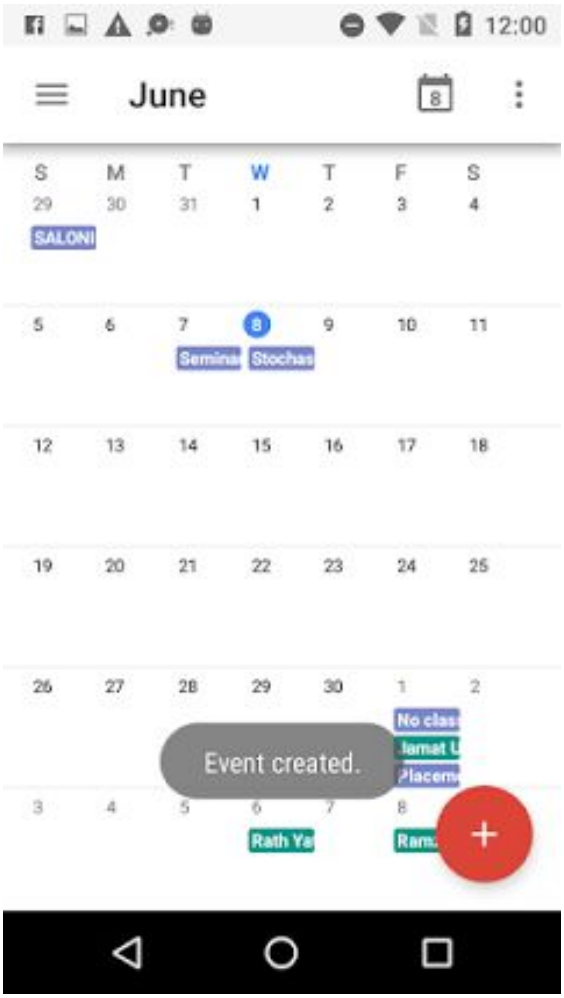
6) Add Seminar to Calendar I



7) Add Seminar to Calendar II



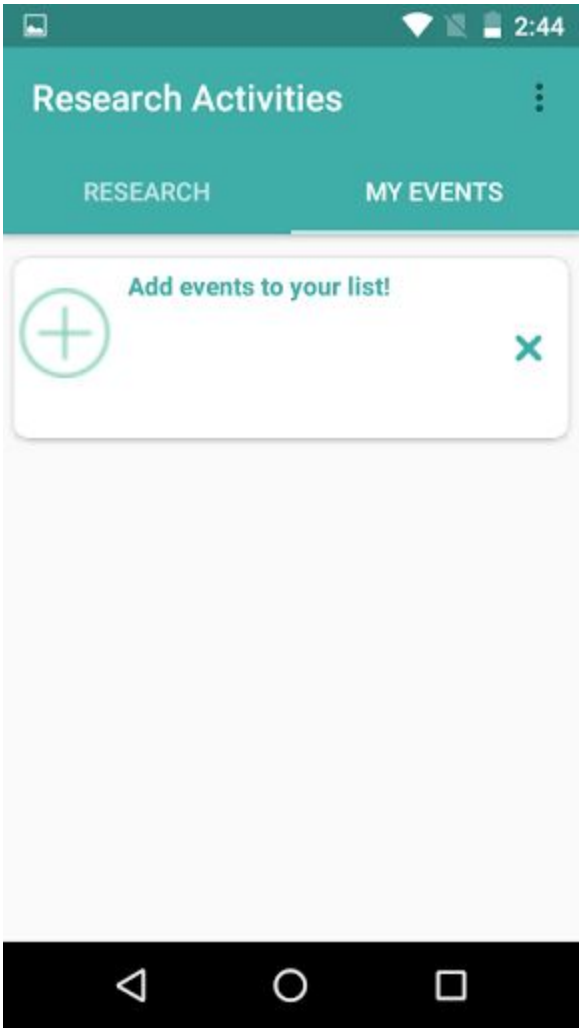
8) Seminar Event added to the Calendar



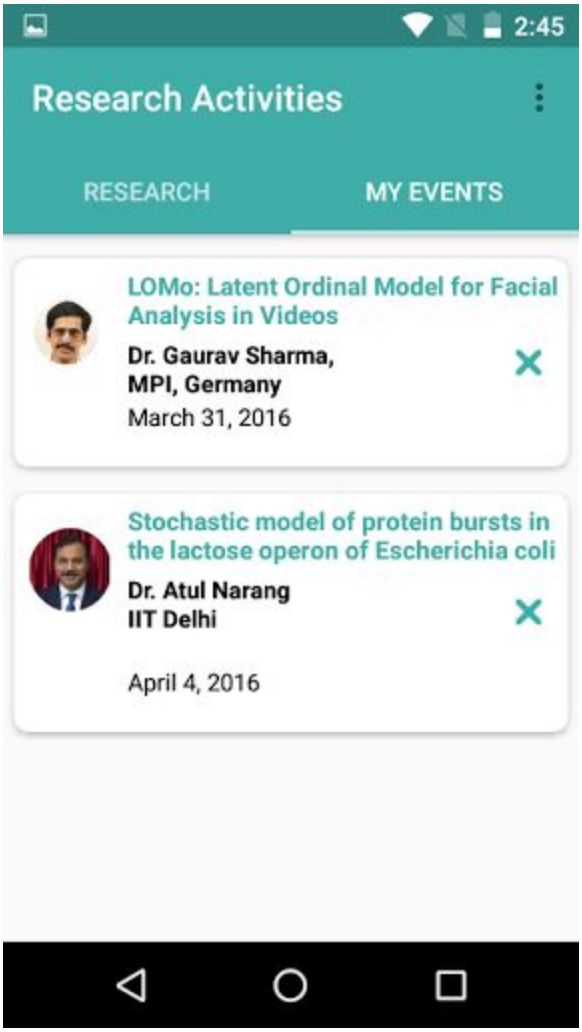
9) Calendar Notification of the SeminarI

10) Map to guide to the Seminar Location

11) My Events tab

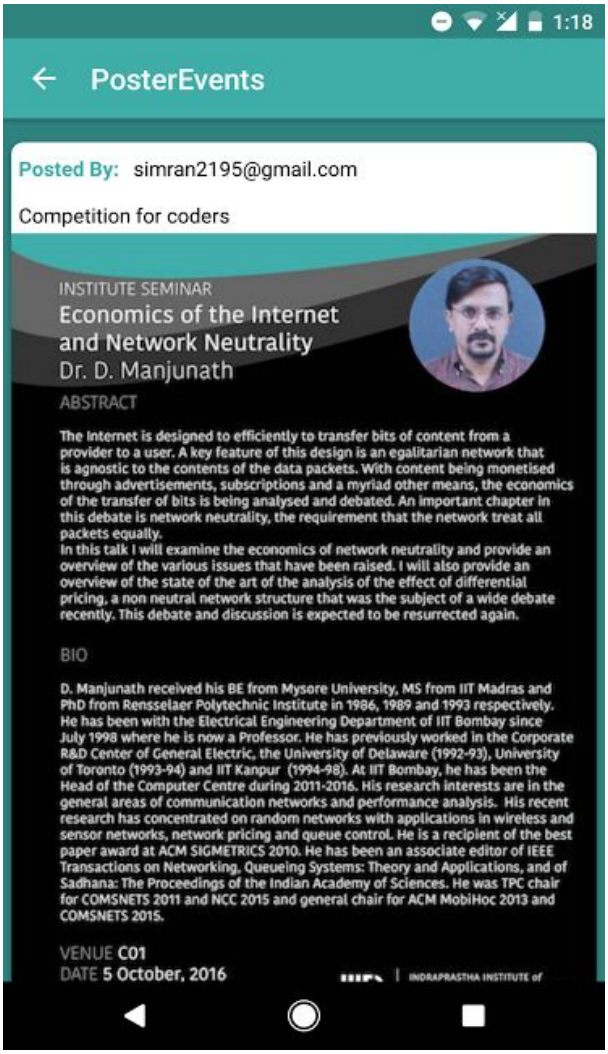


12) My Events tab II

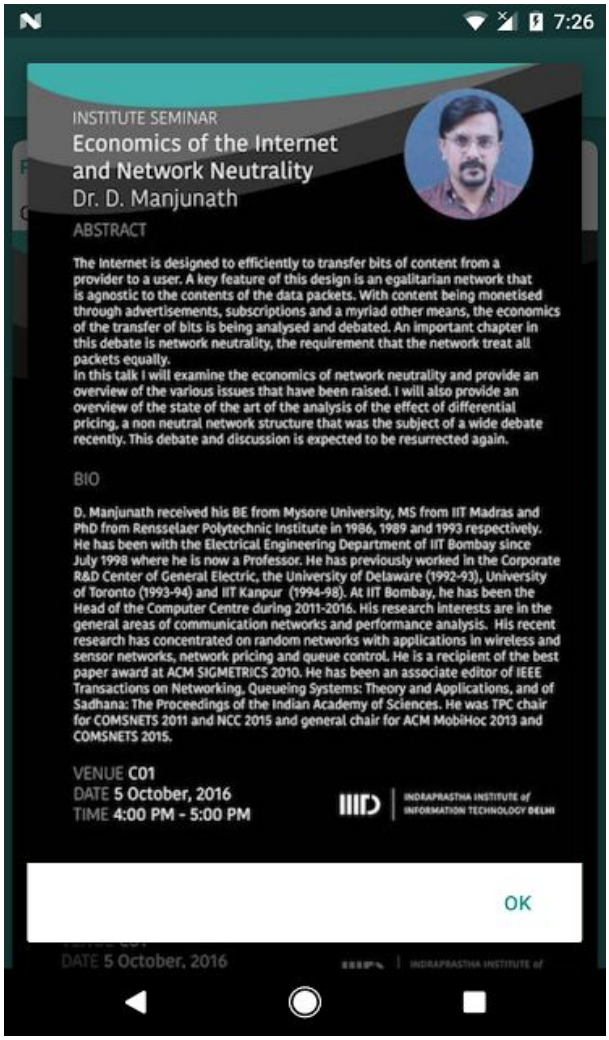


13) MyEvents Tab

14) Poster Events (MyEvents)

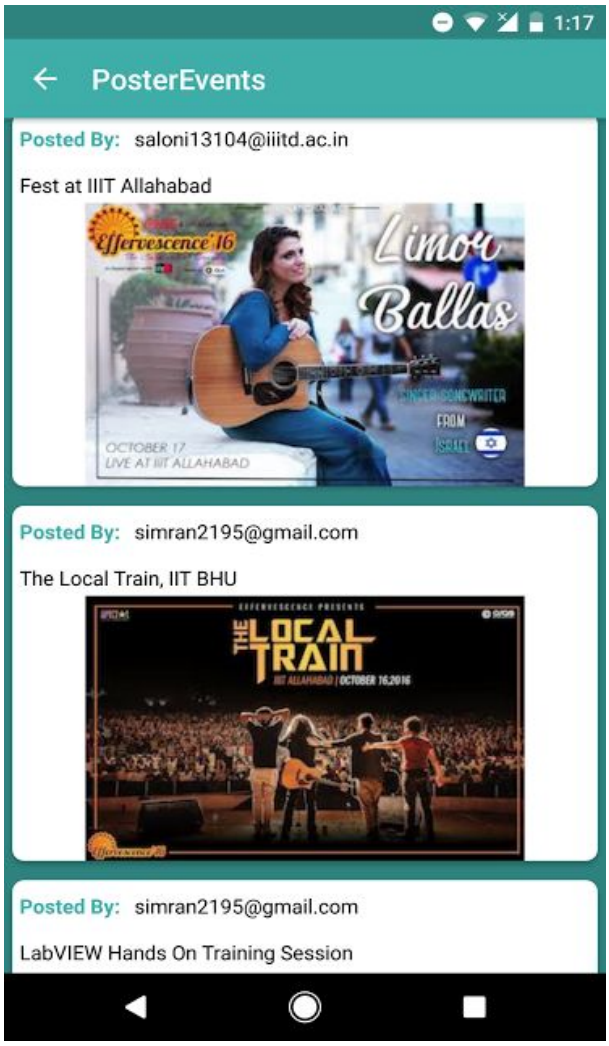


15) View Posters

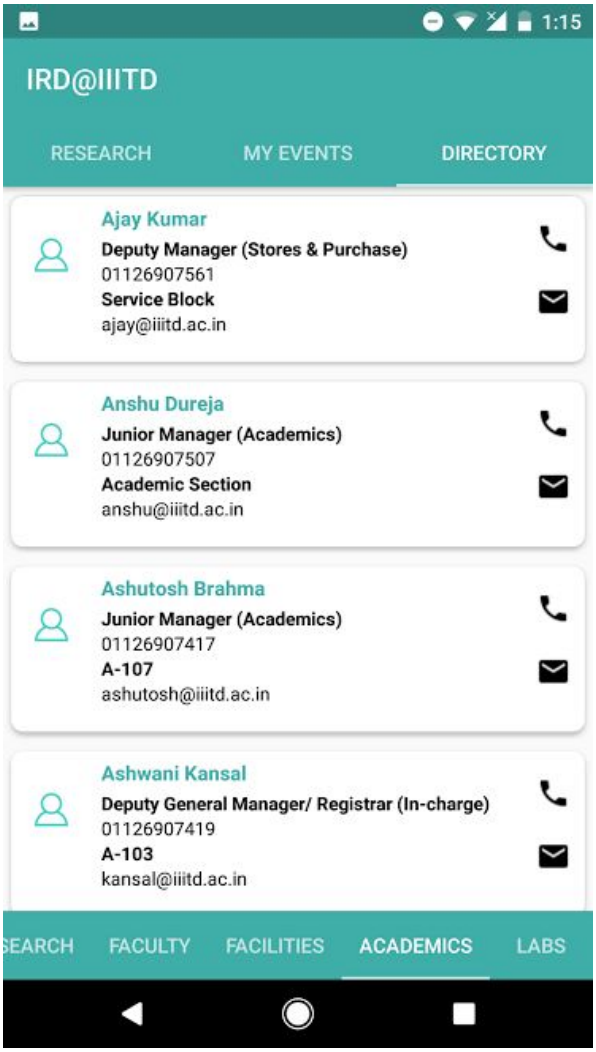


16) Zoomed View of the Poster

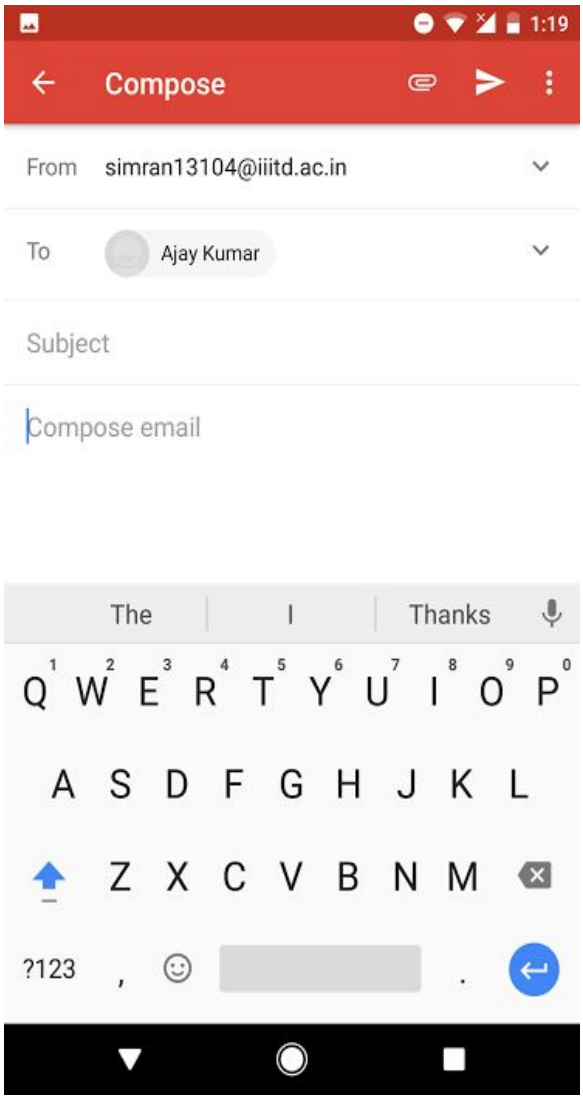
17) Newsfeed with Posters



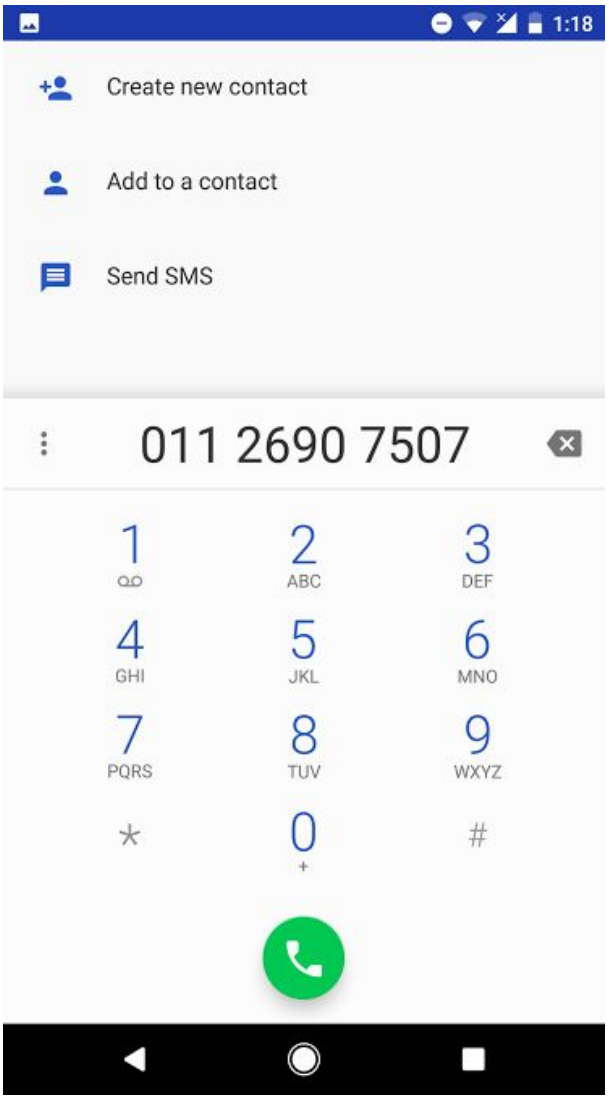
18) Directory



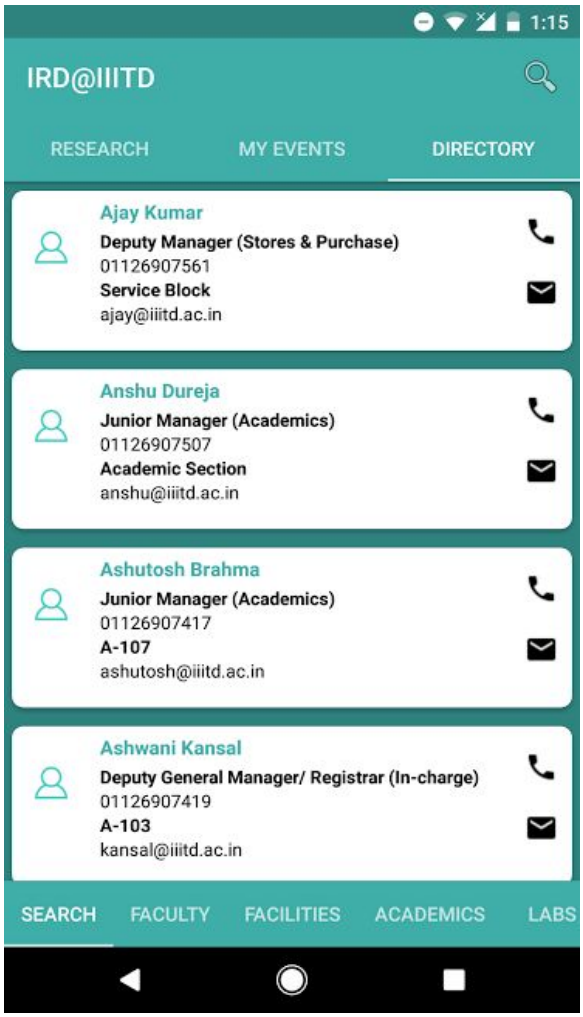
19) Send Email to Contact in one click



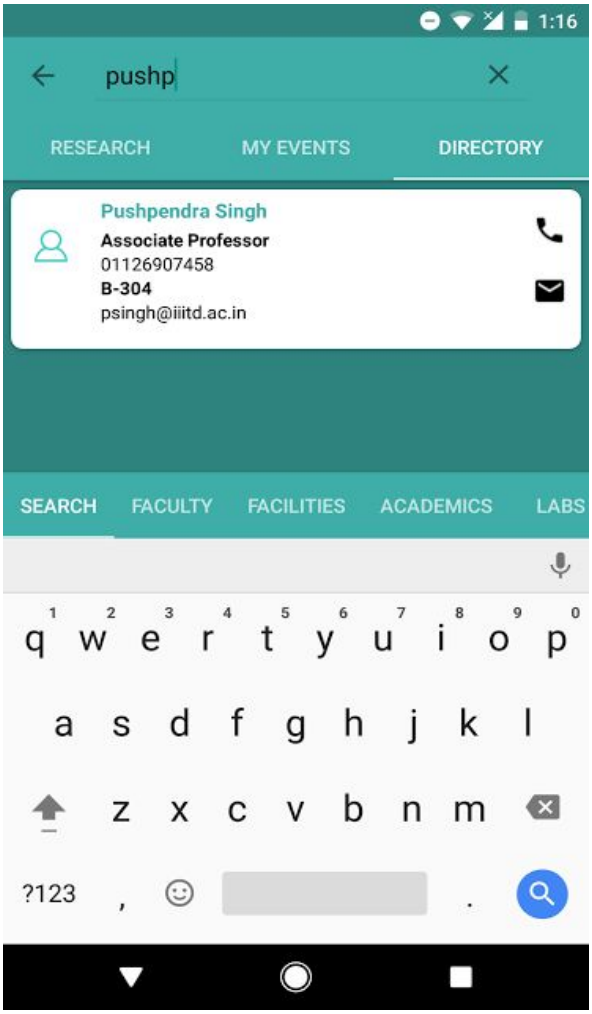
20) Call Contact in one click



21) Page to Search the Directory

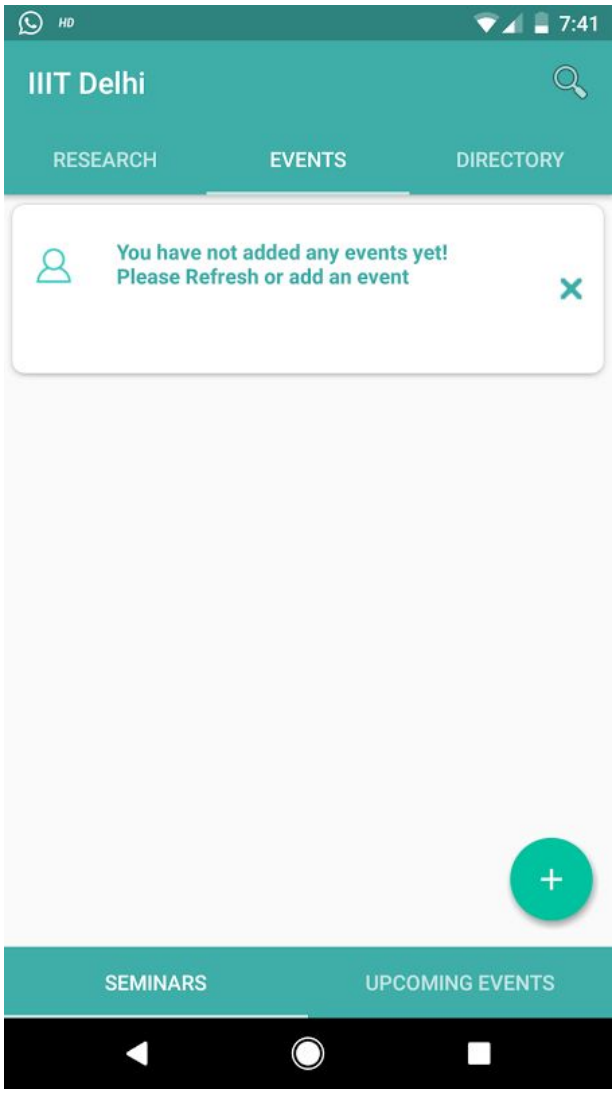


22) Search Result

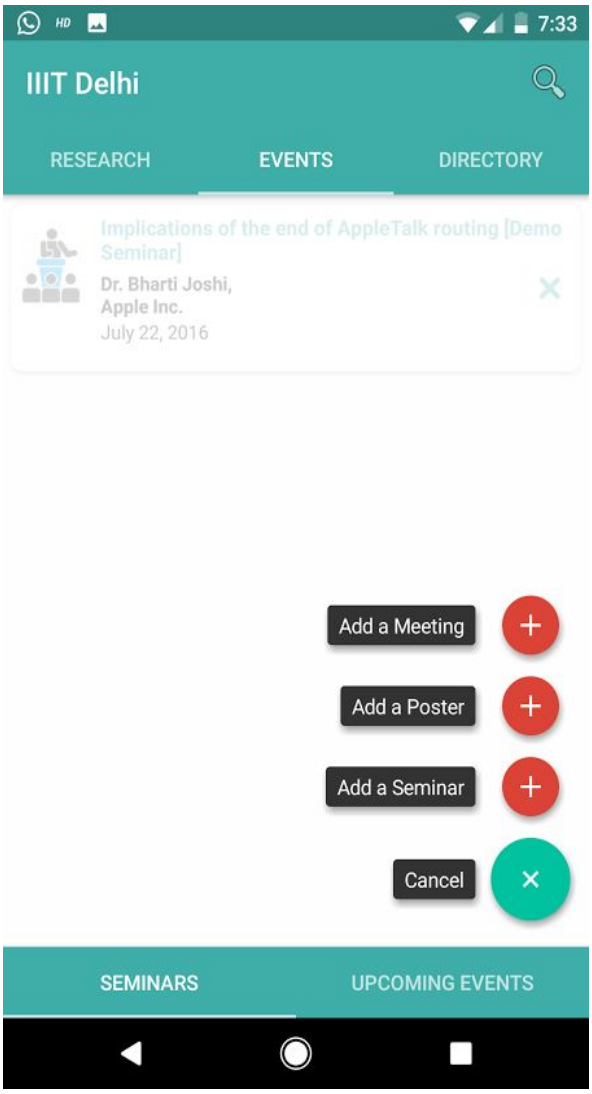


UI Changes after VIth Iteration

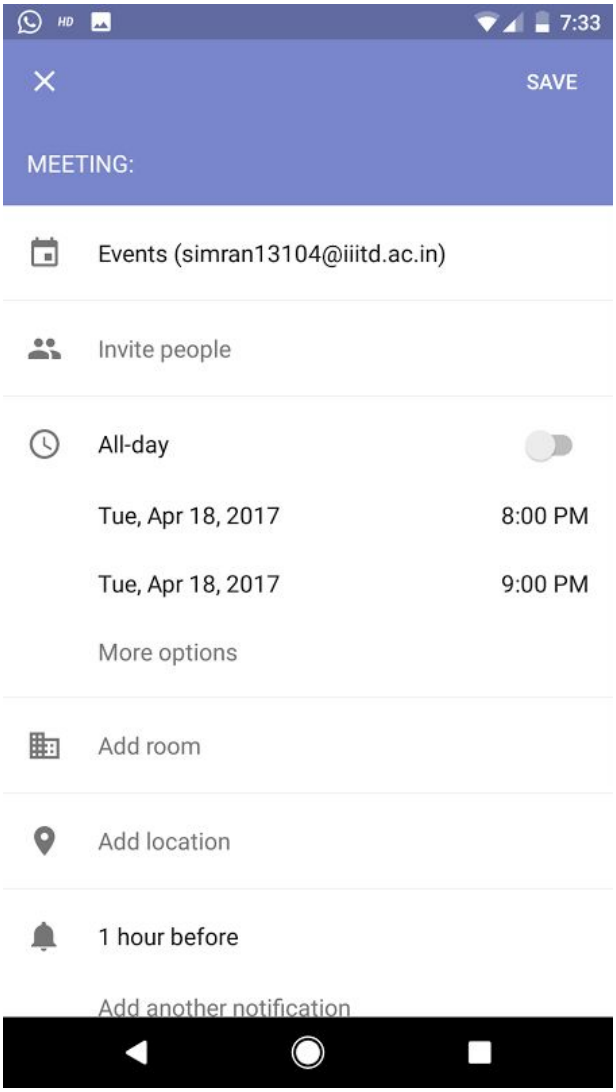
> New Events Tab added to the Home Screen



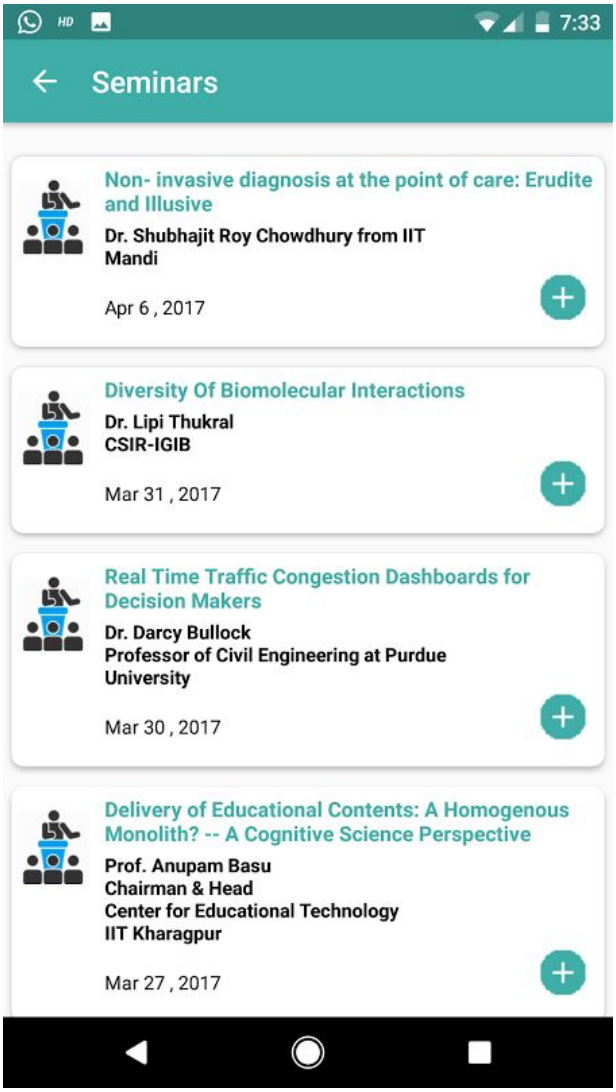
> Floating Button to access Floating Menu



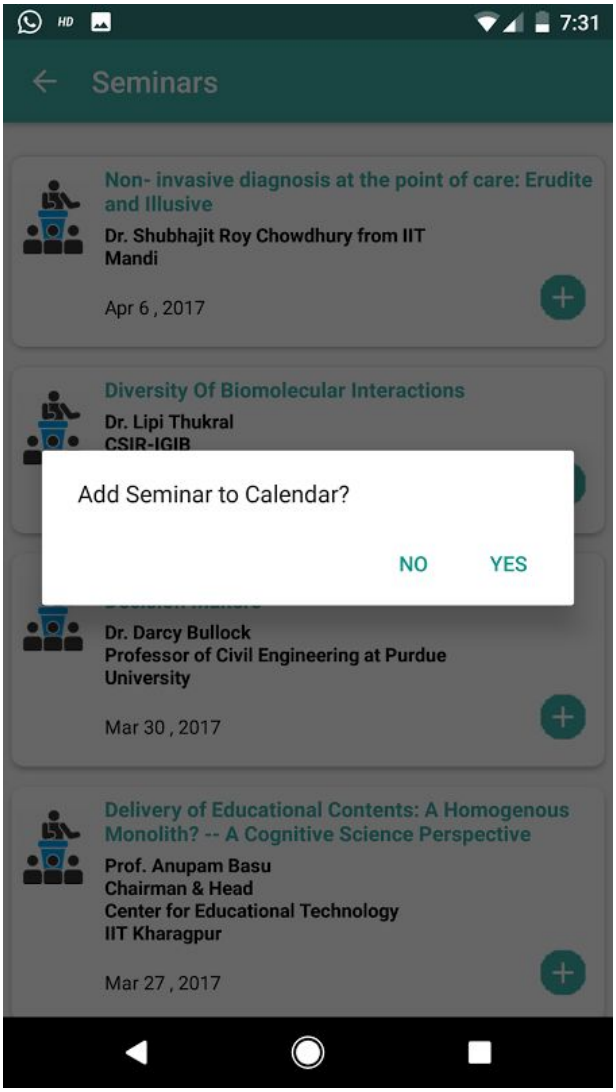
> Option to schedule a meeting



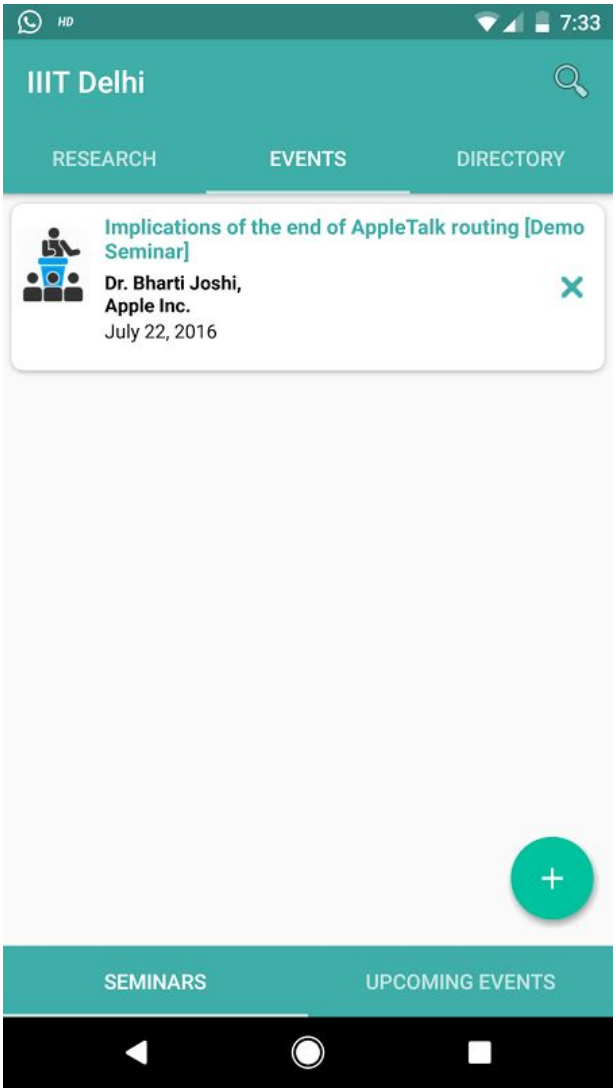
> Option to add a Seminar from floating menu



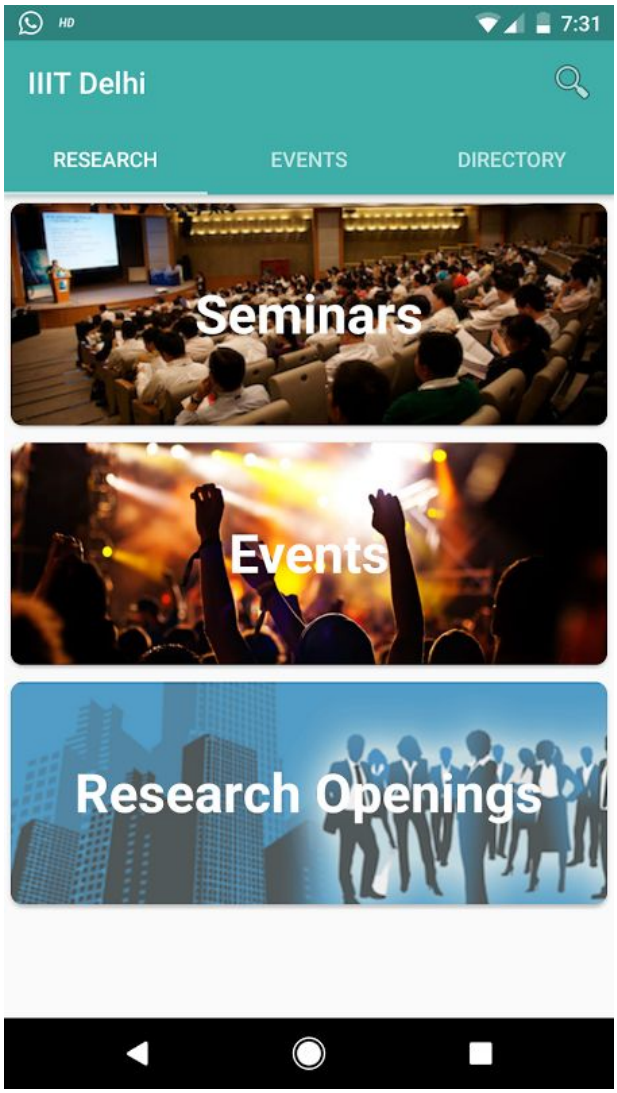
> Add a Seminar from the menu



> The added seminar in the Events tab



> Home Screen with the new Events Tab



> Upcoming Events in the Events Tab

Chapter 9

User Feedback

Some of the suggestions that we got from the Users are as follows:

1. **Iteration I: Paper Prototype**
    a. The theme of the App should have similar colors as that of the IIITD logo (Pantone 7473 C)
    b. Don't include too much text as it becomes monotonous
    c. Include pictures wherever possible

2. **Iteration II: Prototype of Screens [1 to 8]**
    a. Instead of embedding a separate Calendar into the app, there should be an option of adding the Seminars directly to the Google Calendar.
    b. The Research News page on the Website consists of too much text. Should look different on the app.

3. **Iteration III: Prototype of Screens [9 to 12]**
    a. Students must also be allowed to post Internship openings.
    b. A filter should be provided in the Research Openings' section, to get a list of activities lying under the specified domain.
    c. There must also be an option of getting updates/notifications when there is a new project listed by the selected Professor.

4. **Iteration IV: Application**
    a. Add feature to notify when a new Seminar is added
    b. Add feature to invite friends to Seminars while adding to Calendar

5. **Iteration V: Application**
    a. Personalized Notifications for projects based on filters
    b. Have images of people in directory
    c. Invite friends for a particular poster event
    d. Make an event of seminars and keep a track of attendees
    e. OCR to extract details from posters
    f. Sort posters according to Date
    g. Have a time stamp on posters

Chapter 10

Future Aspects

1. The Users would have an option of receiving updates via Notification services
2. An option of inviting friends for specific Seminars would be provided
3. Personalized notifications based on filters chosen for project openings
4. Add feature to keep a track of number of people who would be attending the seminars
5. Make a user profile for all the users who sign in. This would keep a track of the events that the user is interested in, seminars the user has attended and other user related data such as filter choices and preferences. Some of the data may be visible only to the user for maintaining privacy. This would help in improving the overall experience of the user while using the app.
6. Profile based access rights: The users can be subdivided into 3 categories - Faculty, students and phD students. Depending on their category, users will be given the right to add projects (faculty), or add club meeting (club coordinators - students).

Chapter 11

User Manual

The App follows a basic flow. It starts with the user Signing In, followed by an option of choosing various Research Activity Categories for the User's Viewing. The app consists of Float buttons on pages for adding things, and usual click-to-view service.

The general flow of the App can be seen in the following videos:

[1] https://drive.google.com/open?id=0B11CcnfAGbdUelI3a1dWb0labUE
[2] https://drive.google.com/open?id=0B11CcnfAGbdUVVZkaHAyT2N1ODQ
[3] https://drive.google.com/open?id=0B11CcnfAGbdUektySlV5UjQ2VGM

Chapter 12

Bibliography

[1] https://jsoup.org/
[2] https://developer.android.com/guide/index.html
[3] https://www.google.com/design/spec/material-design/introduction.html
[4] https://www.google.com/design/spec/resources/layout-templates.html
[5] http://desicoding.blogspot.in/2011/03/how-to-parse-html-in-java-jsoup.html
[6] https://blog.xamarin.com/android-tips-hello-appcompatactivity-goodbye-actionbaractivity/
[7] https://design.google.com/resources/?gclid=CMyoz7LL1swCFYKYvAodTmYBpw
[8] http://www.androidwarriors.com/2015/11/android-recyclerview-example.html
[9] https://developer.android.com/training/basics/intents/sending.html
[10] http://android-color-generator.com/
[11] http://antonioleiva.com/layout-animations-on-recyclerview/
[12] http://www.grokkingandroid.com/androids-calendarcontract-provider/
[13] http://www.w3schools.com/colors/colors_picker.asp
[14] https://guides.codepath.com/android/Implementing-Pull-to-Refresh-Guide#troubleshooting
[15] https://firebase.google.com/docs/auth/android/google-signin
[16] https://firebase.google.com/docs/
[17]https://guides.codepath.com/android/Implementing-Pull-to-Refresh-Guide#recyclerview-with-swiperefreshlayout