Diary for Major Project

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Introduction

This is a weekly blog, every Friday for my major project in Aberystwyth University.

Main Idea of the project: An android app that collects daily data from a user on how they feel that day(mood of the day) and various questions on how well they have fulfilled some needs on a scale [1-5], example questions can be on: sleep, movement, social. Then use statistics and machine learning to visualize and predict what is important for the user. Some individuals have a better day when they fulfilled their needs on movement and socializing, while other NEED to feel well rested. Maybe allowing the user to add various other questions depending on what their wants and needs, e.g. spirituality.

The niche of my application will be to ask questions subjectively and getting them to think over and reflect on their day while answering the questions. The reason it's subjective is because different people will rank their question differently. A "Couch-potato" might feel fulfill in movement/exercises from walking to the shop, while an athlete will not fell fulfilled at all from the same activity.

Possible extension to the project: Could add a opt in service for the user to share their data with others/public (Anonymously) where more population study might be done. As encouragement to opt in on sharing their data could be to have access to the wider study/statistics in the app. Other method of accessing the data might be through an a website, a twitter bot (Similar to @GWASbot `https://twitter.com/sbotgwa?lang=en`) that post regularly study/statistics, or access through an API for other to run their own studies.

In this second part would have a focus on security and protecting the identity of each user (This would not be as important in the first part as the data would be stored locally).

Technologies

The different technologies that would be put together in this project would be:

- Android development (front-end and back-end)
- Kotlin
- Database and data management

- Statistics
- Regression
- Machine Learning
- Security
- Firebase
- JSON

Even though I have not have had any formal training in Android development, except for second year group project, I think it is an important skill to not be bounded by already known skill. Also by using an app my ideas and products can be more easily be picked up by other users.

KANBAN board

Because I am cheap and all kanban software seems more complicated than I want. Therefor I have a simple table here with various section that I will try to use. Items on done will be removed after a while, depending on importance and difficulties

TODO	**Research**	**In progress**	**Refactor**	**Done**
Enhanced linear plot	Google Fit API			Data 2 CSV
	Pedometer			Firebase Auth
				Synthetic data V2

Table 1: Kanban Board

List of Past Dones: "Set up local DB", "DB for needs", "Linear Graphs", "Regression", "External DB"

1 Week 14 (DUE DATE), April 30

1.1 Meeting summary

Meeting was brief, just giving tips.

1.2 Progress

Just a lot of writing on documentation.

1.3 Focus of Next week

The next coming weeks will be focused on preparing for Project Demonstration.

1.4 Problems

If I see any major problem now, to bad! It is deadline!

1.5 Ideas

I need a break.

2 Week 13, April 23

2.1 Meeting summary

Questions:

- Should/can we open the Git repo so the supervisor can access and se our use, or just tell them we used Git?
- Should we add a link to our blog? (19 pages)
- For item above, how should we reference it? Appendix, Bibliography, or just mention & link in the text?
- How much reference? Reference every singe software/tool/serviced used, Android studio, firebase, or is it sufficient to just mention them in text?

2.2 Progress

Currently I have just been familiarizing myself with the structure of the template report and writing some drafts for some easy sections.

2.3 Focus of Next week

Main focus until next week will be finishing the documentation for this project. There might not be time for any other tweeks in the code!

2.4 Problems

2.5 Ideas

3 Week 12, April 16

3.1 Meeting summary

3.2 Progress

Started on the Major project report, setting up the document and familiarizing myself with the format and what I need. This can be accessed at: `https://www.overleaf.com/read/bsqkbvcvhmst`.

3.3 Focus of Next week

3.4 Problems

3.5 Ideas

4 Week 11(Easter Week 3), April 9

4.1 Meeting summary

There was no meeting due to Easter break

4.2 Progress

All of the tests and more have been converted to fit the new database. A lot of test focus on the registration and log in security of the application.

The synthetic data generator have been upgraded to generate the wants based on randomly generated needs with a preset linear function relation between the needs.

The firebase DB has now become more secure with updated rules to only allow users with to access their own data. This was not really an problem within the application, but outside it makes the DB more secure from outsiders. *I thought that these rules would be much harder to implement :) *. The simple rules can be seen in **Figure 1**

```
{
  "rules": {
    "user": {
      "$uid": {
        ".read": "$uid === auth.uid",
        ".write": "$uid === auth.uid"
      }
    }
  }
}
```

Figure 1: Updated Firebase rules

In addition I have created a python script to allow authenticated users to retrieve the participants data to run their own statistics. This was done with **Pyrebase4** (url-https://github.com/nhorvath/Pyrebase4) a continued supported version of the original discontinued unsupported Pyrebase. It currently only downloads the default data for all users who has allowed their data to be used, and there is only a single authorised user.

4.3 Focus of Next week

For next week I intend to set up the basic structure of the documentation, adding mostly empty section on what I want/think i should include.

4.4 Problems

Had a problem with firebase auth and accessing the users data, needed to call the whole path to user's ID to be able to retrieve data. In stead of "DB" then "/user/$userID/..." it had to first call "DB/user/$userID/" then "/.../"

4.5 Ideas

5 Week 10(Easter Week 2), April 2

5.1 Meeting summary

As I still had a lot of features still in the working I did not feel the need of a meeting, as there was not much progress since last week to have an one-on-one.

5.2 Progress

This week was focused on making a method of registering users with Firebase. This transformed into emigrating the local database onto firebase. While registering a user, they will enter various information about themselves, this could mostly be used for cohort studies to identify differences between sub-groups. Due to a lot of changes in regards to changing storage mechanism, there might be features out of date, e.g. much of the testings (this will be migrated by next week)

5.3 Focus of Next week

For next week I will want to fully migrate the application to firebase (mostly the testing atm). Also upgrading the synthetic data generator, with methods talked about last week.

5.4 Problems

Had some problems with setting up firebase and connecting it to kotlin. This seems to be because adding JSON file (file generated by kotlin to connect to it), would not contain the database location. After much research, testing, and failing, I figured out that this problem could easily be fixed by re-generating the JSON file; as it was generated before the real-time database was initialized.

5.5 Ideas

Should probably start drafting a bit on the documentation and staring on finalizing part of this project.

6 Week 9(Easter Week 1), March 26

6.1 Meeting summary

Solo meeting giving me valuable pointers on where I can expand. e.g. what additional information of the user that could be useful, ethnicity, gender and nationality. I could also focus on the synthetic data generator, instead of randomly generating all the data, I could generate only the need, then using a estimated function to get a more "real" generated data.

6.2 Progress

Have finished the regression and added Spearman correlation to prepare for step count, as this factor will not be normalized and the same range as the other values. Generating of synthetic data has been done, by using randomized values with a with larger centralized data points around a given value (e.g. happiness with main set of values around 4). Implemented a simple pedometer from reading the raw values of pedometer of the collected steps since boot-up.

Also implemented more extensive test for the UI with espresso, should have been done earlier, but better late than never. As well as putting UI tests and unit test into suits automate better.

6.3 Focus of Next week

Focus for next week is to improve the pedometer, hopefully with the help of "Google Fit API", as an additional feature I want to include a activity that enhances the linear plot, either by comparing two data-sets or show the individual data-set alone.

6.4 Problems

From my research on pedometer it logs the total amount of steps since reboot, making it more complicated to get the daily steps; can store the last raw value and retract last days value from the new value, but this comes to problems when user forgets a day (current stupid solution is to let the user edit the value themselves).

There is also google fit API that stores this data, but from my initial research this seems a bit to complicated and will ask around in the meeting if it is any good documentation/tutorials for this, as the quality of resources looked in to is lacking.

6.5 Ideas

Synthetic data generator can be more advanced by only generating the need, then with a estimated regression function we can get a more accurate want value. Registration screen, where the user inputs values about themselves, e.g. ethnicity, location, ect. Currently no ideas in my head 0.o

7 Week 8, March 19

7.1 Meeting summary

Went through our progression and how our mid project demo went. For me this went OK, as I might have rushed the more important bits and could have spent more time on this (10 minutes is not that much to talk about all my thoughts). I got som good ideas out of this demo, e.g. implementing step-counter as another factor of corresponding what makes a day "good".

7.2 Progress

I tried to implement a Naive Bayers ML method to help see how each need affect the want. But as this was harder than expected with few data-points and it inspired me to implement supervised machine learning method linear regression. I took initial inspiration from Thomas Nield (github:`gist.github.com/thomasnield/fbe2e2205233388577e6abe6f5bbe897`). But heavily edited and made my own regression method.

7.3 Focus of Next week

As next week is the start of easter, I might do more spike work than constantly working, but will try to get as much done as possible.

7.4 Problems

Local minimum can be a problem, where in "f(x)= mx + n" changing n and m independently can be a problem.

7.5 Ideas

8 Week 7, March 12

8.1 Meeting summary

Meeting this week were similar to previous, but because I this week had focused more on other modules and front end, I had not much new to show. We got some pointers on how our mid project demo will take part next week, mine is at Tuesday, 16. March, 16.10.

8.2 Progress

This week has been mainly housework: refactoring, rewording, and fixing bugs. Most noticeable here was the change from "subjective needs or active needs" to "needs and wants", indicating that one **wants** to become happier, and a movement is a **need**.

I finally made a semi-set simple icon for my application. It is created with Microsoft PowerPoint and combination of its icons.

Figure 2: Application icon for identify the application better, created with Microsoft PowerPoint

Figure 3: Application icon with background.

The UI has also gotten an overhaul, going from the standard Android Studio theme of purple to a more mood enthusiastic color theme based on orange. For information of why orange is chosen, see the ideas section for this week.

My focus for this week has been an assignment in another module about a poster of my work here. This poster can be accessed in the documentation section in my GitLab repository.

8.3 Focus of Next week

Prepare myself and the project for coming mid project demo. Making a plan on how and what to show. Also improving the style of the application, as I know that some parts

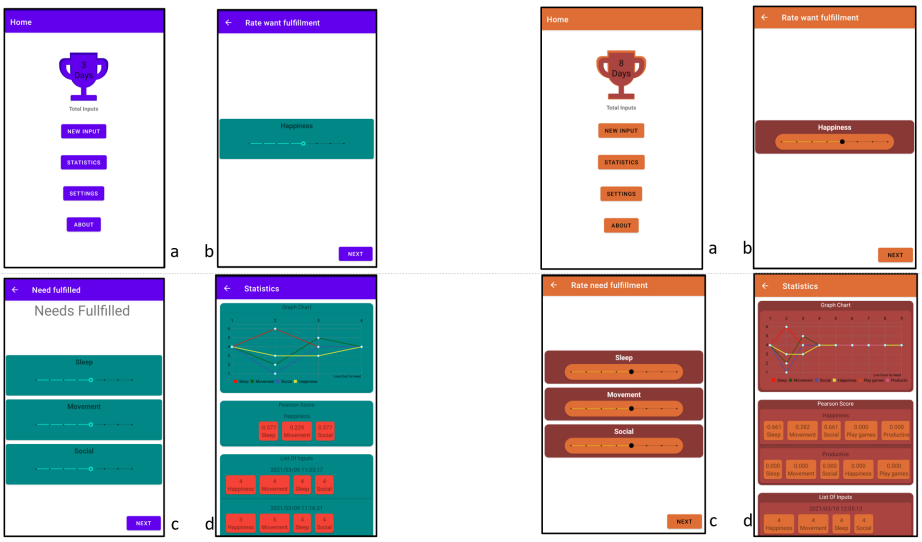

Figure 4: Comparison of old style(left) to new style(right) for the process of inputting a new day rating

can have a different and larger font and colour for more easy readability (e.g. black text on dark background).

8.4 Problems

Finding the right colour combination can be hard, will have to do some more research to find the best combination, and if the shade of orange is the right shade, as there are at least 50 shades of orange, maybe a more yellow tint.

8.5 Ideas

Will the mid project focus on the application or the coding? Would expect to be mostly application, unless I/we want to show our "beautiful" code.

Finding a good colour combination is essential, as colours can be an important role to influence our mood and perception of any situations[BHS03]. I have chosen orange as it has been shown to give the individual a sens of excitement and enthusiasm [Che20; Che19]

9 Week 6, March 5

9.1 Meeting summary

Showcasing our progress to our extended group, giving each other ideas and pointers how and where to improve. This also gave me an introduction to how to preform my mid-project demo that will soon happen

9.2 Progress

This week I have been focusing on allowing the user to add custom subjective needs or active needs and run statistics on it.

9.3 Focus of Next week

For next week I will take a bit step back from this project, only doing small refactors to make it everything worded more correct. This is in regards to making time to focus on creating a poster about this project.

9.4 Problems

Subjective needs or active needs does not "feel" like the right words. Maybe replace the words with something better

9.5 Ideas

10 Week 5, February 26

10.1 Meeting summary

10.2 Progress

Learnt about linecharts and settled on MPAndroidChart, `https://github.com/PhilJay/MPAndroidChart`, as this library contains a vast amounts of different plotting tools that can be utilized later and have a somewhat active community behind it.

10.3 Focus of Next week

Implementing a more flexible method for adding needs, giving the user a method of addind new subjective needs or active needs (subjective: Mood, anxiousness, ect. active: social, movement, work)

10.4 Problems

Need to think about better ways of communicating correlation to the user. ML seems to be more complicated as all inputs are variables, maybe by adding NB for all goals and see what fits the best for each active need.

10.5 Ideas

Maybe Spearman correlation will be better than Pearson, as this might reflect better any correlating changes between subjective and active needs

11 Week 4, February 19

Forgot to write,

11.1 Meeting summary

We discussed testing and different charts

11.2 Progress

Looked into testing and added a few simple test. Also made base for person correlation to see how similar two lists are

11.3 Focus of Next week

learning about graphs, specifically line chart

11.4 Problems

Implementing github libraries will be a new challenge Seems that charts are made for java, therefor learning to use java libraries in kotlin can be a challenge.

11.5 Ideas

Line charts can be good to display data

12 Week 3, February 12

12.1 Meeting summary

We talked about basic progress, mainly I/everyone focused on the project outline and basic research/tutorials

12.2 Progress

Have done some reading on what needs that I should have as default and doing rough UI. I have also started to set up a rough shell of the app to be able to move around it with some of the buttons.

12.3 Focus of Next week

Flesh up the application to be able to Look into cloud services(azur, awp, ect)

12.4 Problems

After starting making the shell of the application there has been some problems getting containers to contain other containers,specific recycleView in recycleView. Got it fixed after some spike work.

12.5 Ideas

Should think about tests and make some automated tests

13 Week 2, February 5

13.1 Meeting summary

In the meeting we mainly talked about our planning and process on project outline document, due 8th February.

13.2 Progress

The focus of this week has been to write up the outline of the project, the overleaf of this can be accessed at: `https://www.overleaf.com/read/pctnvhhdqshy`. By formally writing about the project helped me better explain the project and understand what needs to be done.

I have also set up a Private Github repository for storing the application and documentations, `https://github.com/RunarReve/MoodTrackingApp`.

13.3 Focus of Next week

Finishing outline and sketch out main part of UI

13.4 Problems

13.5 Ideas

14 Week 1, January 29

14.1 Meeting summary

Introduction, talking about ourselves and our plan on our project. Prof. Chuan introduced the idea to adding synthetic data to better showcase the analyses/study on the users of the app. She also showed concerned the data management and security of the users.

14.2 Progress

Done some tutorials for Android development and kotlin, getting a feel for how to do my initial project. Simultaneously I did some re-research/revision into databases and how to use it to communicate and access it with kotlin/android. Also fleshing out the plan for this project, starting on the project outline: `https://www.overleaf.com/read/pctnvhhdqshy`, familiarizing myself with the structure.

14.3 Focus of Next week

Next week I will focus on the project outline and setting up a private github repository for the app and some basic starter code.

14.4 Problems

Problems encountered during this week was putting my project idea into words and identifying how large the project should be. Due to these two problems there is a uncertainty if the project is sufficient to be a major project and might need to be expanded upon.

14.5 Ideas

With Profs idea with synthetic data, I have been thinking on setting up a small survey, e.g. Google Form, with questions that would be added in the app, to have some starting data, avoiding a cold start, when running my analyses on the population.

After consulting with a former student, he pointed out some ethical concerns (Mainly regards to documentations) from working with humans. I wonder how much regards this would relate to our projects?

15 Learning Resources

Firebase rules: https://www.youtube.com/watch?v=dx_gkSb-Ch0 Python Firebase: https://www.youtube.com/watch?v=s-Ga8c3toVY

References

[BHS03] Barry J Babin, David M Hardesty, and Tracy A Suter. "Color and shopping intentions: The intervening effect of price fairness and perceived affect". In: *Journal of business research* 56.7 (2003), pp. 541–551.

[Che19] Kendra Cherry. *The Color Psychology of Orange*. www.verywellmind.com/the-color-psychology-of-orange-2795818. Last accessed March 2021. Oct. 2019.

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