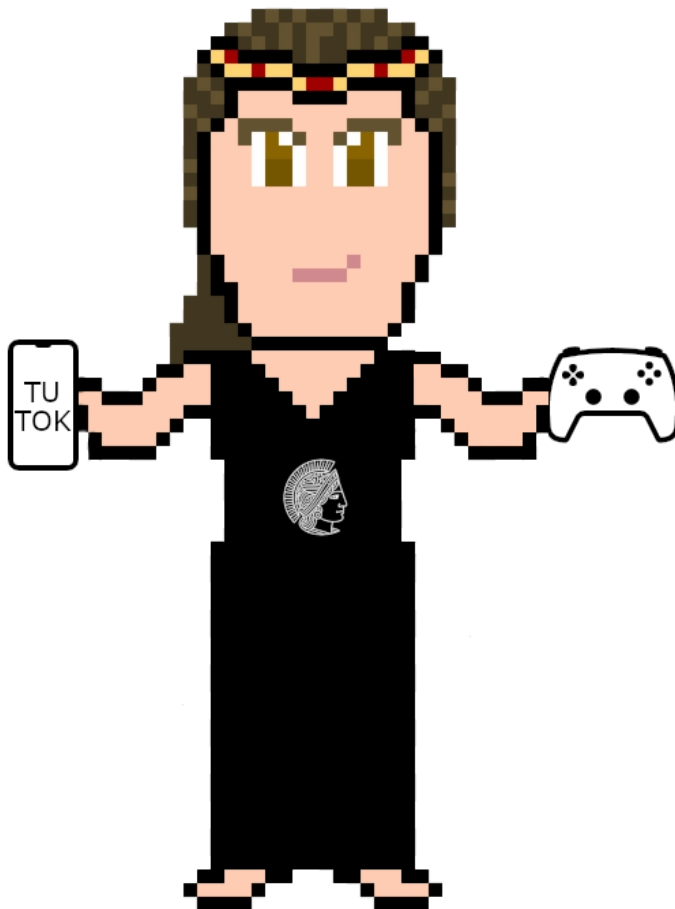

TuTok

Gaming and Clip Streaming app

Ömer Burak Yilmaz, Senad-Leandro Lemes Galera, Eray Dogan, Salim Boutasfat, Bartosz Peczyński
7. Februar 2023



TECHNISCHE
UNIVERSITÄT
DARMSTADT



Inhaltsverzeichnis

| | | |
|----------|---|-----------|
| 1 | Introduction | 3 |
| 2 | Motivation | 3 |
| 3 | Technical Overview | 4 |
| 3.1 | Technologies and Architecture | 4 |
| 3.2 | Database | 4 |
| 3.3 | Endpoints | 5 |
| 4 | Features | 7 |
| 4.1 | Scrollable Clip Screen | 7 |
| 4.2 | User | 7 |
| 4.3 | Game | 7 |
| 4.4 | Commenting | 8 |
| 4.5 | Admin UI | 8 |
| 4.6 | Search/Follow | 8 |
| 5 | User Manual | 9 |
| 5.1 | Login | 9 |
| 5.2 | Interests Page | 10 |
| 5.3 | Clips | 11 |
| 5.4 | Game | 12 |
| 5.5 | Upload | 15 |
| 5.6 | Profile | 16 |
| 6 | Testing | 19 |
| 7 | Conclusion | 20 |
| 8 | Outlook | 20 |

1 Introduction

As an internship project in the context of Internet Praktikum TK, we have developed an Android application with which you can play games, watch clips, and more. The project was created using the agile project management method Scrum within three sprints of four weeks each. In total, six developers worked on the app. This document describes the technical documentation, as well as the implemented features. The application is based on the Flutter framework. Our backend was constructed with Spring, an application framework for the Java platform, which interacts with the CockroachDB database. We implemented all the required features. Users can stream media from a remote location, play games online with other users, interact socially with other users, get game recommendations based on their interests, and more. Automated testing does also exist. There are also some bonus features, like media compression, uploading and managing media, a start-where-you-left-off functionality, and more.

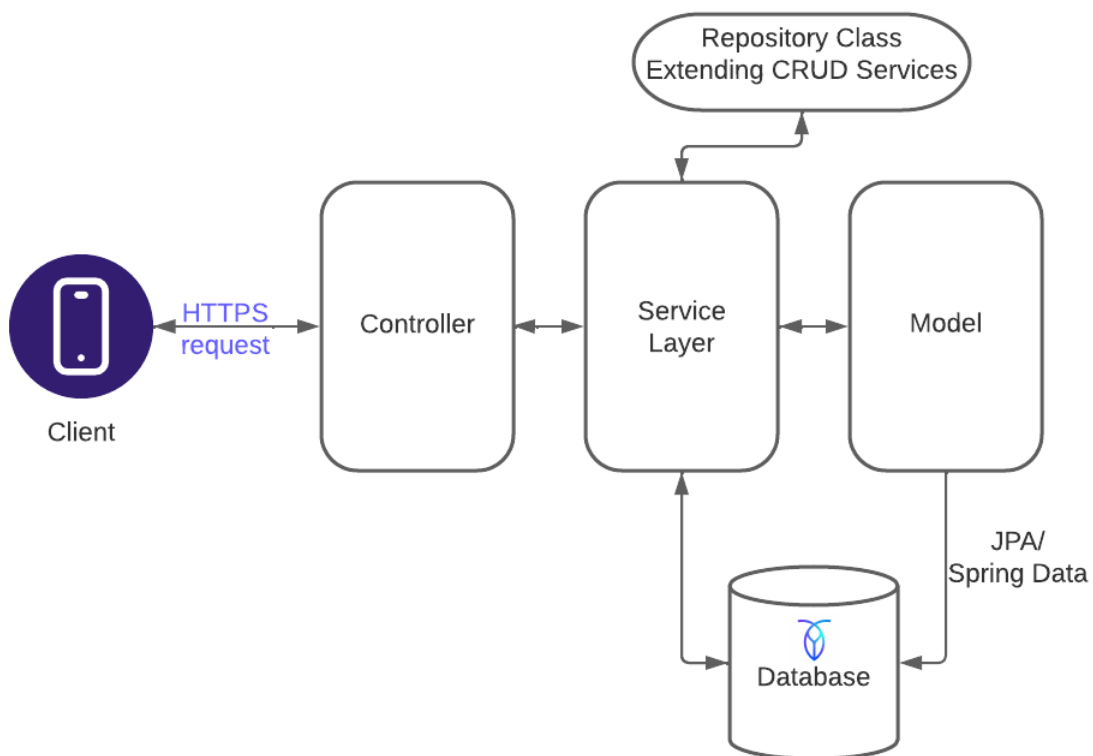
2 Motivation

Probably the most successful app of all time, TikTok basically has a boring idea. Because watching clips is a nice thing, but it gets boring in the long run because there is no variety. With this in mind, we developed TuTok, which also has a clips page, but extends the concept by adding games. Now users can play games based on a viewed clip. But that's not all. Users can also play against other users in real-time and chase the level points. Because only the top 50 players from TuTok are listed in a leaderboard, with the top three players being shown separately. As if that weren't enough, for every 10 levels, players will receive a medal to brag about to their friends. Therefore TuTok is an optimal extension of the most innovative idea of this decade regarding social media.

3 Technical Overview

3.1 Technologies and Architecture

The frontend is built using the cross-platform app development framework Flutter. The backend was constructed with Spring (Version 3.0.1), an application framework for the Java platform (Java 17), which interacts with the CockroachDB database. Our application server is implemented in Spring Boot and receives frontend requests at specific API endpoints, processes them, reports them back to the frontend, and interacts with the database as needed. We are hosting our backend on a Cloud VPS which is from Contabo (Cloud VPS S). A plain HTTP connection can be easily monitored, modified, and impersonated. Our API is proxied behind Cloudflare Proxy, which provides us with signed certificate for HTTPS. Cloudflare also protects our application against DDOS attacks. For implementing our Multiplayer Game, we are using Spring Websockets authenticated using Basic Authorization. We send messages directly to specific users, what enable us to create game rooms dynamically.



3.2 Database

We are using CockroachDB as our database. It is a cloud-native distributed SQL database designed to build, scale, and manage modern, data-intensive applications. It supports the PostgreSQL wire protocol, so you can use any available PostgreSQL client drivers to connect from various languages. For the storage of clips, we use a Bucket from Cloudflare (called Cloudflare R2). We are streaming them directly from Cloudflare to the client APP. The Backend is creating temporary links, that are used for accessing the clips directly from the Cloudflare bucket. So we are not limited by the bandwidth of the server running backend and we can easily scale our app.

3.3 Endpoints

- **User**
 - create an user POST (user/create)
 - delete an user POST (user/delete)
 - upload a profile picture POST (user/upload/image/userID)
 - get a profile picture GET (get/image/userID)
 - following an user POST (user/follow/userID)
 - unfollowing an user POST (user/unfollow/userID)
 - get all follower of an user GET (user/userID/follower)
 - get all following users of an user GET (user/userID/following)
 - list all users GET (user/list)
 - set the categories POST (user/categories/userID)
 - login with user POST (user/login)
- **Clip**
 - create a clip (clip/create)
 - add quality (clip/addQuality)
 - get the Video of the clip (clip/id/video/quality)
 - list all clips (clip/)
 - list all clips with a cliptype (clip/clipType)
 - delete clip (clip/delete)
 - delete comments of a clip (clip/delete/comments)
- **Comment**
 - create a maincomment POST (user/createMainComment)
 - create a subcomment POST (user/createSubComment)
 - get a maincomment GET (user/createMainComment)
 - get a subcomment GET (user/createSubComment)
 - list all maincomments of a clip GET (comment/clipID/listMainComments)
 - list all subcomments of a maincomment GET (comment/clipID/mainID/listSubComments)
 - liking a maincomment POST (comment/clipID/mainID/toggleLike)
 - liking a subcomment POST (comment/clipID/mainID/subID/toggleSubLike)
- **Game**
 - creating a game POST (game/create)
 - creating a gamequestion for a specific game POST (game/gameID/createQuestion)
 - list all gamequestions GET (game/id/gameQuestions)
 - list all games GET (game/)
 - list recommended games for a user GET (game/list)
 - get a game GET (game/id)
 - get the leaderboard GET (game/leaderboard)
 - check the answer given by the user (game/gameID/questionID/checkAnswer)
- **Gamesession for multiplayer game**
 - joining a new Singleplayer session GET (gameSession/joinNewGameSession)
 - joining a new Multiplayer session MessageMapping (gameSession/joinNewMultiplayerGameSession)

-
- joining a created Multiplayer session MessageMapping (gameSession/joinNewMultiplayerGameSession)
 - leave a game session MessageMapping (gameSession/leaveGameSession)
 - list all gamesessions of an user GET(gameSession/userId/listGames)
 - checks the given answer GET (gameSession/gameSessionId/questionID/checkAnswer)
 - get all opened multiplayer sessions GET (gameSession/openedMultiplayerSessions)

4 Features

4.1 Scrollable Clip Screen

- **Clips streaming** Clips will be streamed from a remote Server and you can watch them in the App. The Clip screen contains one clip at a page and with a comment button and a like button also displaying the amount of likes the specific clip has. Also the name of video is shown.
- **Clips ordering algorithm** The algorithm orders all clips from the backend user-specific after every login.
- **Infinite scrolling** We made it possible that Users can scroll infinitely in our App. A User can loose himself in our app and can scroll the whole day by looking for more funny and nice videos.
- **like/unlike clips** For Feedback and Social Interaction, you can like and unlike Clips and see which clips you already liked and how often the clips be liked.
- **Start where you left off** When you switch to another tab in our app your video will still be there when you go back to the clip page and the video will start to play at this position.

4.2 User

- **Login** Users need to log in to the App so they can get their personal clips shown. Also the needed information for the profile like the picture and name is provided after login.
- **Sign Up and Selecting Preferences** New Users can sign themselves up for the app with a username, password, and email. After Signing in you have to select the Preferences you like, with these categories our recommendation algorithm for the games work. With signing up to our app you can be found and followed/unfollowed by other users.
- **Validate inputs** When you register yourself in the App we validate your inputs. The username needs to be unique and at least 3 characters long, and the password needs to be at least 7 characters, a special character, a number, and one lower and upper case letter.
- **Log out** If you not longer want to be in the app you can log yourself out of the app. After logout you see the log in page.
- **Uploading Clips** When a User wants to upload a clip he/she can either select a video from the device or film one by themselves. The selected video will be shown on the screen and the user can give the video a name. After Uploading the clip the video will be added to the clip page.
- **Upload Profile Picture** You can upload a profile picture on your profile. You can wether select a picture from your device or shoot a new one. You can also delete your profile picture, so you get the standard picture back. After uploading/deleting you are back on the profile page and you can look at your new picture.

4.3 Game

- **Leveling system** We also build a leveling algorithm the level and your progress are shown in your profile so you can compare yourself with other players. You level after answering new questions.
- **Achievements** We build an achievement system so that after every ten levels you get a medal. The achievements are shown on your profile page.
- **Recommendation** Games will be Recommended after your Preferences so you see the games first that you like the most. This makes the app feel way better.
- **Single Player game** We made a Single Player game. The Game works like this: first, you see a clip that you can only start but not pause after the clip is finished you have ten seconds to answer a question based on the clip. At the end your score is shown.

-
- **Multiplayer Game(synchronized Playback)** We also made synchronized playback in TuTok possible. You can either create a new MultiplayerGame and then wait for other people to join or you can join an open game session. After answering all questions the winner is displayed. It is possible to play with Users all around the globe. Multiplayer games can also be played by more than 2 people.
 - **Global Leaderboard** A Global Leaderboard is provided so you can compare yourself to other players in the world. You see the Top 50 Players ranked based on their level. The first 3 players are shown separated with special crowns.

4.4 Commenting

- **Comment Videos** In our app TuTok it is possible to comment on videos, so you can give your opinion on this video and give the creator advice on what to do better or what you liked or just making a joke. The comments are displayed directly after you wrote them. Each comment also displays when it's published and the specific user with his profile picture and name.
- **Like comments** When you think a comment was funny or helpful you can like a comment also if you change your opinion or are pressed by accident on that comment you can unlike it. Also, the amount of likes each comment has is displayed. So that you can compare comments with other comments.
- **Answer comments** You can also answer other Comments and give your opinion on that. So you can interact with other users worldwide. You can hide the answers on a comment if you want but show them again if you want to look at the answers.
- **Blacklisting comments** For a good User Experience, not everyone should be able to comment on anything they like so if you swear or insult someone your comment will be censored.

4.5 Admin UI

- **Ban users** In our Admin UI, it is possible to ban Users by deleting their account for example if you see a bad comment you can ban this user. You just need his name because every user name is unique in our app.
- **Delete Comments** Our Admin UI also makes it possible to delete Comments for example if somehow a comment which is inappropriate goes through our blacklisting you are still able to delete it. You only need the clip name and the username to delete all comments.
- **Delete Clips** A very big feature of our Admin UI is to delete Clips which is necessary if an inappropriate clip or a bad clip is uploaded.

4.6 Search/Follow

- **Search Algorithm** We implemented a Search algorithm on the backend so only the specific users with the same start characters are sent to the frontend so we don't overload the frontend and have a good performance.
- **Follow other users** You can search for other Users and then follow/unfollow them It is also displayed on your profile how many people you follow / how many followers you have.

5 User Manual

5.1 Login

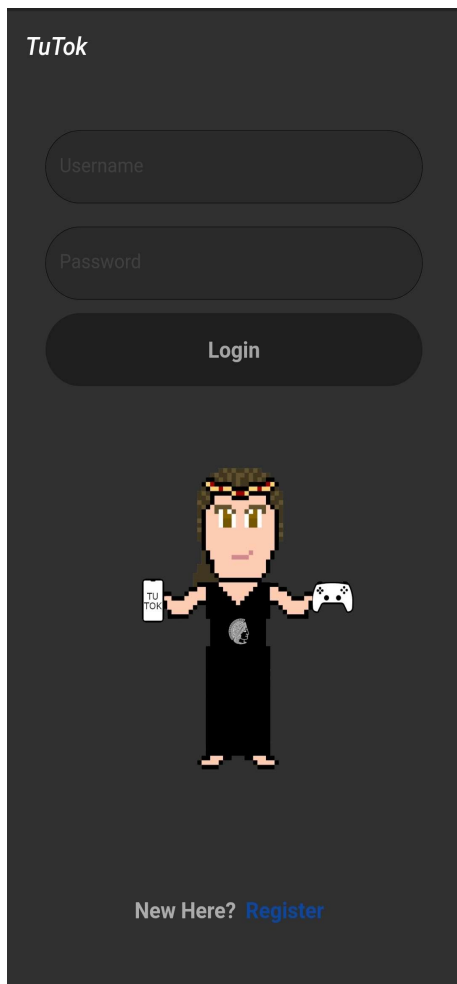


Abbildung 1: Sign in

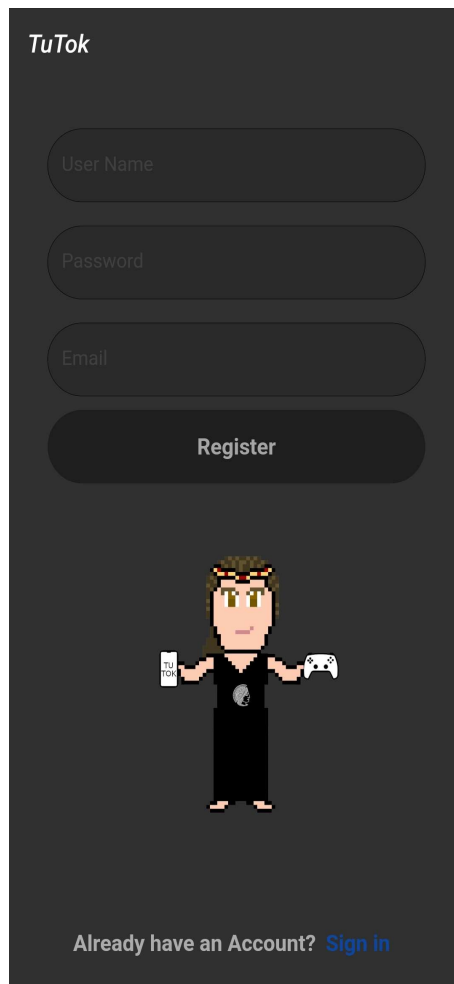


Abbildung 2: Register

In order to register in our app, you have to press on the blue “Register” text. Now you’ll see the register page. You have to enter a username, a password, and your email address. The password must have 9-16 characters, including the following requirements: At least one special character, one capital letter, one number, and one lowercase. After that, you have to press the button “Register”. If there aren’t any problems, you can sign in the next time by entering your username and password.

5.2 Interests Page

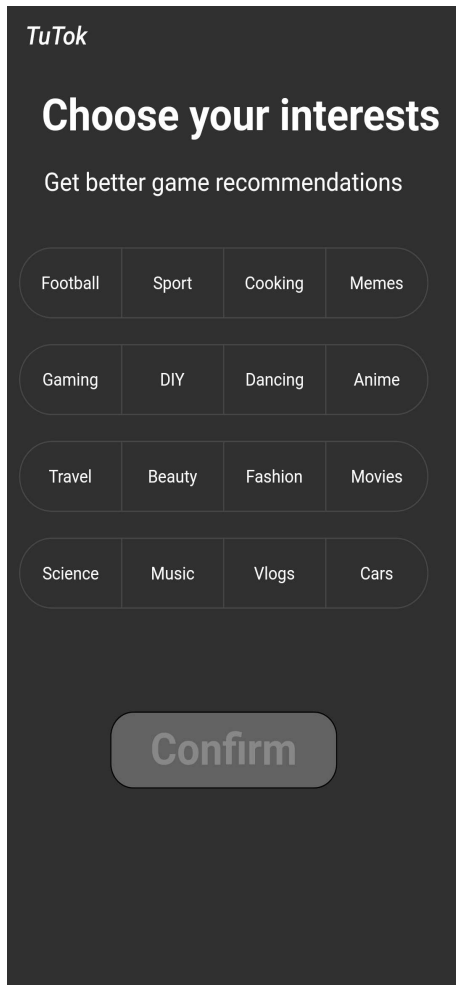


Abbildung 3: Interests Page unselected

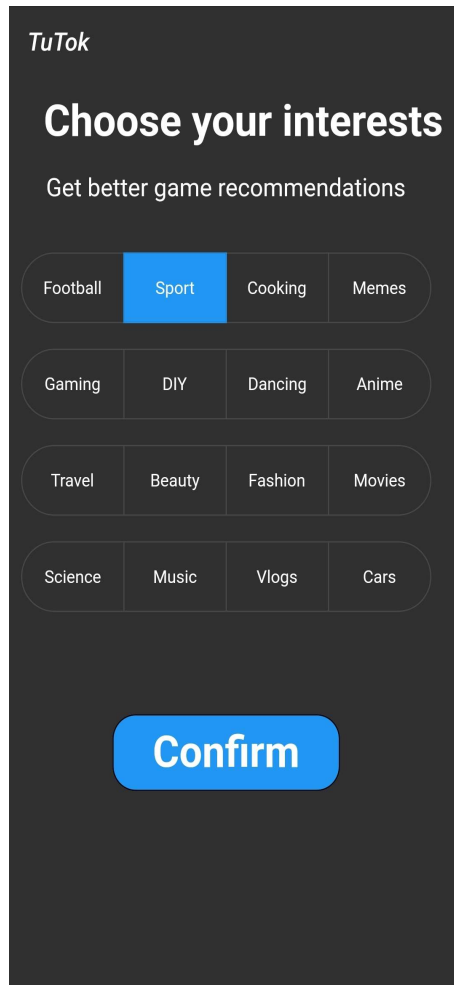


Abbildung 4: Interests Page selected

Here you can select topics, which interest you. In order to continue, you have to select at least one topic. Otherwise, the “Confirm” Button won’t be enabled.

5.3 Clips

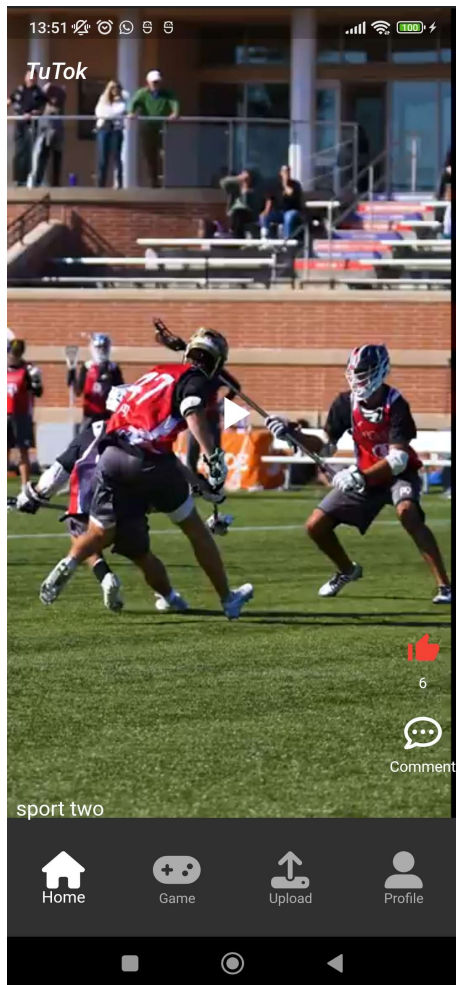


Abbildung 5: Clip with a like

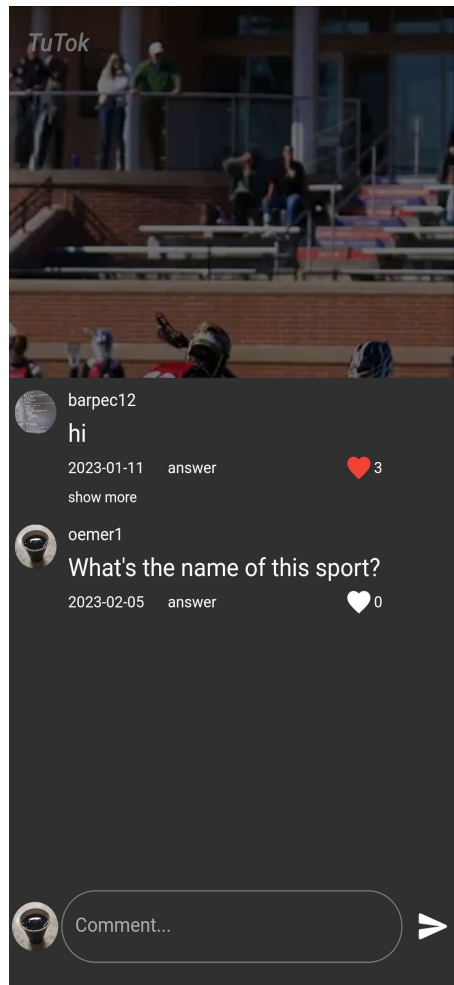


Abbildung 6: Comments

On the homepage, you can watch some clips. If you swipe down, a new clip will play. By pressing the thumbs-up icon, you can like a clip, if you enjoyed it. You can also press on the comment icon and the comment section of this video will pop up. There you can press on the “Comment...” field and write something. You can also like a comment by pressing on the heart, or reply to a comment by pressing on “answer”.

5.4 Game

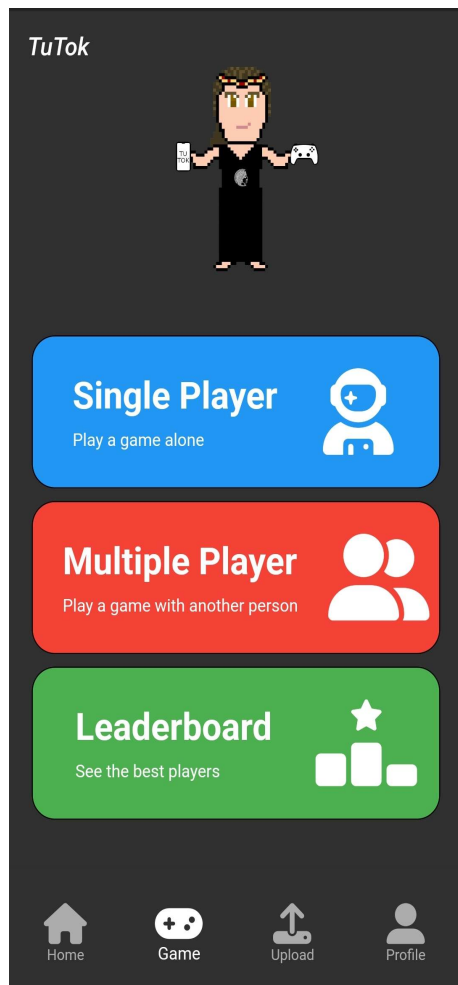


Abbildung 7: Game Screen

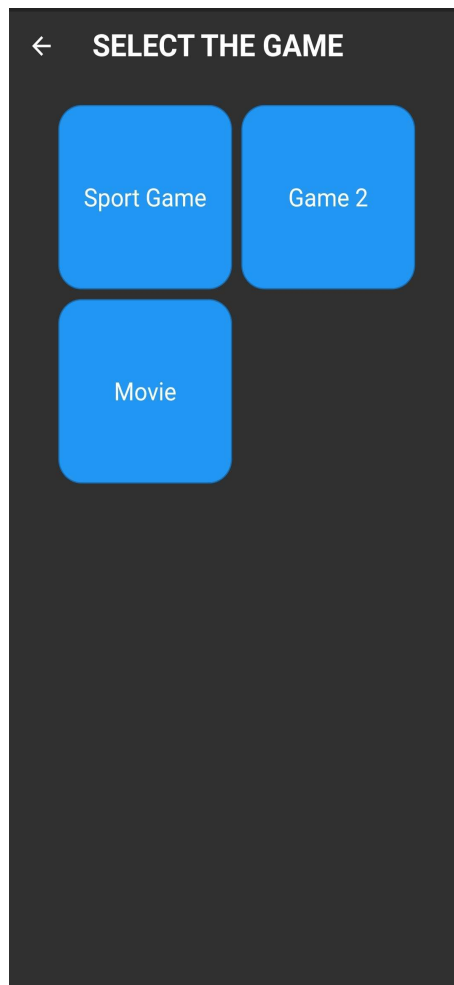


Abbildung 8: Select Game

On the game page, there are three you can do. Firstly, you can play a game alone by pressing “Single Player”. Now you can select a game of your choice with a category. To start a game, press the “START” button.

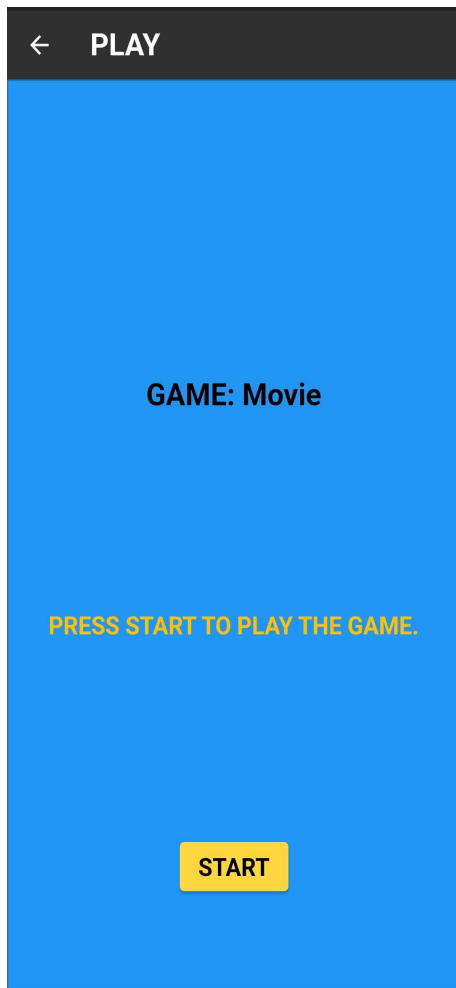


Abbildung 9: Start Game

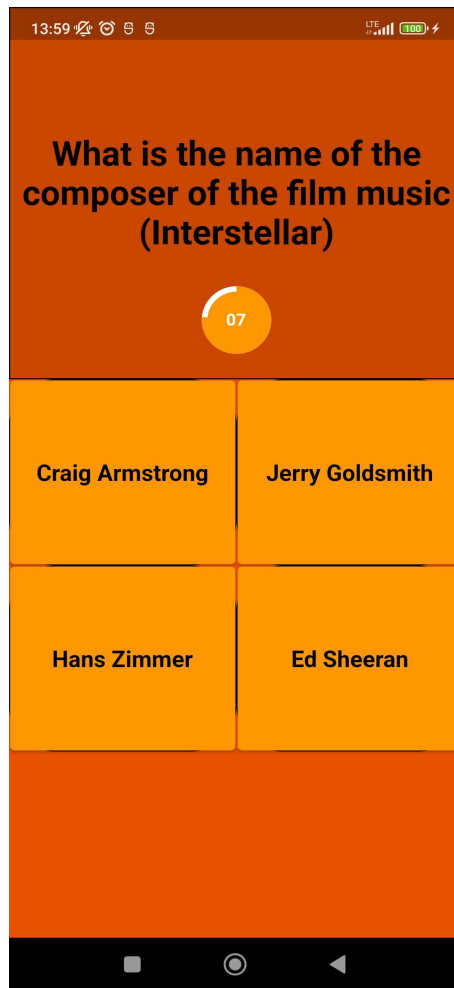


Abbildung 10: Select Answer

A clip will play and then you must answer a question related to the clip.

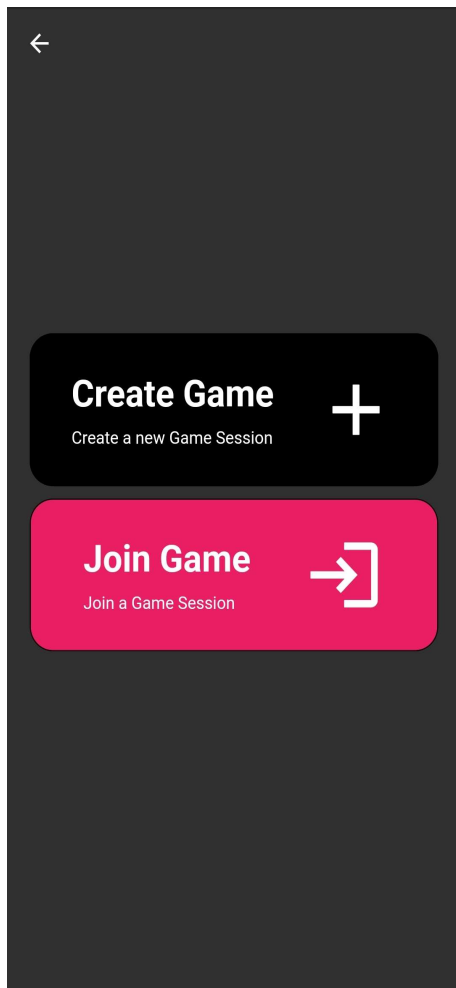


Abbildung 11: Multiplayer Screen

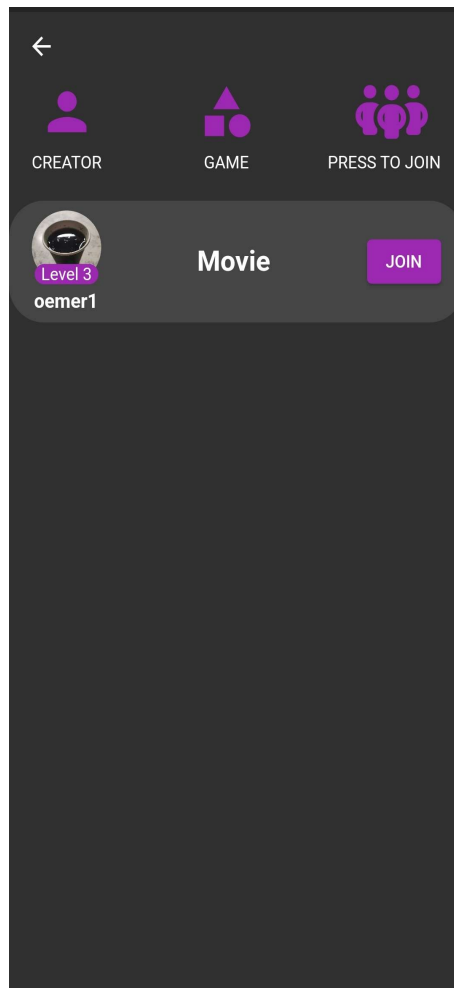


Abbildung 12: Join Game

Secondly, you can play a game with another person by pressing “Multiple Player”. Now you can either create a game or join an existing game session, by simply pressing the respective button. If you pressed the “Create Game” button, you have to select again a game and press on “Create”. After that you have to wait, until someone joins your game. If you pressed the “Join Game” button, a list of existing games will show up, so you simply press the “Join” button, to start the game. Thirdly, you can look up the best players on TuTok by pressing on “Leaderboard”. The top 50 players will be listed, and if you play more, your name will one day also show up there.

5.5 Upload

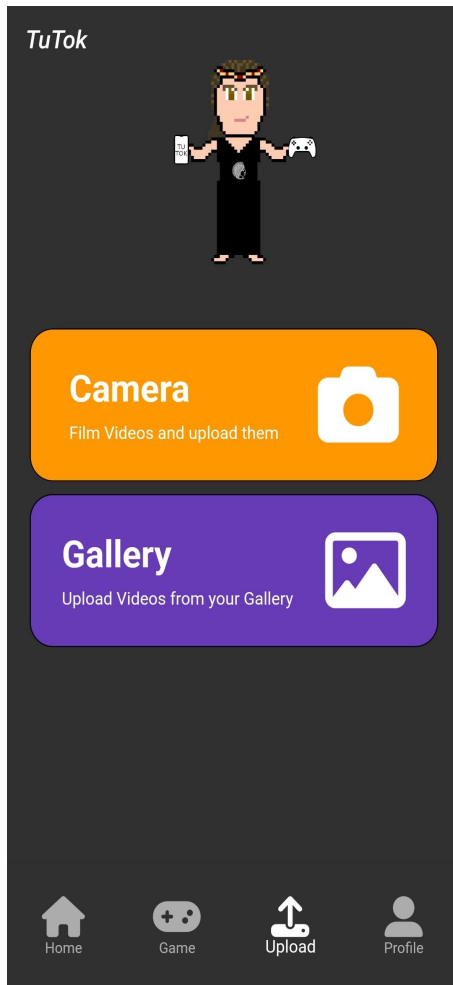


Abbildung 13: Upload Clip

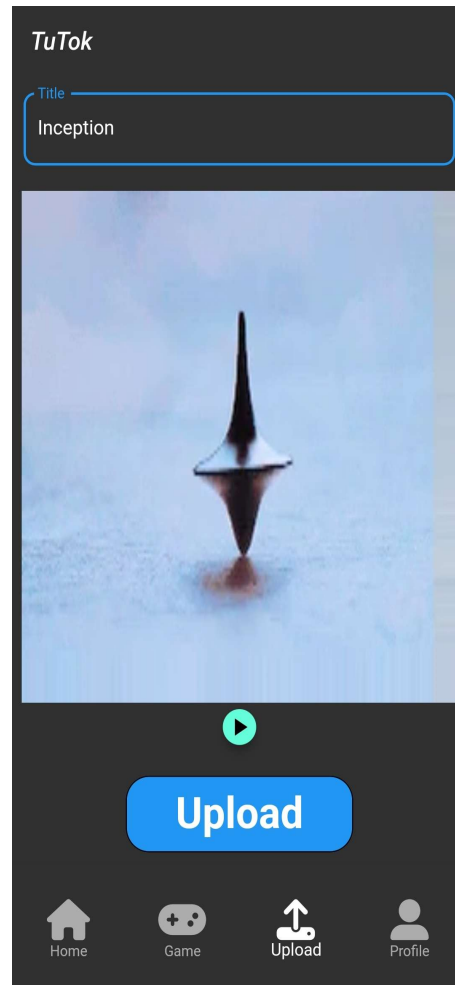


Abbildung 14: Specify Clip

On the upload-page, you can upload a clip, which will be shown to other people on the homepage. You can select whether you upload a clip from your gallery, or you record a video in the app. If you pressed the “Camera” button, you have to allow TuTok to have access to the camera. Now you can record a video. If you pressed the “Gallery” button, you have to allow TuTok to have access to the files on your device. Now you can select a clip from your gallery. After both options, you have to type in a title for the clip you want to upload. By pressing the “Play” button you can see the video you want to upload before uploading it. By simply pressing the “Upload” button, your video will be uploaded, and it will show up after some time on the homepage.

5.6 Profile

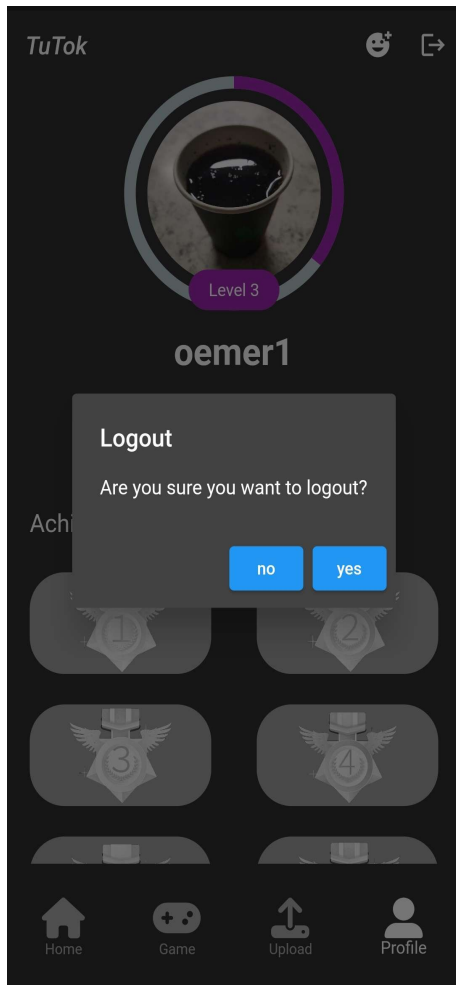


Abbildung 15: Log out

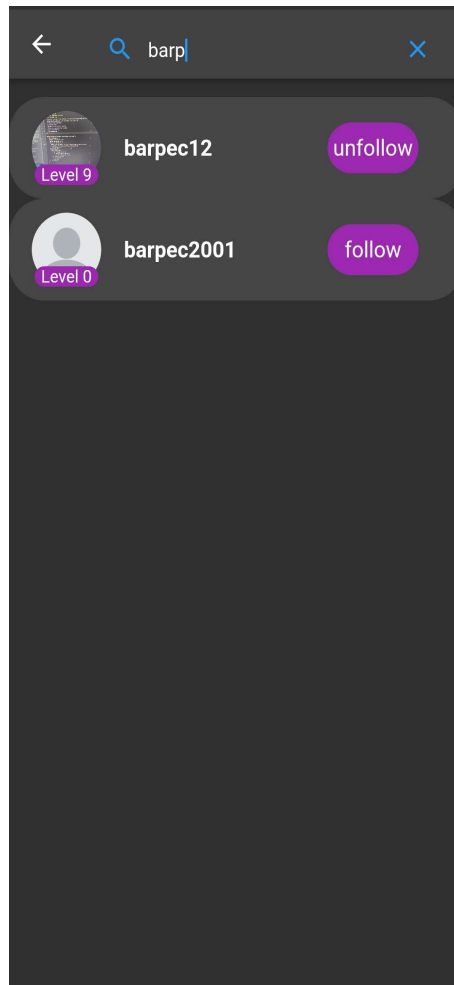


Abbildung 16: Following

On the profile page, you can do many things. First, you can log out, if you press the button on the top right. You can also follow other people by pressing the button the left button from the top right. Now you can type in the username of the person, you want to follow, in the “Search...” text field. If your desired user pops up, you can follow the user by pressing the “follow” button to the right. You can also unfollow the user by simply pressing the “unfollow” button to the right.

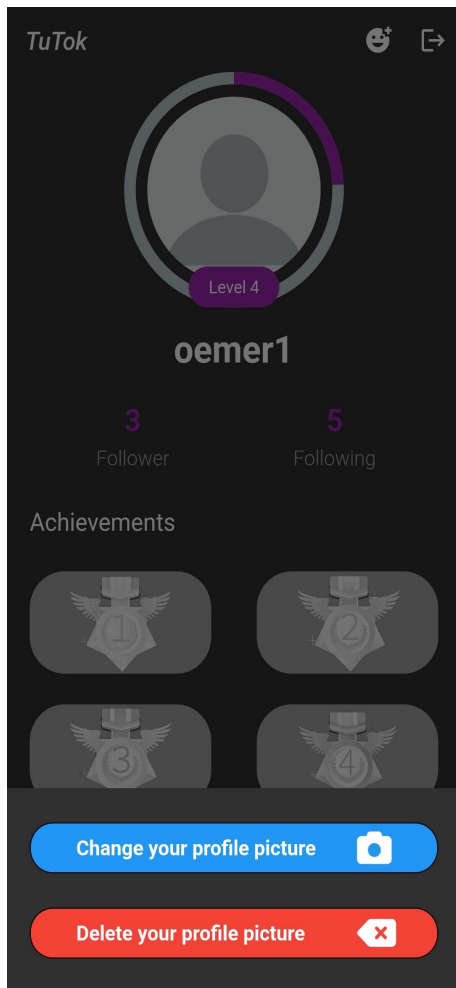


Abbildung 17: Change Profile Picture

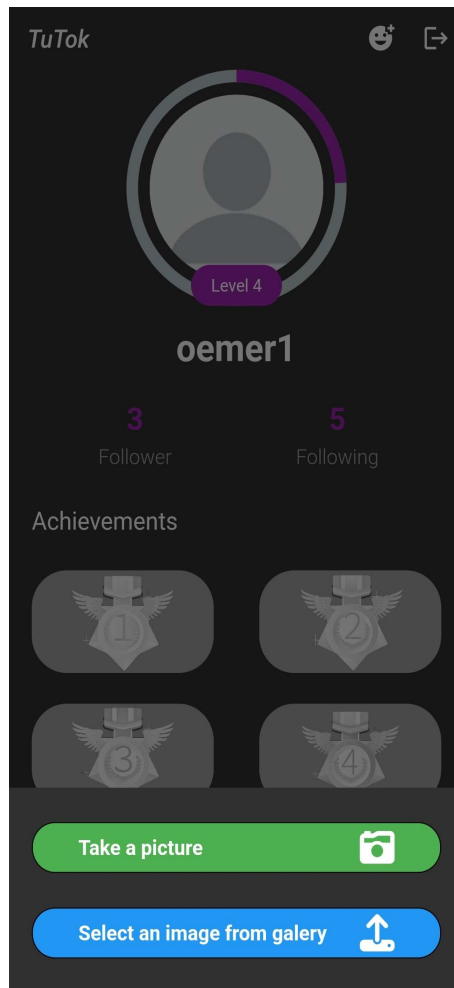


Abbildung 18: Upload Picture

To customize your profile, you can add a profile picture, by simply pressing on the basic avatar until you see a pop-up at the bottom. By pressing on “Change your profile picture”, you can either take a picture in the app, or you can select an image from your gallery. If you pressed the “Take a picture” button, you have to allow TuTok to have access to the camera. Now you can take a picture and confirm it. If you pressed the “Select an image from gallery” button, you have to allow TuTok to have access to the files on your device. Now you can select an image from your gallery and confirm your choice. You can delete your current profile picture, by pressing the “Delete your profile picture” button. After that, the basic avatar will be your profile picture.

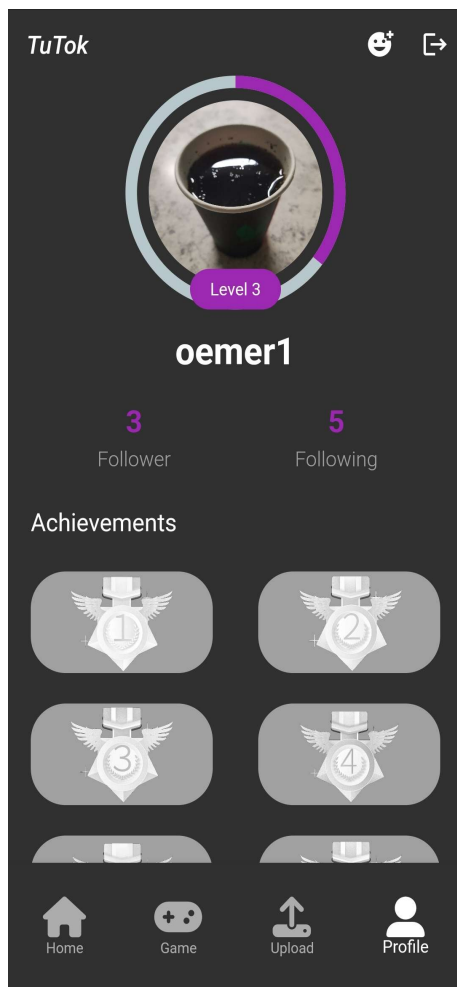


Abbildung 19: Profile Screen

Around your profile picture, there is a progress circle, which shows how much is left until you reach the next level. You can improve your progress and level up by playing games on the game page. Beneath your profile picture, you can see your username, and the number of people you follow, or the people, who follow you. You can also see the achievements, which are possible to unlock. For every ten levels, you will gain a medal. In the beginning, everything will be grey, but if you play more and level up, the medals will be filled with color.

6 Testing

We are using CI & CD - Continuous Integration & Continuous Deployment for Backend. Increased productivity and efficient testing are one of the leading advantages of a CI/CD pipeline. We can also Discover issues in software builds faster and, therefore, facilitate quicker resolutions. After pushing a change to a Git repository, it is automatically tested and if these tests pass, the new version is automatically deployed to our server. In the Frontend we are using Integration Testing in Flutter, since basic widget or unit tests don't test, how all of our individual pieces work together as a whole. Another aspect is, that through integration testing we can capture the performance of TuTok on a real device.

CI/CD PIPELINE



7 Conclusion

In around three months we build TuTok, an Android-Application where you can stream/upload/like/comment Clips, and also play Single-/Multiplayer games.

In these three months, we learned how to work as a team and complete a big project from start to end. We learned why you need to have good communication and also a good workflow in your team. Also, a big part of this journey was to experience the good and bad sites of git and how to make it useful for your project. Not everyone speaking german in our Team also had a big influence on our communication, everyone needed to improve their English skills and also needed to learn how to explain complex problems in English.

It was really exciting but also stressful to learn new technologies. We used Flutter for frontend because it is widely used so it has many features and we personally think it one of the best documentations out there. Flutter works with Widgets which makes it possible for us even with little to zero experience to make a good design for our app and include complex features like streaming videos or making an infinite scrolling algorithm. We can recommend Flutter for building applications on your device because most features are covered and the learning curve is extremely steep. Building a whole Server on the backend with Spring and AWS Buckets also challenged us as a team. We needed to learn how to communicate with the server from the frontend and the backend and how to give the data so frontend can comprehend it the best. Creating a communication scheme over WebSockets for the Multiplayer was also really interesting and challenging.

In the end, we can say that this project was really challenging but also exciting and made us learn much about app development and team working.

8 Outlook

First, we could publish our App to the Google Play Store. Then we could focus to make all features workable on IOS which wouldn't be that hard, because Flutter is a cross-platform framework.

We could then add a Video Editor in the App so that uploading clips become more spectacular. Also, a nice feature would be to see other users' profiles.

It would also be nice to launch some special events for our Game e.g. when you play between 9-10 on a certain day you get a special achievement when you finish the challenges.