School of Computer Science and Informatics



Coursework Submission Cover Sheet

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Student Number	C1519696
Module Code	CM3203
Submission Date	04/02/2019
Hours spent on this exercise	7
Special Provision	

(Please place an x in the box above if you have provided appropriate evidence of need to the Disability & Dyslexia Service and have requested this adjustment).

Group Submission

For group submissions, *each member of the group must submit a copy of the coversheet.* Please include the student number of the group member tasked with submitting the assignment.

Student number of submitting group	
member	

By submitting this cover sheet you are confirming that the submission has been checked, and that the submitted files are final and complete.

Declaration

By submitting this cover sheet you are accepting the terms of the following declaration.

I hereby declare that the attached submission (or my contribution to it in the case of group submissions) is all my own work, that it has not previously been submitted for assessment and that I have not knowingly allowed it to be copied by another student. I understand that deceiving or attempting to deceive examiners by passing off the work of another writer, as one's own is plagiarism. I also understand that plagiarising another's work or knowingly allowing another student to plagiarise from my work is against the University regulations and that doing so will result in loss of marks and possible disciplinary proceedings.

Initial Plan – Activity Monitoring App

Author: Nathan Melly Supervisor: Dr Alia Abdelmoty Moderator: Dr Charith Perera Module: CM3203 One Semester Individual Project (40 Credits)

Project Description

Devices such as smartphones, smart watches, and activity trackers have become ubiquitous in recent years. Users willingly give their personal information, such as location, health, activity, and sleep data, to these devices, and many people use them in order to track their fitness and daily activity. This data allows people to quantify how active they are, and users are likely to be motivated to do more exercise and track their progress as a result.

The aim of this project is to see how a user can be profiled based on data extracted from a Fitbit activity tracker, and what insights can be gained about a user regarding their lifestyle. I will create a mobile application that stores and analyses the extracted data. The data will be mined in order to build a profile for a user which will be displayed within the application. This profile will provide the user with information about their daily activity.

The application will be able to tell the user when they are deviating from their "normal" profile (i.e. if they are less active than usual). This will be useful for users as they will be able to see clearly how they are deviating from their regular activity, allowing them to rectify the deviation by being more active, thus maintaining (or improving) their profile.

The application will set the user custom activity challenges, based on information in their profile with the aim of encouraging the user to be more active and improve certain areas of their profile. For example, if the user is particularly inactive on a certain day of the week, then the user could be challenged by the application to be more active than usual on that day.

Furthermore, I will endeavour to mine the data for any information about how the user's daily activity levels and sleep are related and display the conclusions in the application.

Aims and Objectives

Project Aims:

I aim to design and develop an android application that analyses data gathered from Fitbit devices and generates a user profile based on this data. The application should be able to alert the user when they are deviating from their profile. I aim to develop functionality within the application that visualizes how the values in the user's profile has changed over user-specified periods of time and allows the user to see how their daily statistics compare to these historic values.

Personal Aims:

Learn to develop mobile applications using the React Native JavaScript framework

I have some experience with JavaScript and no mobile application development experience, so I aim to use this project as an opportunity to learn a new JavaScript framework and gain some experience in developing mobile applications.

Objectives:

Objective 1: Gather suitable data sets

- Use personal Fitbit device to gather my own data
- Locate sample data online

Objective 2: Research existing similar solutions

- Identify and study the types of analysis and visualizations provided by similar solutions
- Evaluate the usability of their interfaces and identify good usability aspects to adopt in my designs

Objective 3: Gather requirements

• Identify primary personas and define key requirements for the applications

Objective 4: Design UI

- Research UI standards for Android applications
- Define what screens should be in the application
- Create wireframes for all screens within the application
- Write descriptions for all screens and components within the application

Objective 5: Design backend

• Produce design models and test cases for the system using UML

Objective 6: Develop and test application

- Learn React Native and implement the application
- The application should be tested against the requirements to ensure that all requirements are sufficiently covered by the application

Objective 7: Evaluate the usability of the application

• Conduct different types of evaluation methods, including Heuristic and User-based evaluation to test the usability of the developed system.

Initial Background

Fitbit devices gather a wide range of data about a user. This project will focus on data from three main categories: activity (daily steps, floors, distance etc.), heart rate, and sleep (deep, light, REM, awake). A user's data can be obtained from Fitbit via the Fitbit Web API. The API returns data at different levels of detail; activity data can be requested by the minute, heart rate data can be requested by the second, and sleep data is returned as a set of records, each containing a summary (time spent in each stage of sleep) of a single sleep. Data is sent in JSON format.

Project Challenges

I anticipate that working with the data from the API will present the following challenges for the project:

- Scalability
 - As mentioned above, some data can be retrieved to a detail level of one second. This means that the datasets sent by the API could potentially be very large. I need to ensure that the performance of my application is not noticeably affected when mining large datasets.
- Data Quality
 - The datasets could potentially have missing values caused by the user removing the Fitbit device from their person or by the Fitbit device running out of battery. I need to ensure that my application handles incomplete and noisy datasets appropriately.
- Data Structure
 - As the data is returned by the API in JSON format, there is no explicit structure to the data. I need to ensure my application accounts for this and that the data is in a suitable format before it is mined.
- Privacy
 - The data is personal activity data so I need to ensure that the data will only be accessible by the appropriate user.

Application Features

Based on some initial research on the types of data collected by the Fitbit, I believe the application can store the following attributes in the user profile:

- Create profile The application will mine user data to build and update a profile that contains the following information:
 - o Name
 - o Height
 - o Weight
 - Daily step average
 - Daily heart rate average
 - Daily floors climbed average
 - o Daily distance average
 - Daily burned calories average
 - o Daily active minutes average
 - Most and least active day of week
 - Most and least active time of day
 - Most and least active season

Example of the type of analysis that can be carried out:

- Deviation alert The application will alert the user when they are deviating from their generated profile. In the context of this application, a deviation is when:
 - o The user has done less steps than their profile states

- \circ $\;$ The user has climbed less floors than their profile states
- The user has covered less distance than their profile states
- o The user has burned less calories than their profile states
- \circ $\;$ The user has been active for less time than their profile states

Examples of visualizations that can be provided to the user (based on examples of existing applications):

• Track stats – The application will present the user with graphs that show how their data has changed over time. The graphs will also show the user's statistics for the current day in order to facilitate easy comparison.

Work Plan

Week 1: 28th January 2019 - 03rd February 2019

Tasks:

- Write initial plan
- Existing solution research
- Fitbit data research

Milestones:

• Initial plan complete

Deliverables:

• Initial plan

Week 2: 04th February 2019 - 10th February 2019

Tasks:

- Develop personas and write requirements
- Complete 'The Basics' React Native tutorial
- Research Android UI standards

Milestones:

- Personas identified
- Requirements started

Week 3: 11th February 2019 - 17th February 2019

Tasks:

- UI design
 - Define what screens should be in the application
 - Wireframes for all screens
 - o Descriptions for all screens and components
- Begin backend design
- Practice developing Android applications with React Native

• Finish requirements

Milestones:

- UI design complete
- Requirements complete

Week 4: 18th February 2019 - 24th February 2019

Tasks:

- Backend design
 - Produce design models and test cases for the system using UML
- Practice developing Android applications with React Native
- Supervisor review meeting before implementation is started in week 5

Milestones:

• Backend design complete

Week 5: 25th February 2019 - 03rd March 2019

Tasks:

- Implementation
 - Initial code and considerations
 - Data challenges see 'Project Challenges' above
 - Profile building functionality

Milestones:

• Implementation started

Week 6: 04th March 2019 - 10th March 2019

Tasks:

- Implementation
 - Finish and test profile building functionality

Milestones:

• Profile data mining functionality complete

Week 7: 11th March 2019 - 17th March 2019

Tasks:

• Implementation Begin coding profile deviation alerts

Week 8: 18th March 2019 - 24th March 2019

Tasks:

- Implementation
 - Finish and test profile deviation functionality

• Begin coding graphical stat tracking functionality

Milestones:

• Profile deviation functionality complete

Week 9: 25th March 2019 - 31st March 2019

Tasks:

- Implementation
 - Continue graphical stat tracking functionality

Week 10: 01st April 2019 - 7th April 2019

Tasks:

- Implementation
 - Finish and test graphical stat tracking functionality
- Start Usability evaluation
 - Heuristic evaluation
 - User-based evaluation
- Supervisor review meeting once implementation is complete

Milestones:

• Graphical stat tracking functionality complete

Week 11: 08th April 2019 - 14th April 2019

Tasks:

- Finish usability evaluation
- Begin writing final report (first draft)

Milestones:

- Usability evaluation complete
- Final report started

Easter Recess Week 1: 15th April 2019 - 21st April 2019

Tasks:

• Continue writing final report (first draft)

Easter Recess Week 2: 22nd April 2019 - 28th April 2019 Tasks:

Continue writing final report (first draft)

Easter Recess Week 3: 29th April 2019 - 05th May 2019 Tasks:

- Finish writing final report (first draft)
- Begin proofreading and writing final report

Milestones:

• Final report (first draft) complete

Week 12: 06th May 2019 - 10th May 2019 (5 days)

Tasks:

- Finish proofreading final report
- Submit final report

Milestones:

- Application complete
- Final report complete

Deliverables:

- Finished application
- Final report

Gantt Chart

Task	Start Date	End Date	Days	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	EW1	EW2	EW3	W12
Gather Fitbit data	28/01/2019	10/05/2019	103															
Write initial plan	28/01/2019	04/02/2019	8															
Existing solution research	01/02/2019	02/02/2019	2															
Fitbit data research	02/02/2019	03/02/2019	2															
Develop personas and write requirements	04/02/2019	11/02/2019	8															
Complete 'The Basics' React Native tutorial	08/02/2019	09/02/2019	2															
Research Android UI standards	09/02/2019	10/02/2019	2															
Practice developing for Android with React Native	11/02/2019	24/02/2019	14			_												
Application UI design	11/02/2019	16/02/2019	6															
Backend code design	17/02/2019	24/02/2019	8															
Implementation and test - Profile building	25/02/2019	10/03/2019	14															
Implementation and test - Profile deviation alerts	11/03/2019	22/03/2019	12															
Implementation and test - Graphical stat tracking	23/03/2019	03/04/2019	12															
Usability evaluation - heuristic and user-based	04/04/2019	09/04/2019	6															
Write final report first draft	08/04/2019	03/05/2019	26															
Write and proofread final draft of final report	04/05/2019	10/05/2019	7															
		Milestone																

Risk Plan

Risk	Risk Severity	Risk Likelihood	Solution
Data loss	High	Unlikely	Ensure that backups of all data are stored in different locations. Github will be used to store and control various versions of project code.
Illness	Low	Likely	Accounted for illness and other minor setbacks in the estimated time to

			complete tasks in the work plan.
Scope change	High	Unlikely	Work plan revisions and time reallocation will be done as soon as any scope changes arise to ensure that all critical tasks get completed on time.
Learning curve delays	Medium	Moderate	Start learning React Native early in the project so that I understand it by the time I need to use it to implement the solution.
Delays in schedule	Medium	Likely	Ensure that all tasks are started as soon as possible. If I finish a week's tasks early, then I will begin working on the following week's tasks.

Project Extensions

If I complete the project aims described earlier in the plan, then I will focus on the following extra tasks:

Generate challenges based on a user profile

I aim to develop functionality within the application that generates activity challenges for the user based on information learned from their profile.

Identify connections between activity and sleep data

I aim to develop functionality within the application that mines the Fitbit data to find links between the user's daily activity and their sleep quality.

Ethics

I will only use my own data and data that is freely available online for this project, so I do not need to make any ethical considerations. All data will be anonymous.