

Maddox Scott

Mr. Pierson

IB Computer Science, Period 1

22 March 2022

## **Appendix**

### **Appendix A: Citations**

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## **Appendix B: Interactions with client & advisor**

### **1. Initial Client Interaction 1, Text - 1/24/21**

Maddox: Hello, this is Maddox Scott, and I am making an app for my IB Computer Science class, that must fix a problem. You have previously mentioned that many cycling route tracking apps provide specific details and statistics for each individual ride, such as total duration, speed, and distance. However, on many of the popular cycling apps, there is little documentation for accumulative statistics for all of your rides, such as where all you have ridden, total time spent biking or distance biked for longer time spans, such as a month or year. You mentioned that having the ability to compare rides or view accumulated statistics could prove integral to improving as a cyclist, and would like an app to do so. I spoke to you previously when you pitched the app idea and spoke about you possibly being my client for the application, which means that you'll provide feedback and concerns regarding my app. Are you still willing to be the application's client?

Christopher: Totally! Just let me know what all you need.

Maddox: Great, thank you for being my client. For the app, I want to provide a way of keeping track of accumulative statistics, in order to provide benchmarks or data that could be utilized to improve cycling performance. I also want to provide a method for viewing every single cycling route or segment in a single map UI, so that the user could see what roads they have ridden on the most, or places they have yet to bike. I haven't yet decided on whether individual ride data will be imported manually or by importing a file, but both methods are feasible. Before I can begin designing the app, I need to consult with you in order to determine what criteria must be met in order for the app to be successful in its purpose. I have some questions that would be very beneficial if you answered them.

Maddox: What core features are you looking for in this kind of app?

Christopher: If the hook is cumulative stats, make sure that we can compare multiple rides. Would also be a bonus to compare across users as well. The intensity (maybe speed per segment, how long the ride was) would be good to know as well. Some sort of statistic for the intensity. I may have ridden most of the good rides where I live, but at what intensity and how does that compare?

Maddox: Are there any side features which would be useful to have? (Login page with individual users, ability to remove individual rides from the total list, other random features).

Christopher: You have to have the ability to edit and remove rides. It never fails that there is a gps error or you leave the app on once you get in the car.

Maddox: Alright. Also, I understand that you already track your rides using a mobile application. Which application?

Christopher: Strava and Garmin.

Maddox: What type of mobile device do you use to run this tracking app?

Christopher: Garmin and Wahoo units. Sometimes iPhone.

Maddox: Would running two tracking apps at the same time create issues? If so, would you rather prefer for the app to just read external gps and activity files after the ride rather than track the ride itself?

Christopher: it wouldn't bother me assuming it didn't mess up any of my existing device connections. If it messes up my routing, that's a non-starter.

Maddox: What device would you like the app to be on?

Christopher: Probably iPhone

Maddox: What would you like the app to be called?

Christopher: Big momma's gps tracker.

Maddox: Really? Not sure if I can get away with the happ having a name like that

Christopher: Fine, have it your way. Name it something simple like "Route Analyzer"

Maddox: Any color schemes or UI feature requests?

Christopher: This is a good question. I think you 1) need to ensure that you avoid small and light gray text (strava, training peaks). That is STUPID. I would spend a lot of time on stay visualization. Make it look cool. Not basic and not over the top - but modern with slight animations.

Maddox: Alright, thank you so much for the feedback, I'll start implementing it into the design. I'll give you a progress update once I get a working prototype up and running.

## **2. Advisor Meeting 1, In person - 1/26/2022**

Maddox: Just spoke with Chris, he said he'll be my client.

Sean: That's good to hear. I think he'll have more fun with it than Tony would.

Maddox: I also looked around, and it turns out that flutter has a Strava library that lets me import Users and user location directly from Strava.

Sean: Are you sure you have enough time for that? Integrating strava means handling connections between different applications, not to mention internet connectivity and access privileges. You're coding in a language that you've never used before and you keep adding new features to the list. You're never going to finish the app like that.

Maddox: Okay, I'll skip it for now. Maybe it can be something to add after the project.

### **3. Client Interaction 2, Email - 2/26/2022**

Maddox:

Hello,

This is Maddox Scott again, and I have some wireframes and flowcharts for the cycling app I am making. The first diagram is a wireframe for each state of the application, and the second one is a general flowchart for the app's functions. The last document attached is a use-case diagram just to show how different users interact with the app. Any feedback would be greatly appreciated.

Also I am looking into direct Strava integration with the app, but it's a large task to implement, so I'll hold off on doing so for now.

\*Pictures of first iterations of wireframe, flowchart, use-case iterations linked

Thank you for your time,

Maddox Scott

Christopher:

Some thoughts:

1) on the UI flow you have delete as the second option. Do you expect this to be a frequent occurrence? If not, I would place last in the list. My guess would be that new and compare and analyze are all used more frequently and thus should come before delete.

2) Do you need to map out a recovery password/userID flow?

3) how does the app work if there is no connectivity? is there an offline mode? should that be the first check?

Let me know if you need more feedback. glad to dive deeper.

Maddox:

Thanks for the quick reply. I will move the “delete activity” button to the bottom of the menu. The user won't use that very frequently anyways. Also, the user is capable of resetting their password from the new user screen. There just isn't an individual screen for password recovery. Finally, the internet connection concern is a considerable problem. The application needs to function in any location, including bike routes with no connectivity, So I will try to have the app fully function without an internet connection.

Thank you for your time,

Maddox Scott

#### **4. Advisor Meeting 2, In Person 2/28/2022**

Maddox: So it turns out that the gpx library that I've imported into my program doesn't have any methods for returning total distances or durations from gpx files. Any ideas for how to get them from the files?



Sean: If there's no method already made for getting those, then it would mean making a loop that sums the durations and distances between each GPX coordinate within the GPX file. You would also need to figure out how to convert the latitude and longitude differences into miles, which is a whole nother beast. For this app, you can always have the user manually type in statistical information.

Maddox: Really? Wouldn't that be a little cumbersome?

Sean: If the user has their Strava rides which they got their gpxs from, then they'll also know the total distances and durations already, so it won't be hard for them to just type it in.

Maddox: Alright, I'll have a pop-up screen where the user can type those in.

## **5. Client Interaction 3, Email - 3/13/2022**

Maddox:

Hello,

This is Maddox Scott again, and thank you for your feedback from the last email. I have an initial prototype ready, and a video of it functioning is linked below. I have noted and made the following changes:

- The "Delete Activity" Function was moved to the bottom of the home page, because it is something that the user does infrequently.

- The Application saves data locally, so the application should function just fine without a connection.
- The user is able to reset their password using the "New User" page.

Some other design changes I made:

- Social Sign-On is a feature that would require a large amount of extra work, which is outside the scope of the project and its timeframe. If I had the time to implement it, I would also focus on direct strava integration.
- There is no between-user share feature as of now, because communicating with other applications and programs is difficult to incorporate on IOS. Although, sharing between users of the app could likely be implemented after the project's timeframe.

I have linked a video below of the app running through its processes to record and display data. I have not yet set up the accumulative or comparative Google maps widgets yet, but for the next iteration, the user will be able to see all of their routes in a single map. For now, the user manually provides such information.

<https://drive.google.com/file/d/1U8d3U2ytGugV3gjXwW14q6dhpM82hzEG/view?usp=sharing>

Lastly, if you have the time, I would greatly appreciate it if you would export some of your strava activities in GPX format to me. The app pre-loads GPX files before run time, so I have to add the GPX files to the correct directory before deploying the app. Before next week, I will have a final product ready for final testing.

Thank you for your time,

Maddox Scott

Christopher:

Hey - sorry this got buried in my inbox. Adding work email so I will respond in AM.

Christopher:

Alright, some thoughts 1) Why is the background of every page gray? Makes it hard to view black font on gray backgrounds 2) Will you map widgets use some version of google maps, or some other map function? Google adds location names and markers, would be cool to add.

Everything else looks great. I think some of these should be rides. Just grabbed what was local. LMK if there's not any data (just course data).

-Afternoon\_Ride.gpx

-And\_it's\_another\_bear\_while\_climbing.gpx

-Morning\_Ride.gpx

## **6. Advisor Meeting 3, In Person - 3/16/22**

Maddox: Can you come look at my code for a minute? I have an issue and I have been trying to solve it for almost a day now.

Sean: Sure, what's the issue?

Maddox: I have a method that converts an activity to a polyline. Polyline are used to display routes or lines on a google map. In order to convert the GPX code to a polyline, I have to call this method to read the gpx file's contents and pull all of its gps coordinates out. I run this method for every activity, but when the map widget builds, no polylines appear. Any thoughts?

Sean: Why are you reading the gpx file contents with an asynchronous method?

Maddox: Flutter can only access file contents asynchronous.

Sean: It looks like the moment that you call the readCotents method, the entire constructPolyline() method becomes asynchronous, so the map is built without waiting for the polylines to finish. You'll have to construct those before the page load is called, so that they are ready before the map is built. You can probably use a loading state to wait until all polylines are finished.

Maddox: Ok, I'll give it a shot.

#### 7. Final Client Meeting, In Person - 3/20/22

\*The application was installed onto Christopher's iPhone 11, using XCode to deploy. After launching the app, Christopher spent several minutes testing the application for its success criteria, as well as how it handles bad data.

Afterwards:

Maddox: So that's my 'final' version of the application. Any comments regarding whether or not it achieves each of the success benchmarks you set?

Christopher: Thanks Maddox. This is very good to see. I like where you are at for this point. As you showed me, the app can clearly get the routes from the strava files and map them. I could restart the app and data persisted so local saving worked as intended.

Maddox: That's good. And what about for criteria 2?

Christopher: The google maps were great. I loved to see location markers linked to the roads I've biked on. Zooming worked as intended, but a recenter button would have been handy.

Maddox: Noted. I'll add one. What did you think about the comparison feature?

Christopher: It functioned just like I hoped it would. I appreciate the consistent colors for ride routes and fonts. Color-coding statistics let me see which ride was better just at a quick glance. In terms of where to head next, I would really start to think about different data visualization, such as graphs or charts. Cyclists can be data nerds and perhaps that is the gap this fills. Mobile cycling app data visualizations are not great today. Don't listen to anyone who tells you differently!

Maddox: Sounds like a good direction to take. Were you able to sign in fine?

Christopher: Sign-in worked. I made my user and was able to log in with it after restarting the app. If you keep working on the app, I would love to see social-sign-in integration, like signing in through google or facebook accounts.

Maddox: Oh, I forgot to ask. What did you think about the accumulated statistics page?

Christopher: This was easily the highlight of the app. Being able to see all my rides in a single map was neat. The distance and duration totals also helped set all my biking into a proper perspective.

Maddox: And you were able to delete activities ok?

Christopher: no issues on that front. You told me to check and yup, deleted activities don't affect the accumulated statistics. Would have been bad if they did.

Maddox: Any UI thoughts or improvements?

Christopher: There are some UI elements, and it's early to call this out, that would be useful to update as you progress. For example, when comparing rides, the ride title color and the data container backgrounds should match. It helps the user quickly understand which ride they are viewing. But all of the fonts in the app were high contrast and easy to read. I didn't see any too-small text, so all is good there.

Maddox: Awesome. Looks like all success criteria were met. Any suggestions for additions moving forwards?

Christopher: I already said more visualization, but I would love to see Strava integration at some point. You said a while back that Flutter has a Strava library, so that could remove the need of having users add activities in the first place. Also, you will obviously want to add the integration for automatic distance and duration getting, given that the GPX files have this information stored.

Maddox: Sounds great! I'll try to add these in the future!

Christopher: Keep working here, and thanks for letting me be part of the process.

## **7. Final Advisor Meeting, In Person - 3/20/22**

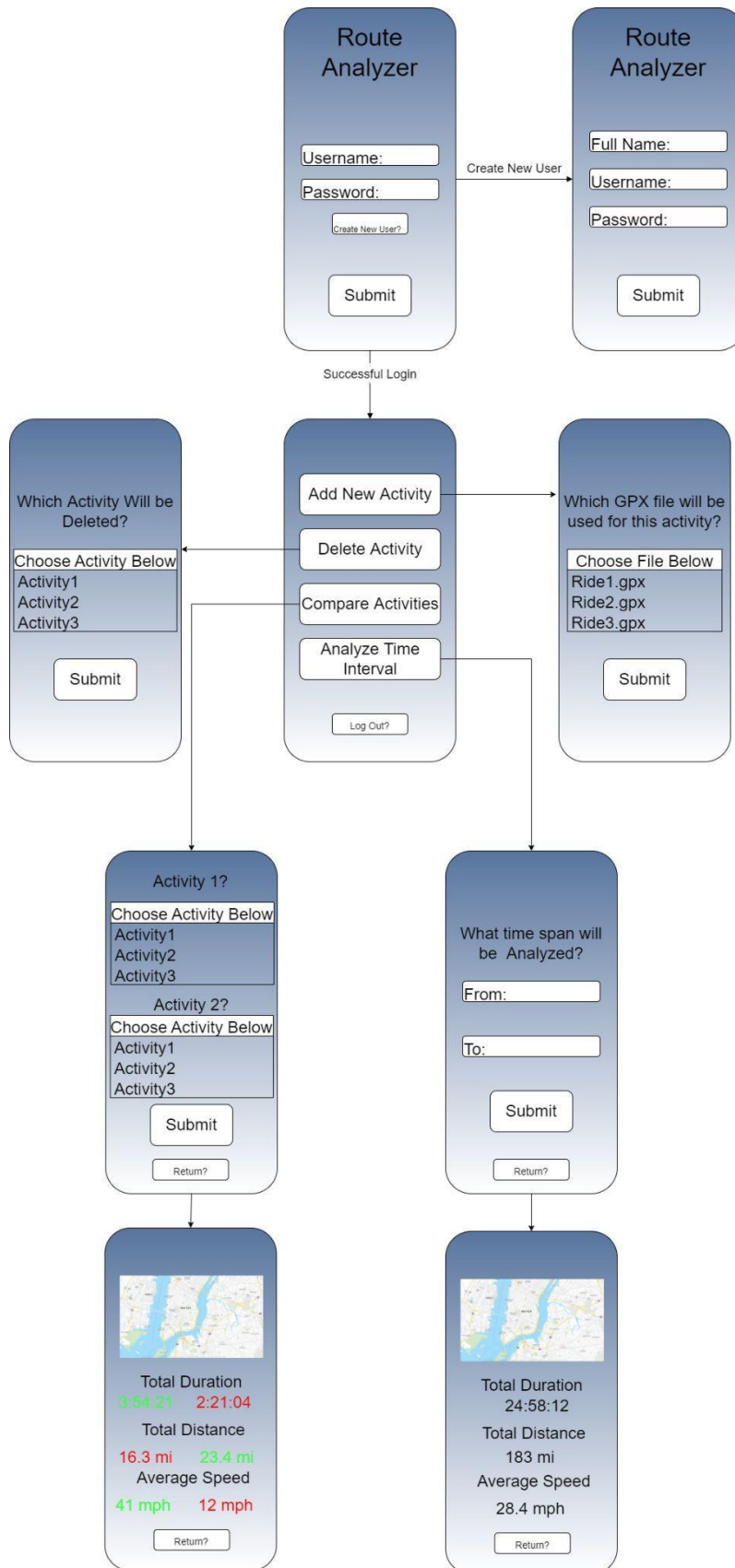
Maddox: I deployed the app on Christopher's iPhone. He had all good things to say, with some good feedback and possible additions. You've seen my final build, so is there any feedback or adjustments you think should be made?

Sean: Your “delete activity” algorithm worked very well, handling different contexts well. If the user can delete activities, I think It would be a good addition to have the ability to delete users as well. This wouldn't be related to any of the success criteria, but it is a good UX feature to have.

Maddox: Shouldn't be too hard to implement, I'll try it out!

## **Appendix C: UI Design Progressions**

First Iteration: The entire application has a blue to white gradient in the background, to visually appeal to the user. Buttons and text fields have white backgrounds so they maintain readability.





Second Iteration: The blue to white gradient has been replaced with a constant-blue-gray color.

This is to reduce visual clutter and confusion. The awkwardly placed “Route Analyzer” title has been replaced with an app bar, which persists between all pages. Return and logout buttons have been made smaller due to their less frequent use. Buttons have been made blue to keep with the aesthetic consistency with the app bar. Slight screen animations trigger on view change, as requested by the client.

Example Screens:

## Route Analyzer

### Login

## Route Analyzer

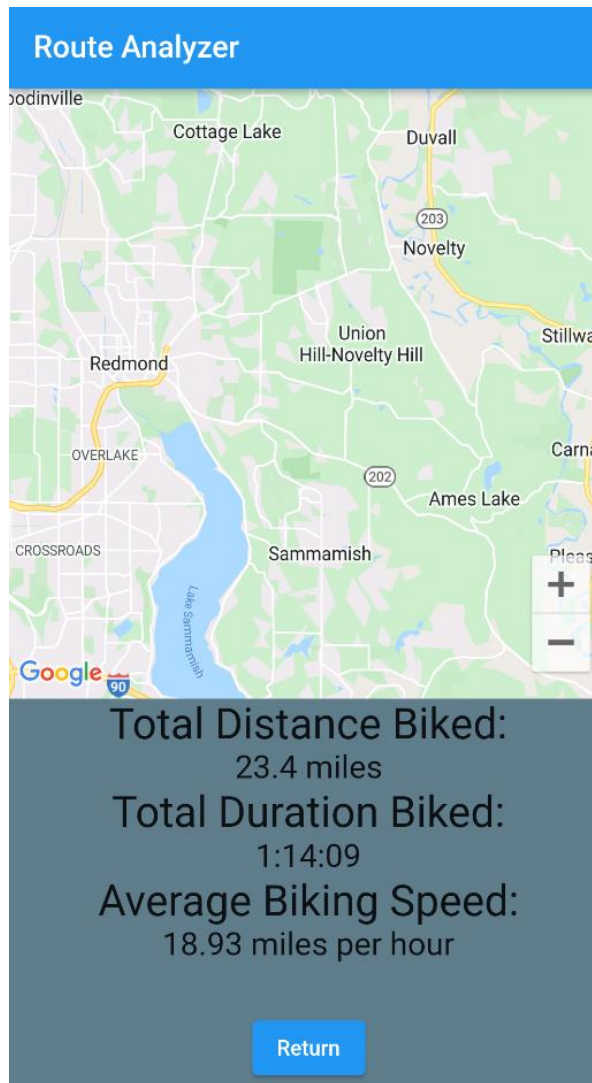
Add New Activity

Delete Activities

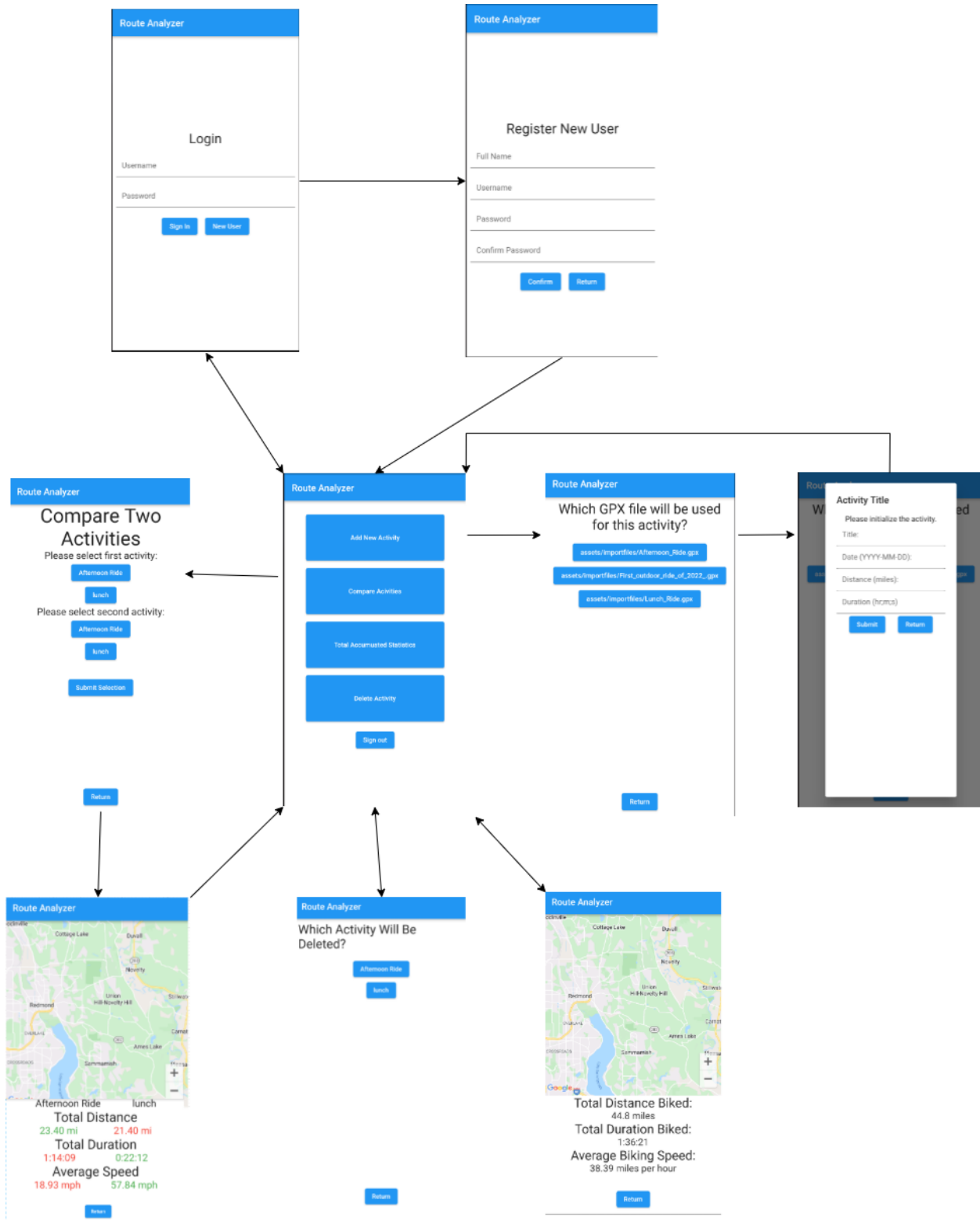
Total Accumuated Statistics

Compare Activity

Sign out

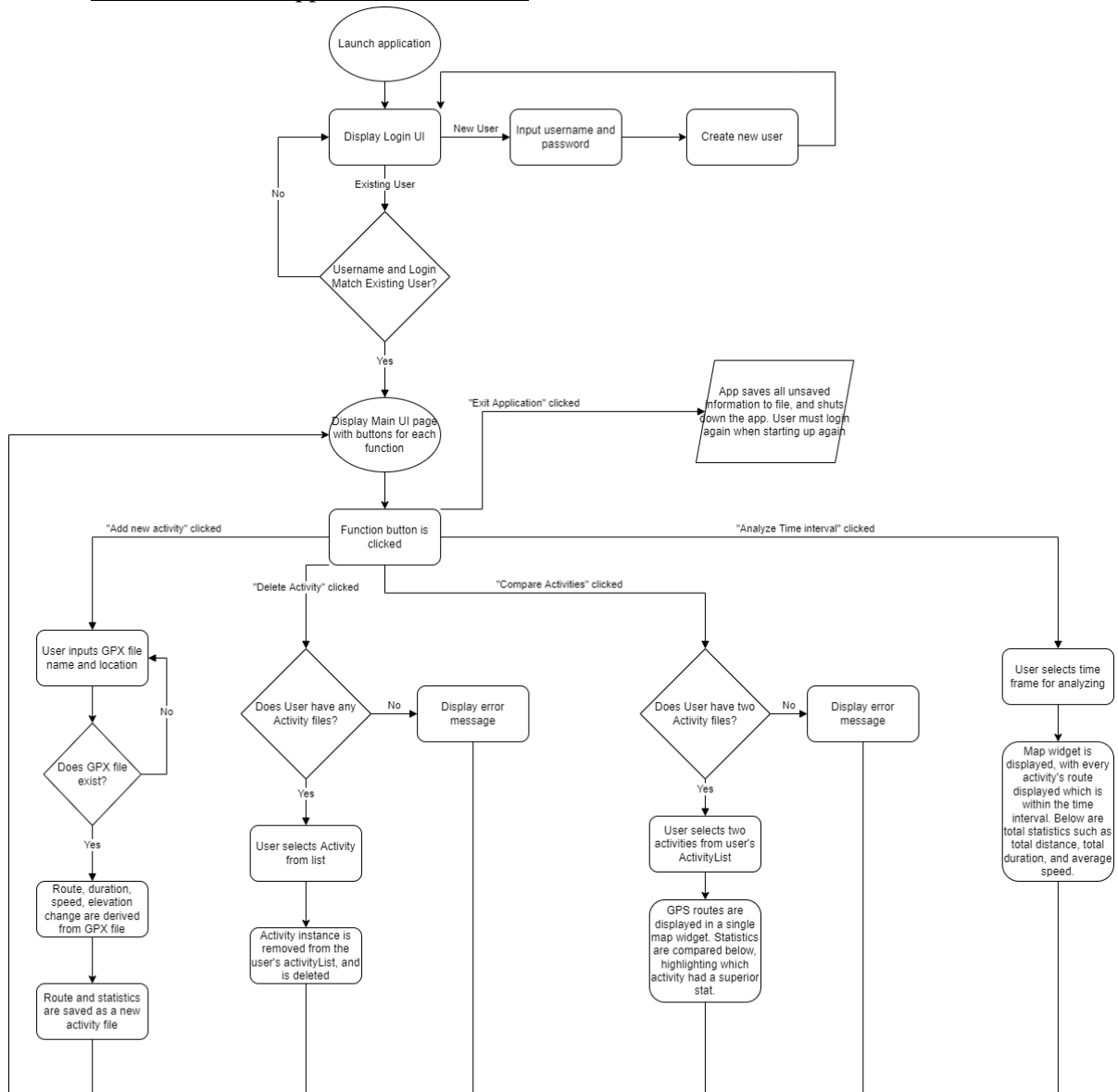


Final Iteration: Background color has been changed to white, as back text on blue gray proved difficult to read in some scenarios. The “delete activity” has been moved to the bottom of the hub because of its infrequent use, at the request of the client.

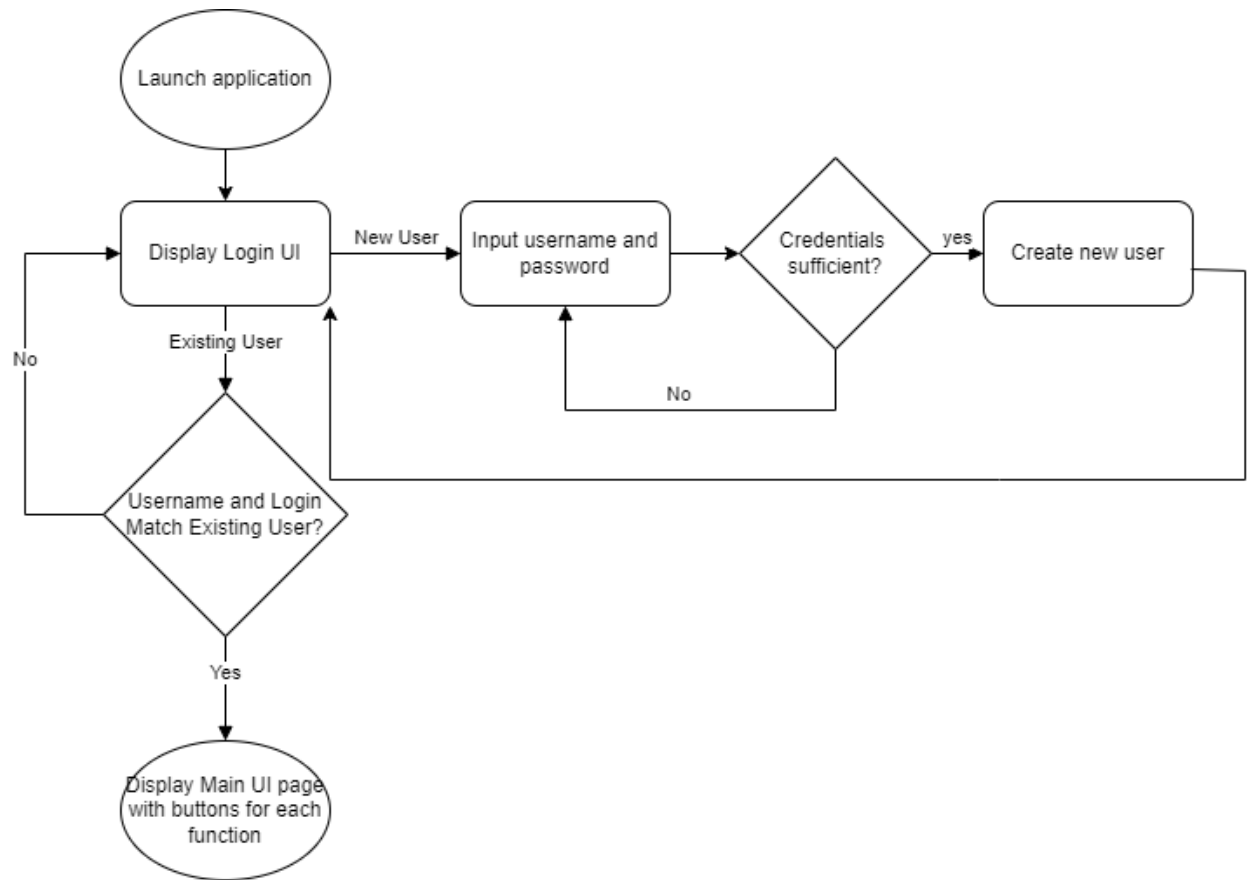


## Appendix D: App Design Progressions

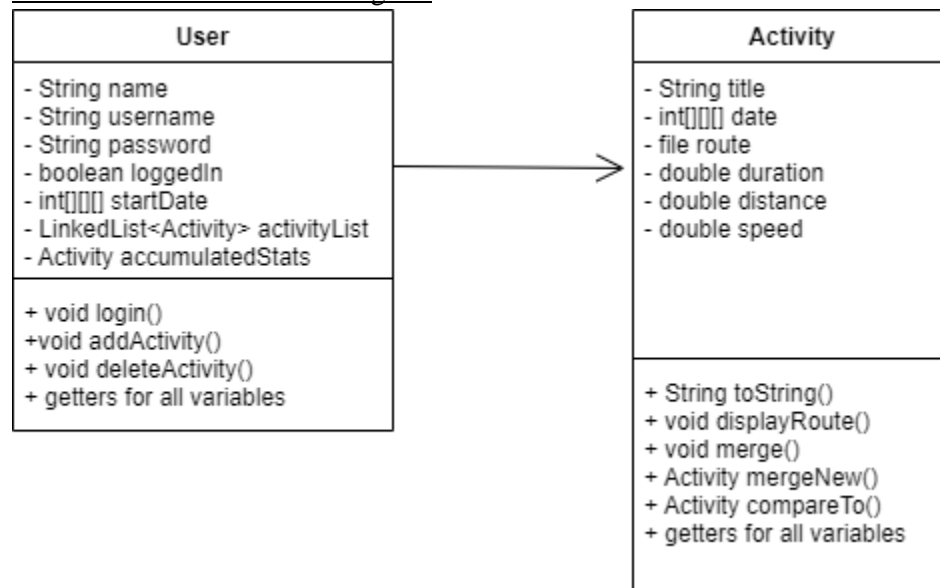
### 1. First Iteration of Application Flowchart:

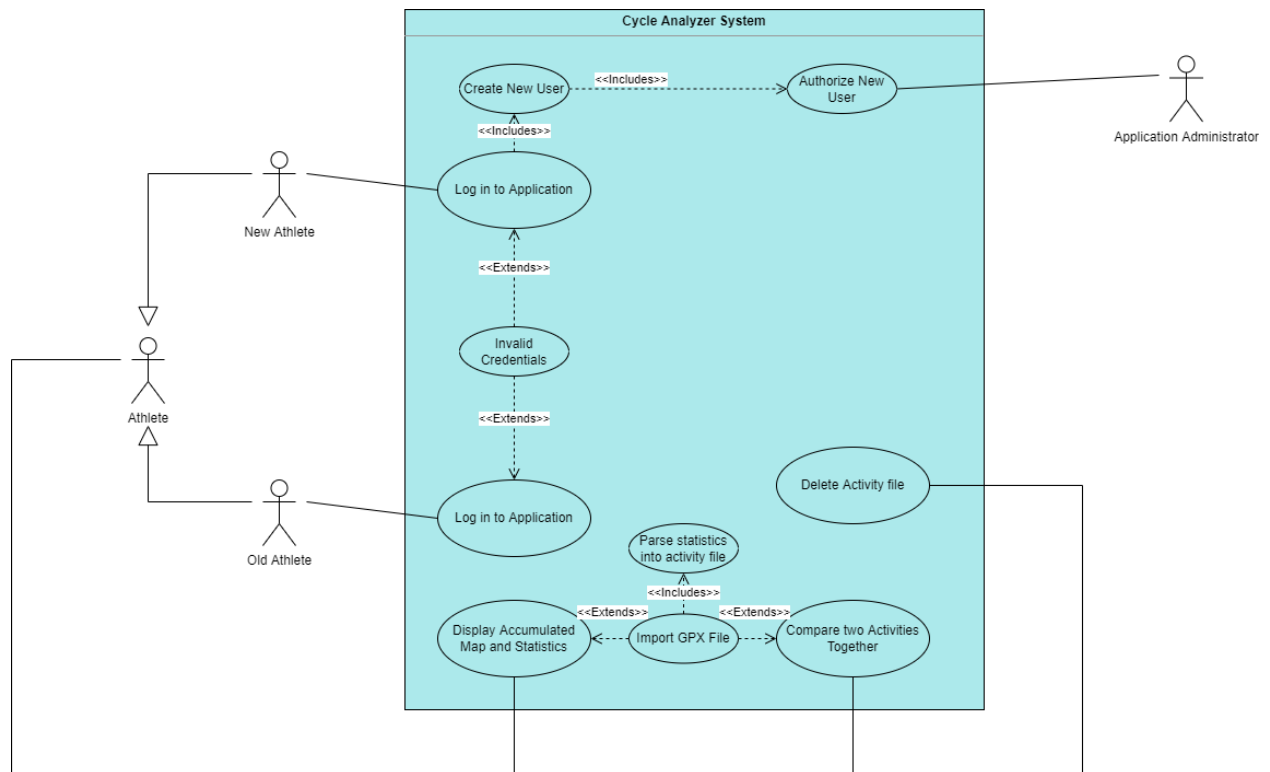


### First Login Flowchart Iteration



### First Iteration of Use Case Diagram





First Iteration of converting an Activity's GPX file to a mappable object



```

void constructPolyline(Activity activity) async {
    print('CONSTRUCT POLYLINE CALLED');
    List<LatLng> polylineLatLongs = [];
    String contents = await readFileSync(activity.routeFile.path);
    Gpx gpx = GpxReader().fromString(contents);

    //debug messages
    print('trks: ' + gpx.trks.length.toString());
    print('trksegs: ' + gpx.trks[0].trksegs.length.toString());
    print('trkpts: ' + gpx.trks[0].trksegs[0].trkpts.length.toString());

    for (int i = 0; i < gpx.trks.length; i++) {
        for (int j = 0; j < gpx.trks[i].trksegs.length; j++) {
            for (int k = 0; k < gpx.trks[i].trksegs[j].trkpts.length; k++) {
                polylineLatLongs.add(new LatLng(gpx.trks[i].trksegs[j].trkpts[k].lat,
                    gpx.trks[i].trksegs[j].trkpts[k].lon));
                print('ITERATION DONE');
            }
        }
    }

    //debug message
    print(polylineLatLongs.toString());

    _polylines.add(Polyline(
        polylineId: PolylineId('0'),
        points: polylineLatLongs,
        color: Colors.blue,
        visible: true,
        width: 10)); // Polyline
    print(_polylines.toString());
}

```