



Bilkent University

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Department of Computer Engineering

# Senior Design Project

## Quex

## Final Report

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## 1. Abstract

The problem of finding an expert has always been a problem that several communities tried come up with a solution. However, in order to validate expertise such platforms could not stay generic. Q&A sites like Stackoverflow are successful because they are as specific as they can get than validation is not as necessary as before. Our approach to this problem is different, to provide experts in broad and generic matters we have a base point of validation by background and in time users of our program will cross validate each other. The purpose of the program is to provide experts in a social and mobile platform while using locality.

## 2. Introduction

Everyday people face with daily challenges as routine of their lives. Handling the challenges takes some effort and time. These challenges become easier with the development of the internet. People started to ask these challenges to experts in forums or websites. To catch up with rapid changes in the world these solutions become slower. So, we wanted to change this approach to the problems with social media approach where everything happens instantly.

Since the problems occur instantly, we aimed to solve these situations with the same manner with a smartphone application where people can help each other and get help from the others in variety of categories via chatting each other. Any pop-up question or serious technical problems can be asked to the experts directly via chat, instead of waiting to somebody see your topic and desires to help, like in forums.

Quex uses principles of both forum and social media. The major functionality of the Quex is, it allows person to person communication between the questioner and the expert. That creates great communication environment for the problem solving. If that does not solve problem, the problem sends to dashboard and becomes community topic where everyone can share their opinions and solutions with comments.

Quex matches the questioner and the expert based on location. This provides if the problem solution much easier; for instance, two students in the same campus can help each other much efficiently.

This report is general overview of the Quex with its all features and the technologies. The architectural design, used tools and technologies, written algorithms, progress and challenges during the development process are all discussed in this final version application report.

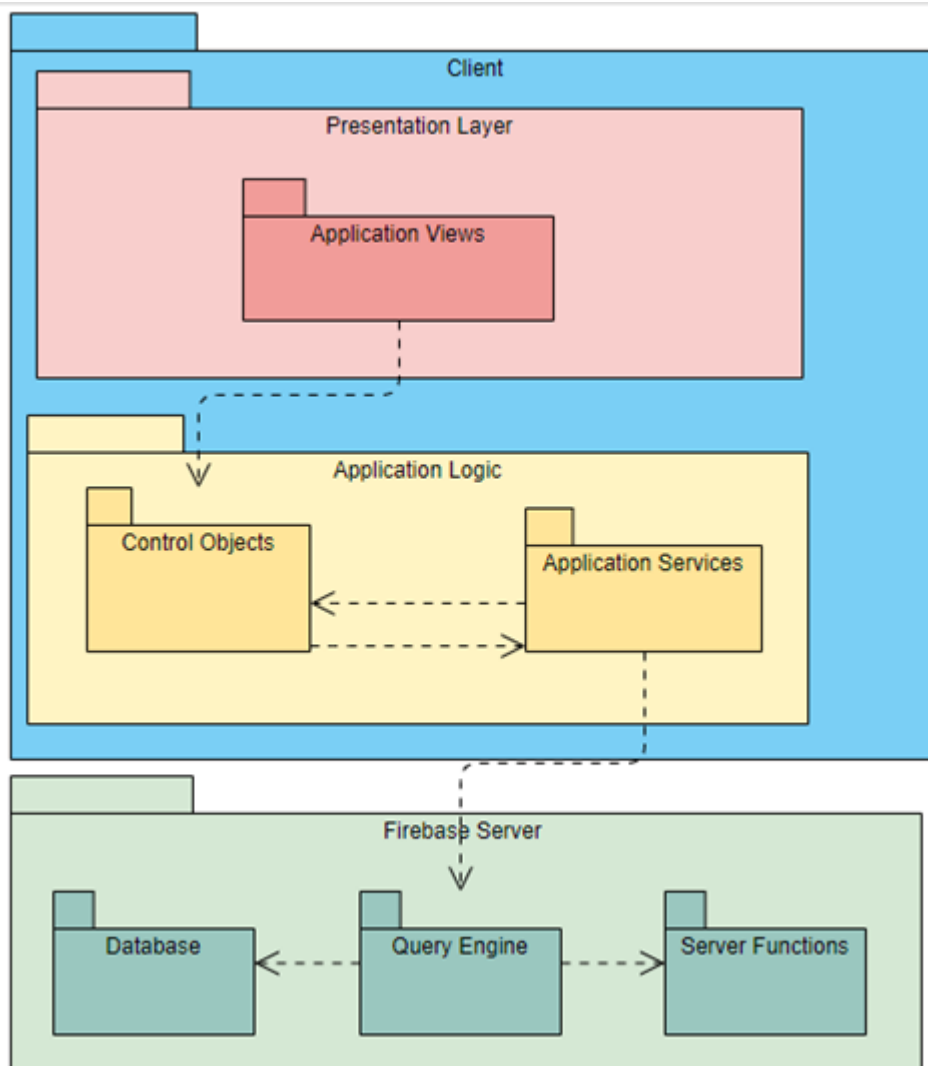
### 3. Final Architecture and Design of the System

#### 3.1. Overview

In the subsystem decomposition section, the subsystem decomposition of Quex is shown in a detailed manner with diagrams of layers and included subsystems, and then final hardware/software mapping is provided in the successor section.

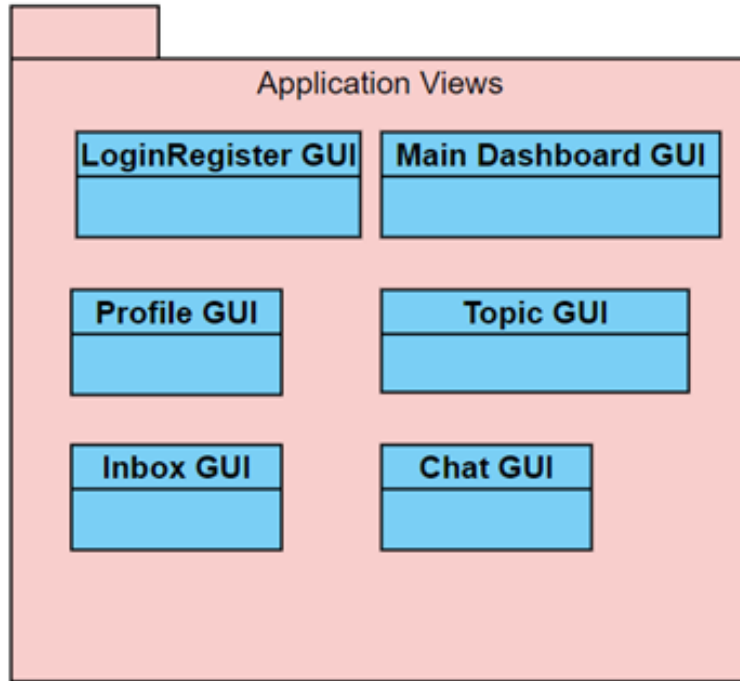
The system employs a Client/Server architectural style with 3-layered structure which 2 of them(Presentation and Application Logic) resides in Client part and the Data layer resides in Server side. Application Logic is divided into 2 subpackages as Controller Objects and Application Services. Application Services are the classes that connects to Firebase server and request, retrieve and send data. In the Firebase server, Server Functions subsystem consists of the codes run when triggered by specified database actions.

#### 3.2. Final Subsystem Design

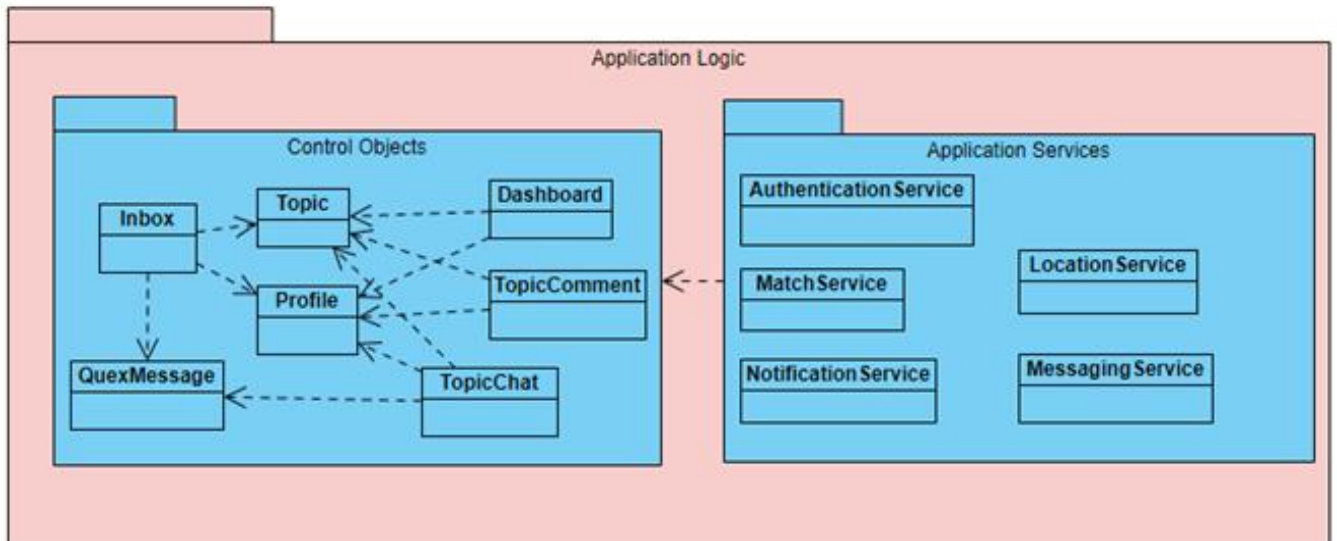


3.2.1. Client

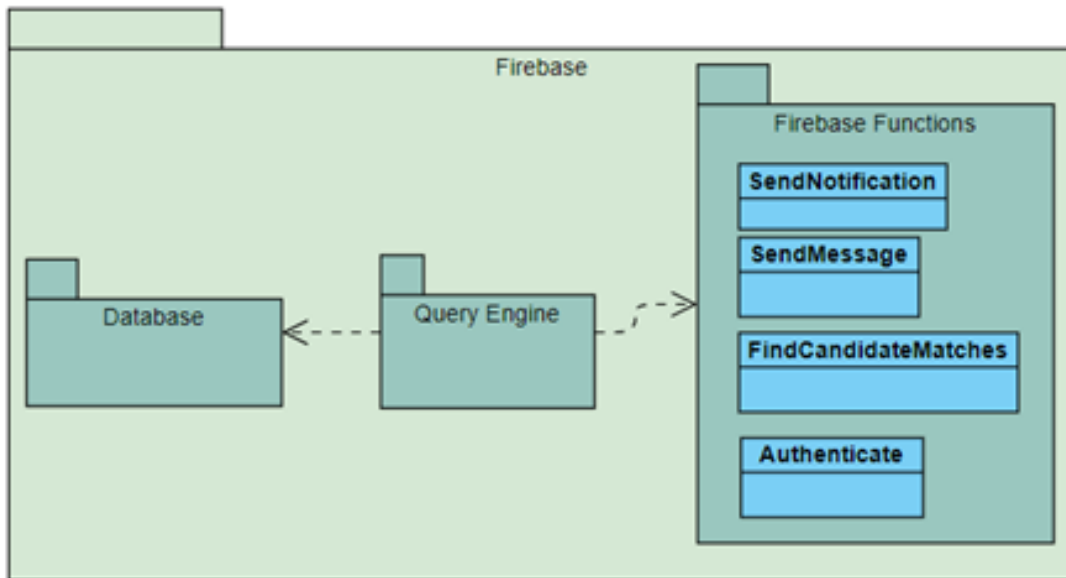
3.2.1.1. Application View



3.2.1.2. Application Logic

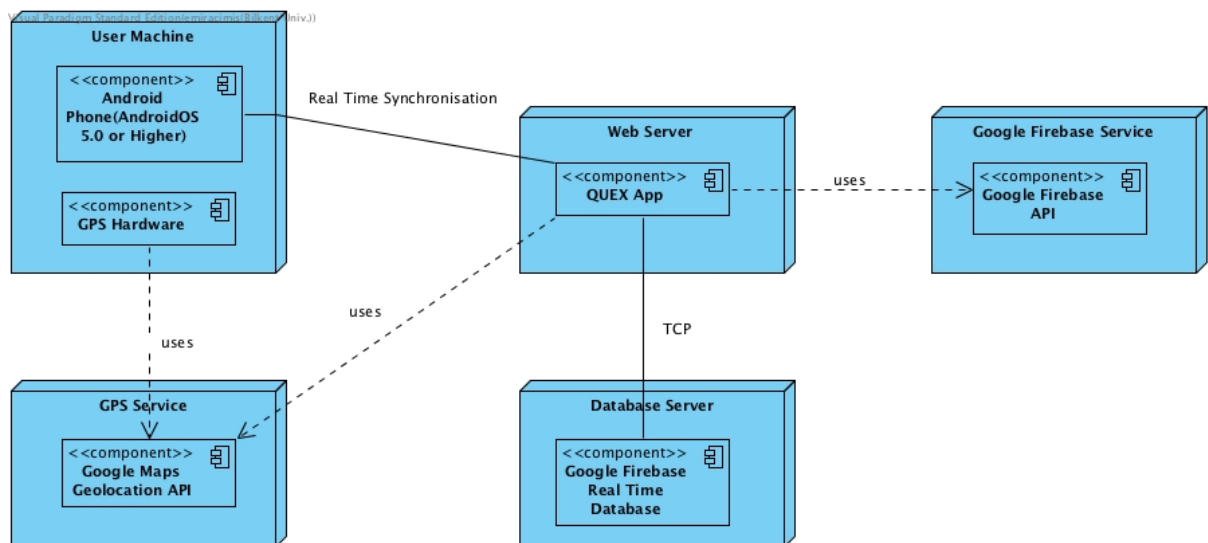


### 3.2.2. Server



### 3.3. Final Hardware/Software Design

Quex's presentation and logic tiers are mapped to the Android device. Subsystems in the logic tier provide the interface on connecting, manipulating and retrieving data. The application synchronizes with the server when there is new data and therefore it requires internet connection and the GPS component of the Android phone. The web server of Quex App also resides in Firebase for easy, fast and efficient synchronizations and runs.



## 4. Impact of Engineering Solutions Developed in the Project

### 4.1. Global Impacts

Social media application have the widest user base in the world. The only way to achieve the widest user base thus the largest global impact is to imitate the platform which the most widely used applications provide. Thus our application is natively developed for Android which is the major mobile operating system.

The application aims to appeal to the user base of Q&A platform like Quora and enlarge it with the accessibility of a mobile platform. The vision behind Quex will bring expect finding to a social, mobile and a local platform. Using users immediate vicinity allows us to provide answers to questions which are related to the local area. Therefore Quex will have a global impact provided by both locatilty and accessibility.

### 4.2. Economic Impacts

Quex is not planned to have an economic impact until its successfully launched and gained a user base of its own. Our first goal is to provide quick, expert help to our users. Any attempt to collect any earnings from this application is out of the question until the data shows that the app succeed which means that people are able to access our platform and get the help they need either in a global or locale scale. Only after that we could look for making our application more widely spread across the world, at this point Quex can have advertisements displayed within it in order to keep its wheels turning however other than the above point mentioned there will not be any attempts of making a profit through this platform.

### 4.3. Societal Impacts

Quex is a social media application after all. This claim requires some standards in our part. A social media application should allow people to socialise within itself. The most convenient way to provide users with this aspect is to implement chat functionality. However a simple chat implementation would not have any impact and Quex would not have a societal impact if the functionality was limited with that. In Quex chatting is not meant to be for fun, chatting has a context which means that somebody has a problem that need to be figured out. People will socialise in our platform in order to solve a problem. The socialisation aspect will be bigger because it will have a purpose.

### 4.4. Environmental Issues

Quex is designed to have a generic design which means that the users of our application will not be domain specific people like the user base of platform like StackOverFlow. Although we did not see foresee any environmental impact or issues, there are no constraints to our users purposes. Therefore any environment related usage of our application is up to our users.

## 5. Contemporary Issues Related with the Area of the Project

### **Security:**

Security is a big contemporary problem for any application. Recently application security gained momentum regarding importance with latest security leaks. At this point in time security is a too critical matter to ignore but it is also mission critical and complicated therefore developing a security protocol is out of the question for a five man development team. Because of this we provided security to our application from platform that has been already provided a satisfying degree of security. We are using firebase authentication services in order to guarantee that our application can only be used by authenticated users.

We are also using a cloud based data storage solution which google firebase also provides. Every bit of information the app needs to store is stored in the cloud. This means that there is no critical data that can be accessed from users phone.

### **Accuracy of user location:**

There are two ways to access user location. One is from the Gps provider and the other is from the network provider. Accuracy of Gps location is determined by the gps hardware located on the user device and the satellite connection, there are failure points regarding these aspect that our development team can not possibly do anything about to increase their correctness at any given time. However we are handling possible problems by switching between providers when we see necessary and if we can not get a user location anyway the application uses the most recent one we have available. The accessibility and accuracy of user location is a contemporary software issue for all of the apps which are concerned with locatilty. We are trying our best for possible inconveniences to not take anything away from the user experience we provide. Therefore it is possible to utilise Quex both with or without a proper user location.

## 6. Resources Used

### 6.1. Library Sources

- ❖ Android JDK & SDK
- ❖ Google Firebase Libraries (com.google.firebase:firebase)
- ❖ Google Play Services (com.google.android.gms:play-services)
- ❖ Droids on Roids (pl.droidsonroidad.gif)
- ❖ Glide Bumptech (com.github.bumptech.glide)
- ❖ Hdodenhof

### 6.2. Web Sources

- ❖ <https://stackoverflow.com>
- ❖ <https://developer.android.com>



❖ <https://material.io/guidelines>

## 7. New Tools and Technologies

**Android Studio:** Android Studio is an integrated development environment (IDE) from Google that provides developers with tools needed to build applications for the Android OS platform [1]. It is free to use and it gives developers flexibility and useful functionalities when it comes to UI development. It provides a fast emulator to deploy and run/test the application and also it has extensive test tools in itself so that it is an advanced tool which meets most of our needs for mobile application development.

Since we are familiar with java and Android Development is widely used, we prefer Android Studio to improve our skills and knowledge about this thriving tool and finally develop a completed android application.

**Java:** Java is a widely used computer programming language. It is a high level language and can be read and written easily by developers and others [2]. Android mainly supports Java and we used it when we were developing QUEx.

Due to the fact that we all have knowledge about Java language since we have practise on it in our previously taken classes, we decided and used Java with Android Studio.

**Firestore:** Firestore is a Backend-as-a-Service that started as a YC11 Startup and grew up into a next generation app-development platform on Google Cloud Platform. Firestore is a server, an API and a datastore, all written so generically that you can modify it to suit most needs [3].

It provides a real-time database with a WebSocket connection which is far better in terms of connection speed. All of the data synchronize with Firestore quickly.

E-mail / password authentication and Google, Facebook and Twitter authentications are included in Firestore and they can easily implemented into the application.

With use of Google Cloud Service, Firestore comes up with a reliable file storage system. File hosting is also included in the features of Firestore.

**Git:** Git is a code hosting platform for version control and collaboration. It lets you and others work together on projects from anywhere [4].

It is a free tool and let us work in a collaborative way. Different branches can be created to develop different parts of the code in a parallel way. It is the most preferred version control system since it provides a better file integrity and immediately store changes in branches. It also provides backup and security features to secure our work in an online environment.

**Adobe Photoshop CC:** As one of the best editing, design and art tool, it is inevitable to do not use Adobe Photoshop when developing an application. Every application needs logos and pictures to have a good-looking visuality. Pictures from the internet generally do not fit with our expectations in terms of size and shape so we need a tool to handle these problems.

When we started to create a template for our user interface (UI), we used Adobe Photoshop to design our predefined page templates. After we done with the design, we implemented our design into Android Studio.

## **8. Similar Products**

There are similar products with QUEX in terms of different parts of applications like matching system and database system. Tinder is one of them. QUEX uses a location-based matching system and shows experts around your location and then let you chat with these people. Tinder has a similar way of matching people, it gets your location and finds people around you and match you with them so that you can chat with people. The other similar application is Quora. In QUEX, users defines their problems to match it with a proper expert, in Quara, this process is same with our application. Users selects their interests to reach topics which are related with their interests. System shows them proper and informative topics. Lastly, because of QUEX has chat functionality, Whatsapp can be counted as a similar product since it is widely used and successful chatting application.

## **9. Possible Future Developments**

- Some possible future developments are considered for QUEX and they will be applied later, some of them will be applied only if a need arises.
- iOS version of QUEX will be developed to reach more people who use mobile applications.
- Scale of the application database probably will be increased to handle lots of user accounts.
- Suggestions which are shaped with the previously posted problems of the user can be added later so that QUEX can suggest proper experts to a user.

## **10. User Manual**

The user manual of the QUEX application is on the appendices heading of the report.

## **11. Conclusion**

In this report we have analyzed the final version of the application Quex in areas of its architecture and design. The resources used during the project, engineering solutions and the possible future developments are also mentioned. The user manual is also given to create more user-friendly environment and understand the Quex better.

## References

- [1] <https://searchsoftwarequality.techtarget.com/feature/Learn-more-about-the-Android-Studio-IDE-from-Google>
- [2] <https://www.thoughtco.com/what-is-java-2034117>
- [3] <https://howtofirebase.com/what-is-firebase-fcb8614ba442>
- [4] <https://guides.github.com/activities/hello-world/>

## Appendices

### User Manual

#### 1. Welcome Page

When users touch the application, first they encounter with the welcome page of the application. It is not a functional page it is just welcome the users.



Figure 1: Welcome Page

## 2. Login or Register Page

After welcome page, users will encounter with the login or register page. In this page, if the user has an account on the system, he/she will touch the login button, however, if the user do not has any account on the system and wants to use the system, he/she will touch the register button on the page. On the other hand, if the user has one of the google or facebook account, they can just touch the Sign in with Google or Connect with Facebook button and authenticate into the application easily.

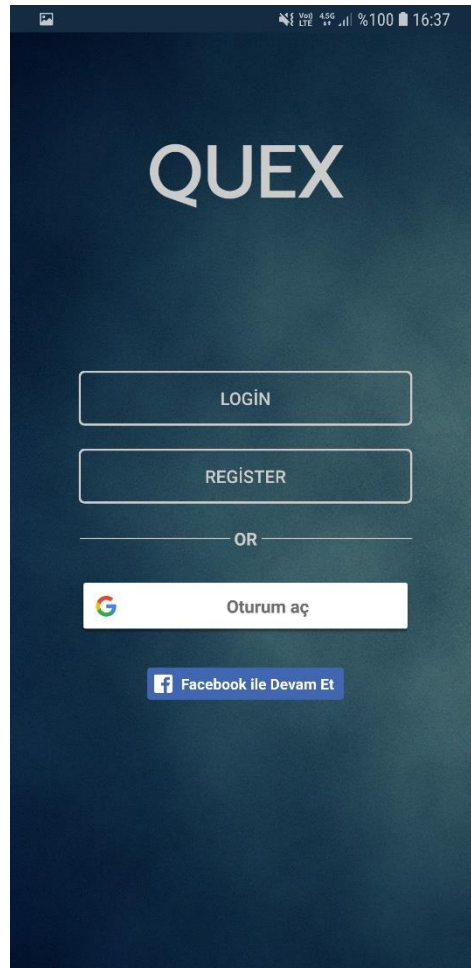


Figure 2: Login or Register Page

### a. Login Page

This page will be open if users touch the Login button on the Login or Register page. In this page users will type their emails and passwords of their account and then touch the login button. If users type correct emails and password, they will use the system. Otherwise they will get “Email or Password is wrong try again” warning from application.

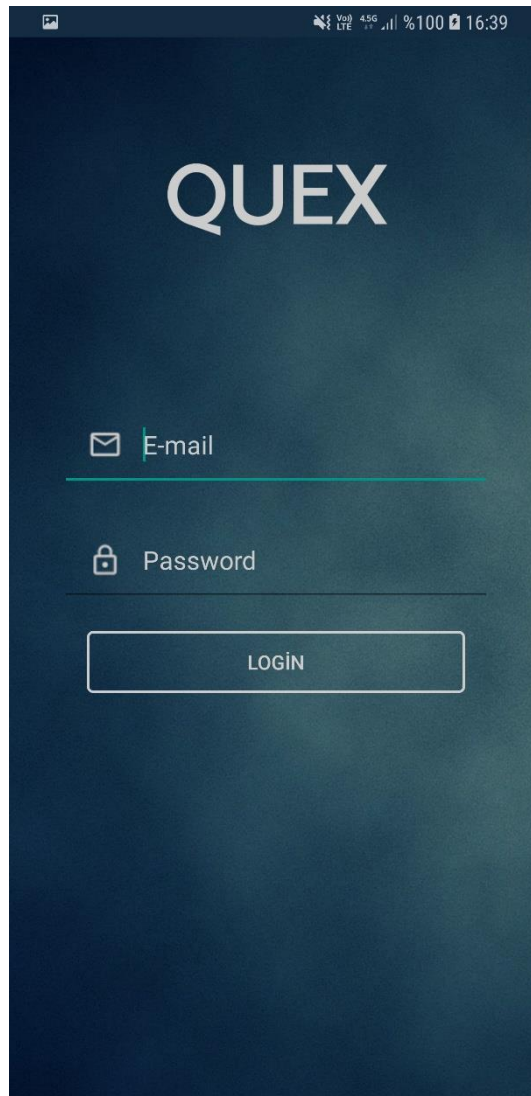


Figure 3: Login Page

## b. Register Page

This page will open if users touch the Register button on the Login or Register page. In this page users will create a new account for themselves with typing proper emails and passwords on the text fields. If they write wrong type of emails and passwords, they will get “Email or Password is not compatible type. Please try again” warning from application. After writing email and password fields, the page send users to the Edit Profile page and they will continue registration process of the application.

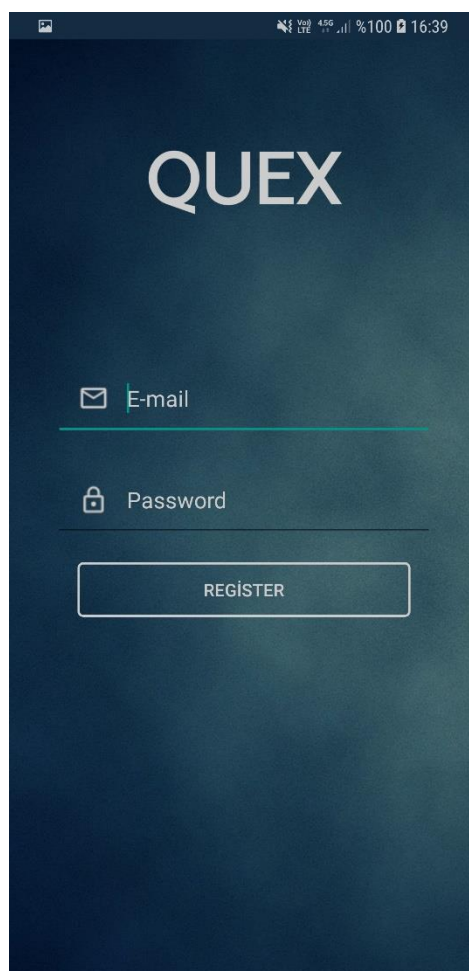


Figure 4: Register Page

### 3. Dashboard Page

After the authentication process user will encounter with the Dashboard page of the application. In this page the user will see a bunch of topics on the application. Each topic on the dashboard will show 3 field of a specific topic which are topic owner name, category of the topic and description of the topic. In the system the topics can be marked as solved or unsolved and on the dashboard the user can understand whether the topic solved or unsolved or not from the category field of the topic. If the category name is red colored, the topic is an unsolved topic and if the category name is green then the topic is a solved topic. In addition to these, this page has some other functionalities which are filtering topics on the dashboard, comment on a specific topic, search topics and seeing topic owner profile page.

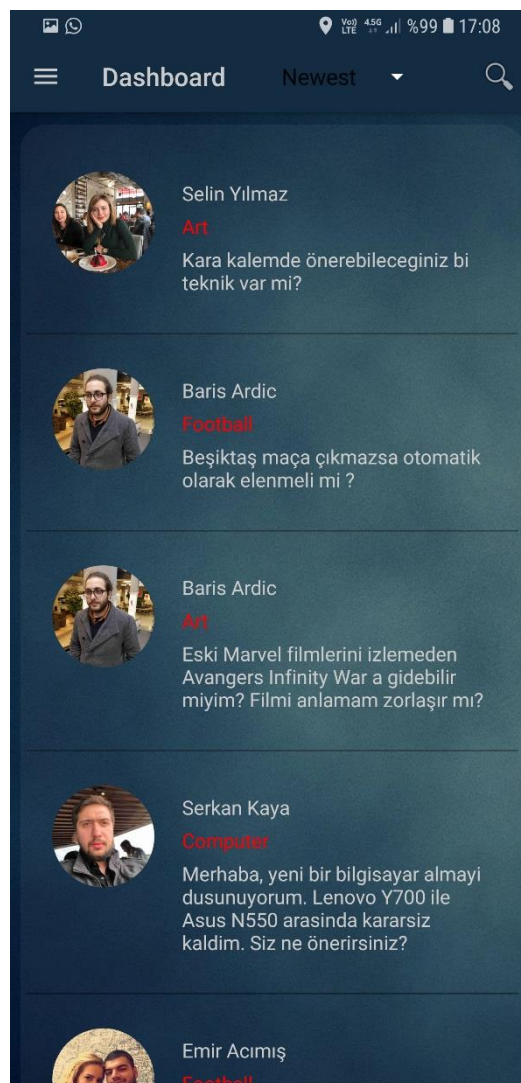


Figure 5: Dashboard Page



### a. Filter Topics

First functionality on the dashboard page is filtering the topics. Filtering operation can be done on the Spinner on the toolbar. The filter options are Newest topics, Older Topics and Category base filtering options (categories that specified on the application). If users touch the newest or oldest button on spinner, they will filter topics according to generation date of the topics. Newest button shows lastly generated topics on the system and oldest button show oldly generated topics of the system. The other filter option is category based filter option which is show topics on the same category. For Example; if we choose the Technology option on the spinner, the system will show us topics who are on the technology category.

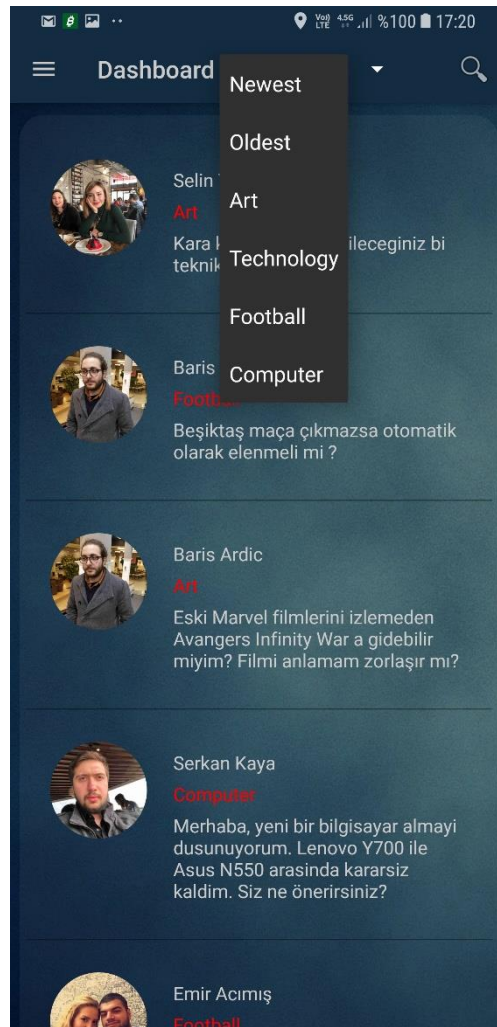


Figure 6: Filter Options

## b. Comment Page

Each topic is showing in a box and each box is a clickable box and when users touch a specific box they will encounter with comments of the topic. These comments are visible for all the users. If users want to send a comment on the topic, they can type their comments on the text area and then send these comments with touching the comment button next to the text field.

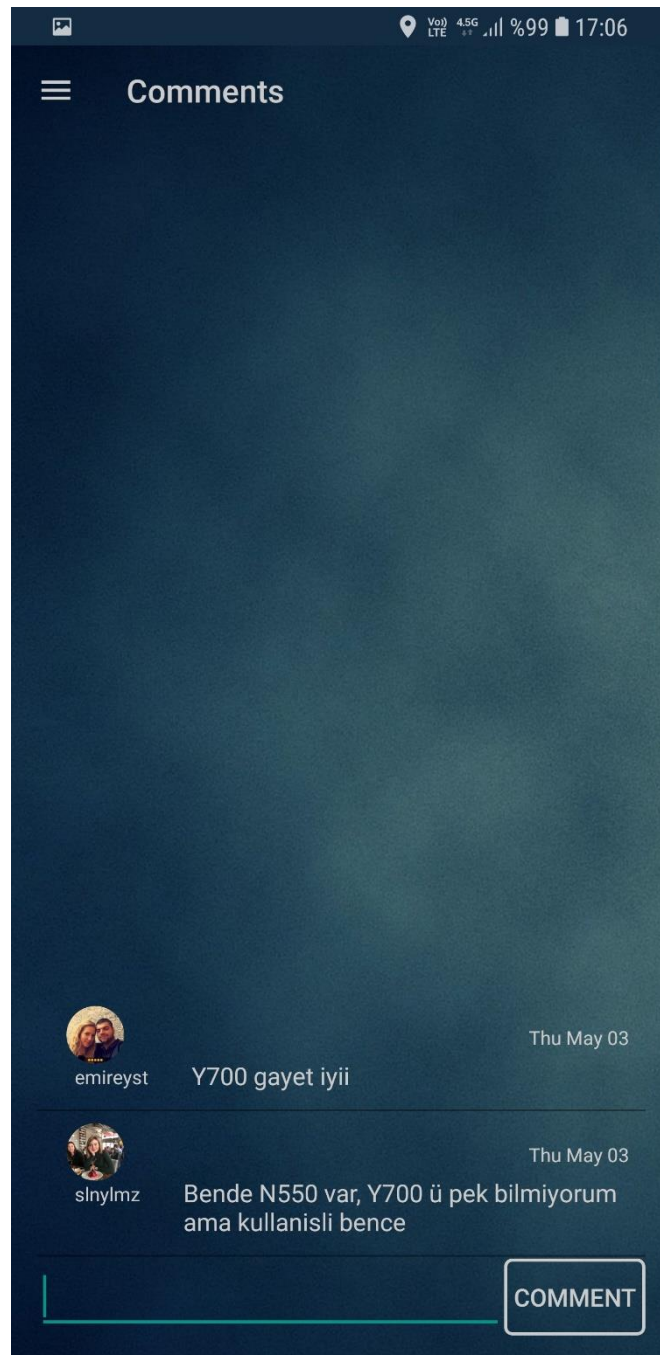


Figure 7: Comment Page

### c. Search Topics

Another functionality that dashboard can do is searching topics on the system. User can do this by touching the magnifying glass image on the toolbar. After touching it, they will see a text field. When they type a character or a word or a sentence on the text field, system automatically start searching for the character or sentence or word and show the search results.

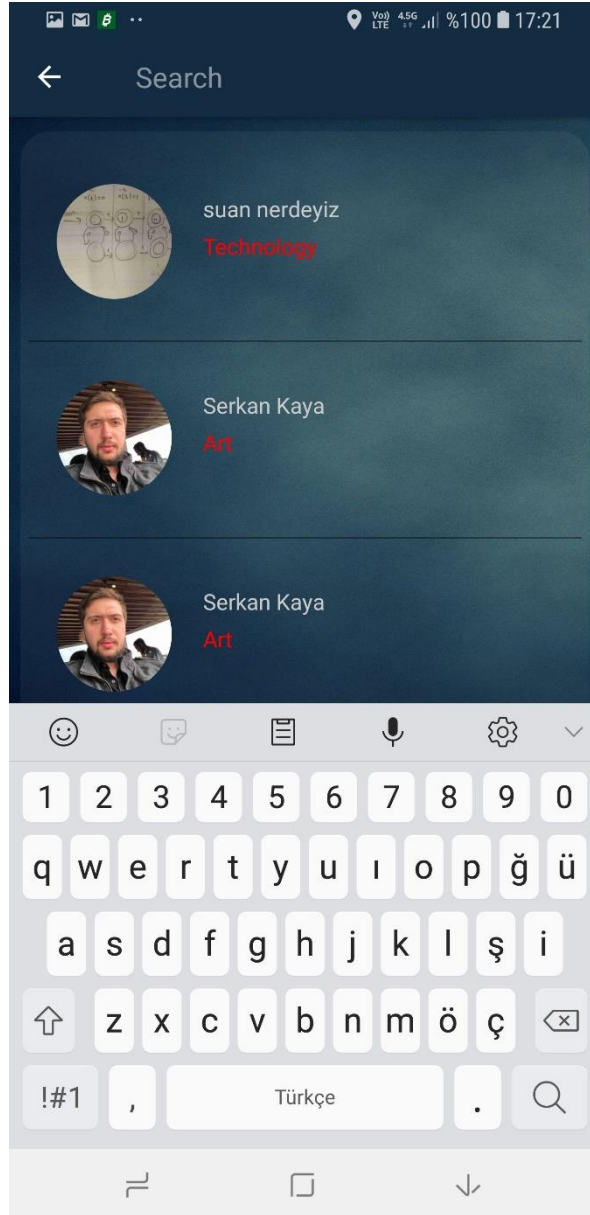


Figure 8: Search Topics

#### d. Topic Owner Profile Page

On the topic box, there is an image on the left of the box. This image is the topic owner image and this image is also an clickable button too. If the user touch this image, users can see a different page which is topic owner profile page. This page show the topic's owner details about the user who send the topic.

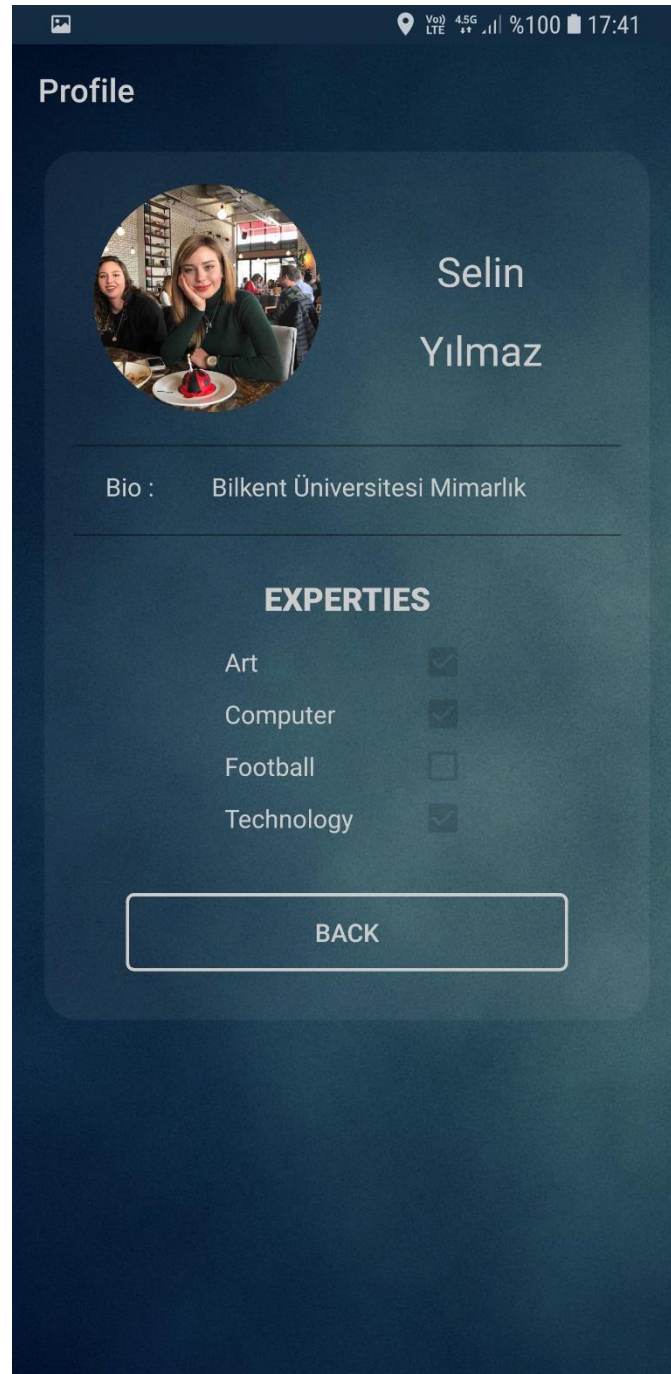


Figure 9: Topic Owner Page

#### 4. Navigation with Toolbar Menu

Rather than Dashboard activity, there are other activities on the system. To reach these activities, there is a navigation view on the top left corner of the toolbar (three line icon). When users touch on this icon, they can see the menu of the application. There are bunch of fields that users can go through other activities of the application which are Profile page, My Topics page, Create New Topic page, Inbox page and Sign Out activity. This menu is visible on all pages in application.

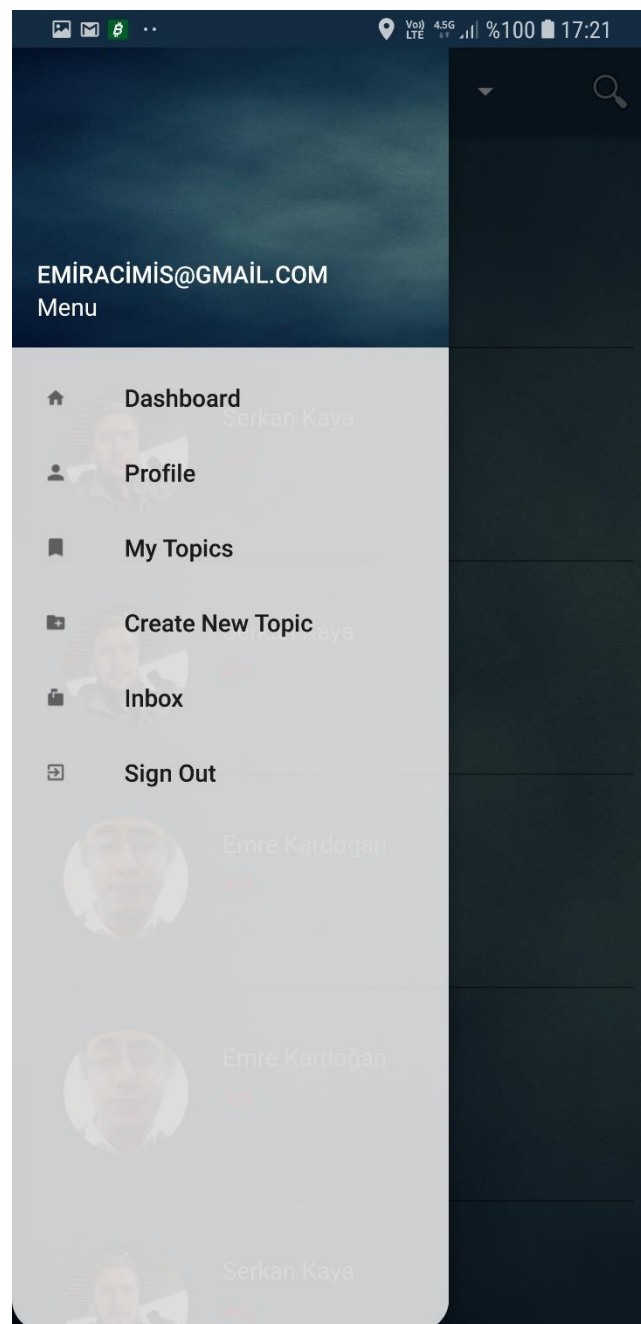


Figure 10: Navigation with Toolbar Menu



## 5. Profile Page

When user touch menu icon and then touch the Profile field on the menu, they will reach the Profile page activity of the application. In this page, user can see their information like name surname, information, username, profile image etc. On the other hand, user can also see their expertise they have on profile page. In this page there are two buttons on the bottom of the page which are Edit Profile button and Back button. When users touch Edit Profile button, they will reach the edit profile page of the system and they can change and edit their information on. When they touch the Back button, they will get back to the dashboard activity.

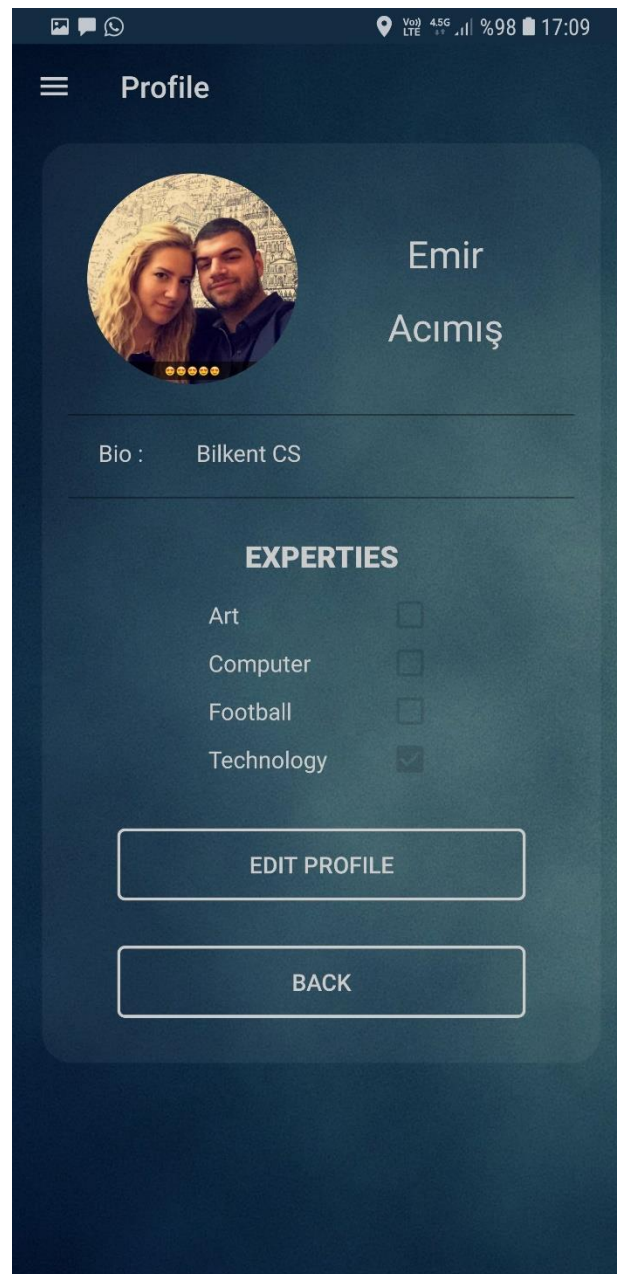


Figure 11: User Profile Page

### a. Edit Profile Page

After touching the Edit Profile button, users will see a page like in the picture above. In this page users can change their information which are saved on the system. There are bunch of field to change which are profile image view, name, surname, username, information text view and category switches. If users want to change profile image on the system, users should touch the profile image on the edit profile button. When they touch it, the system will direct users to the photo gallery. Users will choose the profile photo from the gallery and after choosing a photo the system get back user to the Edit profile activity. If users want to change their information on the text field, they just need to delete old information and type new information that they want. Last but not least, users can change their expertise in edit profile page. If users want to add or delete expertise, they just need to touch the square on the left of the category name. They will open or close expertise with swiping the switches. After finishing all changes that users want, they will touch the Done button on below of the page and they will save the new information to the system. After finishing the task system send users to the profile page again.

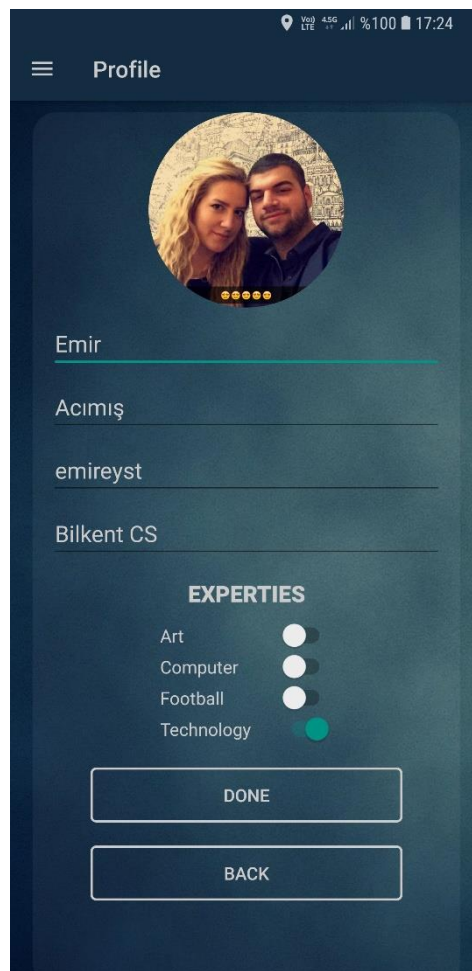


Figure 12: Edit Profile Page

## 6. My Topics Page

When users touch the menu icon and then touch the My Topics field, they will reach all topics on their own in the system. In this page, user will see their topics in a grid layout with bunch of field of a topic like; topic solved unsolved information, topic creation date and a little description of the topic will be visible for the users in this page. In this page, each topic is also clickable like the dashboard topic and when users touch one of the topic, they will see the comment page of the topic. The comment page is same page that is shown in the dashboard heading.

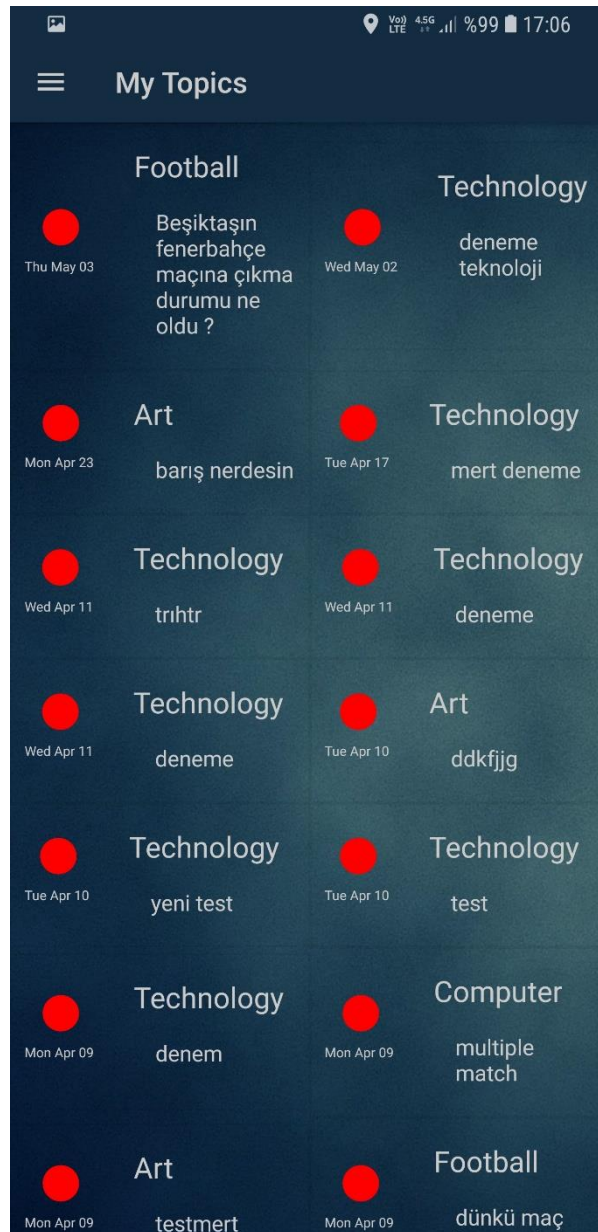


Figure 13: My Topics Page



## 7. Create New Topic Page

When user touch the menu icon and then touch the field Create new topic. After this happen, they will start the process of creation a new topic to the system. This process has 4 phase which are choosing topic, writing description, seeing the possible matches and choosing one of them and start the chat with the specific expert.

### a. Choose Category

When users choose the create new topic field on menu, they will first encounter with the choose category page of the application. Users will see bunch of categories with image buttons. Users will choose a category which is related to their topic. For Example; if a user has a problem on their computer and he/she wants to solve, he/she should choose the computer category on choose category page. After that the system direct users from topic description page of the application.

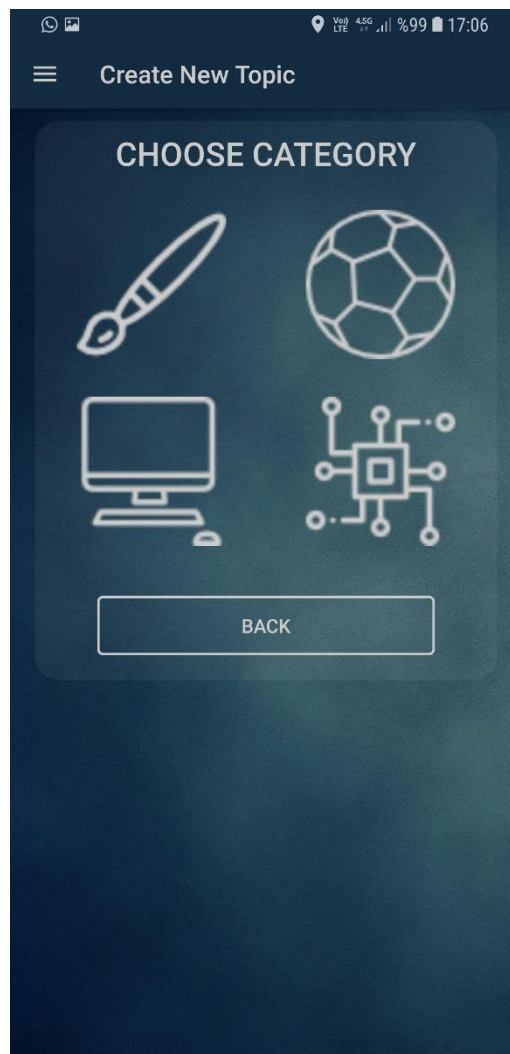


Figure 14: Choose Category Page

## b. Topic Description Page

After choosing category, the system will show the topic description page of the system. Users will see one text field which is writing description field and two button which are Match button and Back button. On description text field users will type their problems in a proper language. After finishing writing, they will touch the Match button and the system start to find proper matches for users. If users decide not to write their problem, they will touch the back button and terminate the process of create new topic.

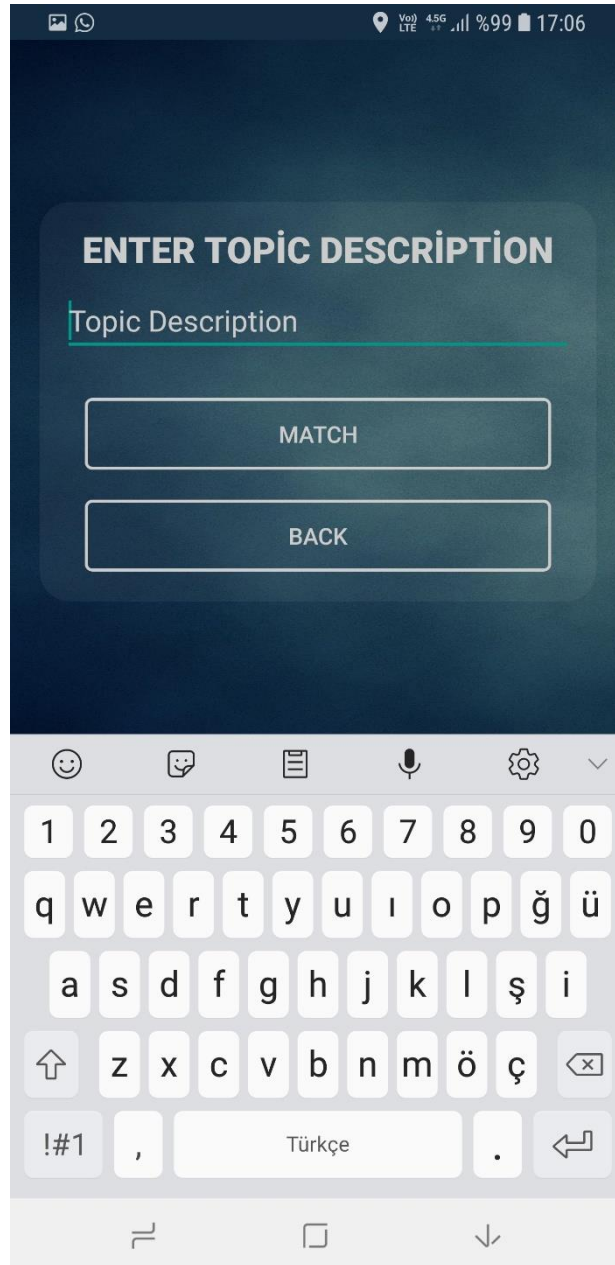


Figure 15: Topic Description Page

### c. Taken Match Page

If users touch the match button after writing their problem descriptions the system start searching for possible matches for users. After that, the users will see bunch of experts on the screen. These experts are the closest people to users. They are founded by the system with GPS of expert. Each expert is showing in a box and this will show bunch of information about the expert which are profile image of expert, name and surname of expert and distance of expert. With this information users will decide which expert should choose and after their decision they will accept or reject the expert. If they touch the accept button the system direct users to the chat page. If they reject the system will give another expert on the expertise list.

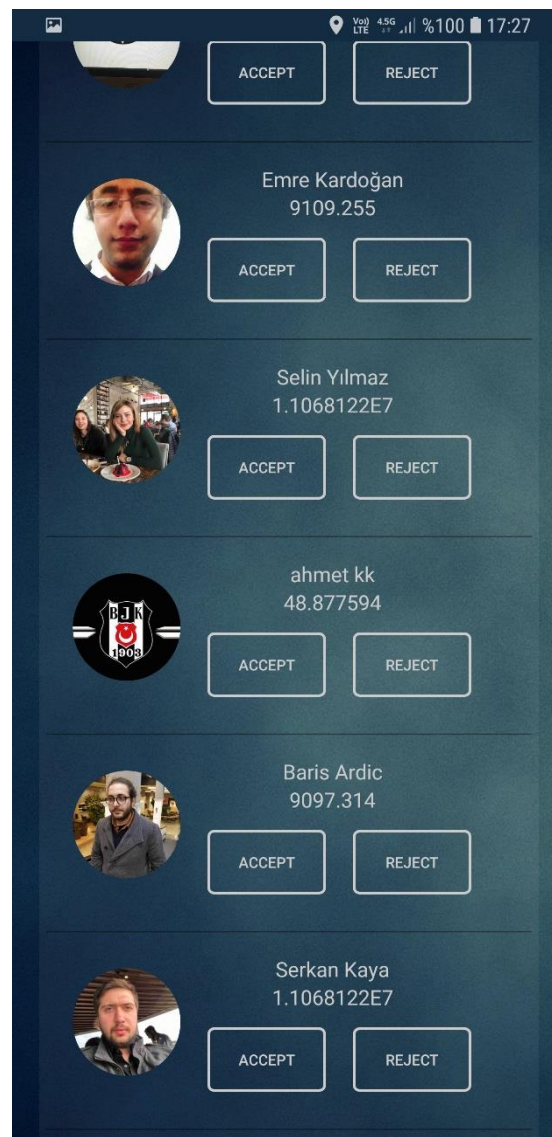


Figure 16: Taken Match Page

#### d. Chat Page

If users accept an expert, the system direct users to chat page and at the same time the system send a notification to the expert to notify. When expert touch the notification, the system starts a chat with the owner of the topic.

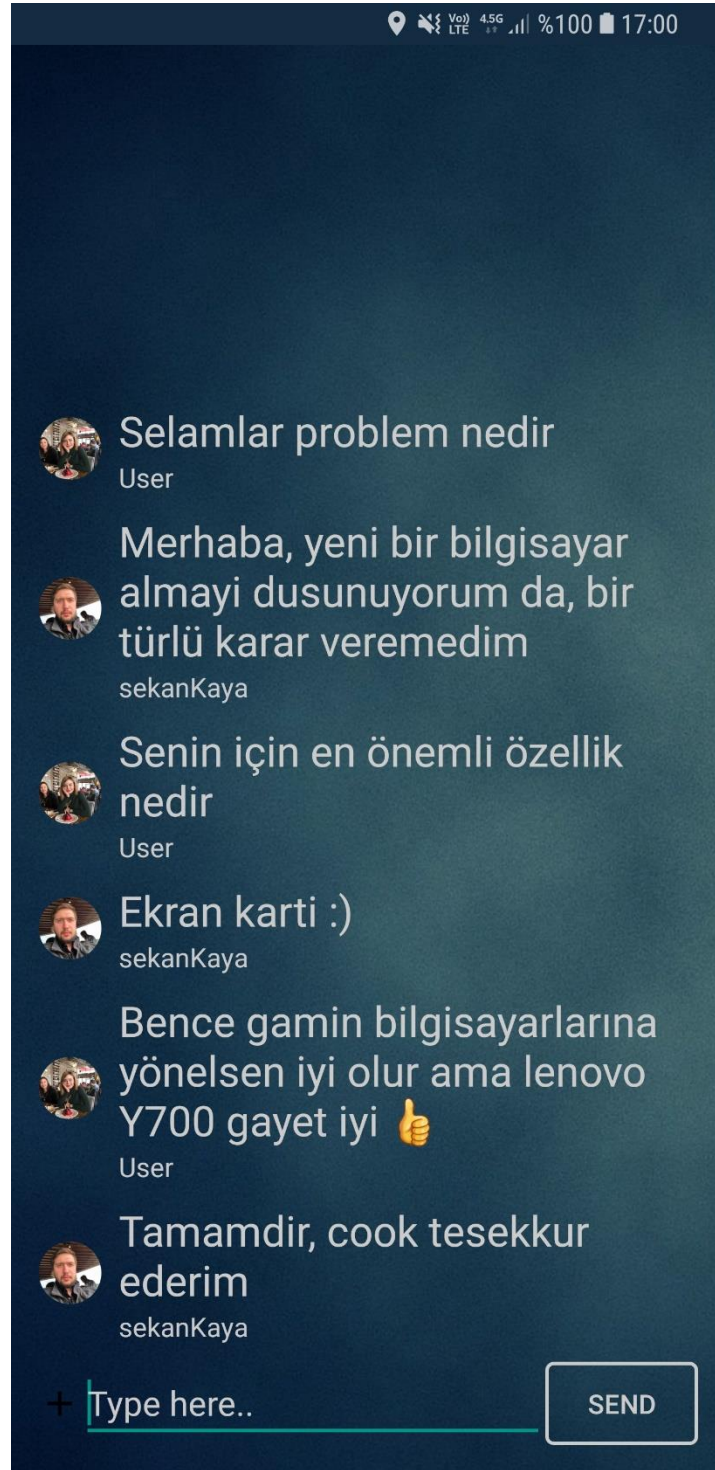


Figure 17: Chat Page

## 8. Inbox Page

When users touch the menu icon and touch the Inbox field of the menu, users will see their old chats with experts and they can see all the chats about their topics. When the users touch to one of the box on the inbox, they will see all the chats they do with experts. On this box there is another functionality which is long click. If users long click to a box they will see two field which are marked as solved and delete buttons. If they touch the mark as solved button they will mark the topic as solved and if they touch the delete button, they will delete the chat from their inbox. They do not delete the topic but they will delete the chat with the expert with this button.

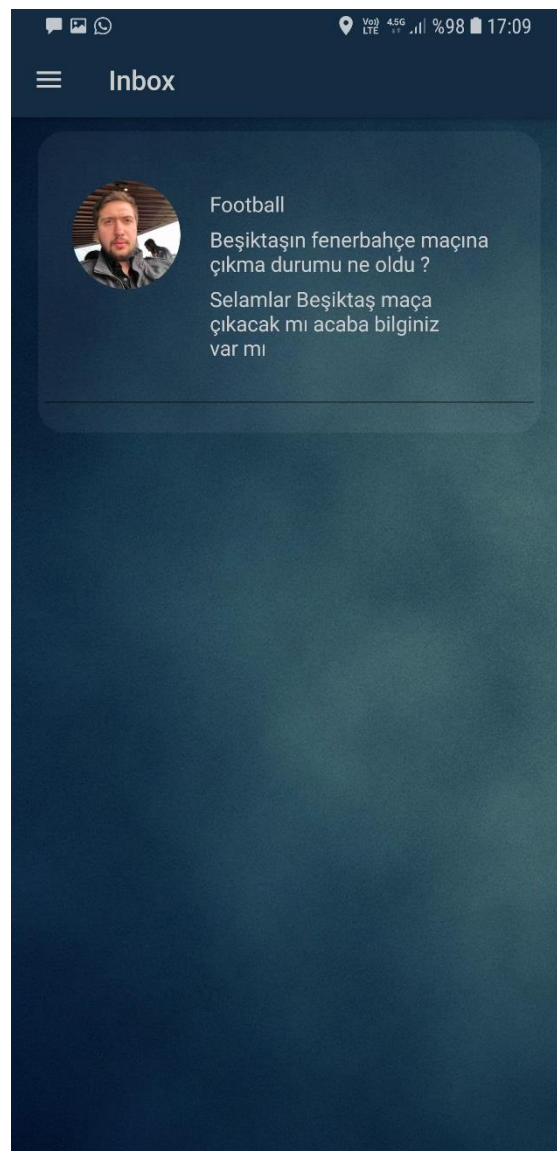


Figure 18: Inbox Page

## **9. Sign Out from System**

When users want to close their authentication with the system, they can sign out from the system from the menu. To do this user should first touch the three-line menu icon and then choose Sign out field. When they touch the sign out field, they will direct to the login or register page of the application. To start their session again, they have to login the system again.