

DEAKIN UNIVERSITY

CAPSTONE TEAM PROJECT (B)

ONTRACK SUBMISSION

Company Progress Report

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April 23, 2023



Redback Operations - Company Progress Report for 2023 T1

Executive Summary

Redback Operations intends to gamify exercise by producing cutting edge connected fitness devices to improve exercise quality and training effectiveness.

This trimester focuses are on improving the performance of the projects, by adding/developing more features. Such as implementing (FTP) to the Smart bike project in order to provide more personal workouts for users. VR team will be adding more features to game and also we will be working on improving the marketplace to provide additional incentive for exercising. We will continue improving visual consistency of the website, and securely deploying related services.

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Leadership Team

Acting Director: Kevin lee

Company Leader: Ella Zarandi and Avinash Maurya

Leadership Team:

Team	Leads
<i>IOT</i>	<i>Ella Zarandi</i>
<i>VR</i>	<i>Hilal Irshad</i>
<i>Mobile</i>	<i>The Tung Truong</i>
<i>DevOps</i>	<i>Team Manager: Avinash Maurya</i> <i>Tech Lead: Adhish Anand</i> <i>Sub Lead: Arjodh Singh</i>
<i>Data/AI</i>	<i>Mark Telley - Ella Zarandi</i>
<i>Web/Design</i>	<i>Main Lead: Avinash Maurya</i> <i>Sub Team Lead: Brian Dang and Yiannis Doulgerakis</i>
<i>Cyber</i>	<i>Team Manager: Avinash Maurya</i> <i>Sub Team Lead: Caitlin Parker and Nasim Emadi</i>

Team Members:

IOT	Data/AI	Mobile
<i>Ella Zarandi</i>	<i>Mark Telley</i>	<i>Tung Truong The</i>
<i>William Djodiredjo</i>	<i>Ella Zarandi</i>	<i>Seth Tan</i>
<i>Jarrold Yong</i>	<i>Prastut</i>	<i>Manusha Umayanga</i>
<i>Ethan Benjamin</i>	<i>Sindhuja Manduru</i>	<i>Raveen Yashod</i>
<i>Thomas Morgan</i>	<i>Tianqi Liang</i>	<i>Pengyu Xiao</i>
<i>Momin Khalid Butt</i>	<i>Saeed Alnaqeeb</i>	Web/Design
<i>Ahmad Riaz</i>	<i>Miriam Llauce Cotrina</i>	<i>Brian Dang</i>
<i>Haris Sajjad</i>	<i>Tejas Varun Baskar</i>	<i>Evan Mitropoulos</i>
VR	<i>Feature Lead</i>	<i>Nicolas Tomas</i>
<i>Hilal Irshad</i>	<i>Prastut Sapkota</i>	<i>Nicholas James</i>
<i>Jarrold Yong</i>	<i>Kunal Tripathi</i>	<i>Harsh Patel</i>
<i>Steven Markris</i>	<i>Samuel Borough Kamau</i>	<i>Robert Bajan</i>
<i>Daniel Isla</i>	Cyber	<i>Enock Nyaundi</i>
<i>Jiahao Feng</i>	<i>Adam Bainey</i>	<i>Hokky Kurnia Gondo Kusumo</i>
	<i>Carla Estella</i>	<i>Qianhui Meng Meng</i>
Devops	<i>Caitlin Parker</i>	<i>Jack Cousens</i>
<i>Arjodh Singh</i>	<i>Stephen Tobeckukwu</i>	<i>Yesitha Liyanage</i>
<i>Astifo Paul</i>	<i>Tahlea Grant</i>	<i>Avinash Maurya</i>
<i>Adhish Anand</i>	<i>Jikuan Liu</i>	<i>Han XIA</i>
<i>Steve Lee</i>	<i>Ash Fricker</i>	<i>Anno Gomez</i>
<i>Sam Titus Menacheery</i>	<i>Melvin Manoj</i>	<i>Mohit Jurani</i>
	<i>SANJAY MEDIKONDURU</i>	<i>Yiannis Doulgerakis</i>
	<i>Nasim Emadi</i>	
	<i>Harshana Thilanga</i>	

Trimester Goals and Objectives

Planned features are:

- The Cyber team aims to develop necessary security measures to protect critical systems, also they will implement incident monitoring and firewalls to prevent compromise.*
- The Dev/Ops team aim is to automate the code workflow by developing the CI/CD pipeline and gain in-depth understanding of various tools and technologies used in the process*
- The IOT and Embedded Systems team will be working on implementing a system to measure functional threshold power (FTP) in order to provide more personal workouts for users.*
- The Mobile team will be focusing on app responsiveness and Implementing authentication and verification for the Login from both backend and frontend side, also the remaining pages in the mobile application will be implemented*
- VR team will continue implementing and developing the Sun Cycle project, The marketplace will be completed for the website so rewards from exercise can be redeemed*
- The Web-Design team will improve the consistency and responsiveness of the website and develop the marketplace.*

Company Structure and Projects Overview

<i>IOT</i>	<i>Project 1: Smart Bike Project</i>
<i>VR</i>	<i>Project 2: Sun Cycle Project</i>
<i>Mobile</i>	<i>Project 3: Mobile Application</i>
<i>DevOps</i>	<i>Project 4: Git App Repository Google Cloud Deployment</i>
<i>Web/Design</i>	<i>Project 5 : Mobile application Fixes and Additions</i>
	<i>Project 6 : Website Design Project</i>
	<i>Project 7: Web Development Frontend</i>
<i>Cyber</i>	<i>Project 8: Implementation of a SIEM System</i>
	<i>Project 9: Factor Authentication (2FA) Continuation and Securing the CICD Pipelines</i>
	<i>Project 10: Implement Vulnerability Management Process</i>
<i>Data/AI</i>	<i>Project 11: FIT File Handling and Data Pipeline</i>
	<i>Project 12: Corporate Reporting</i>
	<i>Project 13: The Cyclist/User Categorisation Project</i>
	<i>Project14: Sentiment analysis (language processing)</i>
	<i>Project 15: User Ranking - Engagement</i>
	<i>Project 16: Performance Ranking (User)</i>
	<i>Project 17: Workout Categorisation</i>
	<i>Project 18: Data Warehouse</i>
	<i>Project 19: Google Analytics/Hotter Analytics/MixPanel/App Analytics</i>
	<i>Project 20: Posture Analysis</i>

IoT and Embedded Systems

Overview, Goals, and Objectives

The IoT and Embedded Systems team will be predominantly working on the Smart Bike Project.

This trimester main focus of the IoT and Embedded Systems team will be to continue the development of the Smart Bike Project. As the majority of the Smart Bike's sensors and other hardware are already installed, the team will focus namely on:

- Implement system to measure functional threshold power (FTP)*
- Improving the quality of data that is transmitted from the bike*
- Fixing known bugs with the integration into other teams*
- Fixing known hardware issues with the bike and its sensors*
- Furthering the integration with the other projects of Redback Operations*
- Finish Rigging the NPC model and manipulating its key points based on the pose*

Project 1 : Smart Bike Project

Overview, Goals, and Objectives

The Smart Bike project developed an IoT enabled indoor exercise bike which takes the sensor data and delivers it to the cloud, where it can be used by the mobile application for exercise, or to deliver an immersive VR experience in Project Sun Cycle.

Given Redback Operations' focus on building "cutting edge technologies for connected health, fitness and sport to enable smart, safe exercise", the Smart Bike forms an integral part of the company's mission. As such, it is extremely important for the IoT team to continue with the development of the Smart Bike to allow the other teams to continue with their development and integration of it.

The IoT and Embedded Systems team will be working on implementing a system to measure functional threshold power (FTP) in order to provide more personal workouts for users. This will result in users being able to get the most out of the smart bike by training to their maximum sustainable workload.

Deliverable: Implement FTP system

Description: *To measure functional threshold power (FTP) in order to provide more personal workouts for users. This will result in users being able to get the most out of the smart bike by training to their maximum sustainable workload.*

Key Progress:

A research conducted on what a typical FTP measurement workout would contain, this was needed to understand the requirements in measuring FTP (Functional Threshold Power).

The Trello board updated with adding description in the ticket for others to understand the use case and reasoning for a user to want an FTP measurement.

FTP workout contains:

- *20 Minute non-stop ride at riders maximum push capacity*
- *Measure power in watts per second*
- *Average of every measurement per second * 0.95 == FTP score*
- *Use the score in further workouts that allow riders to aim in increasing their FTP.*

Initial implementation of this feature began as a local testing of the feature, using Keyboard input for 'power', the purpose of this was test to feasibility.

The pull request for this implementation can be found here with reasoning:

<https://github.com/redbackoperations/iot/pull/60>

Repo location: (Remote Upstream):

https://github.com/redbackoperations/iot/blob/main/Drivers/FTP/ftp_test.py

The next implementation is using the MQTT power value from the KICKR to measure a riders FTP, meaning that we can start to introduce legitimate data from the smart bike to measure and output FTP scores for users. This involved piggybacking previous MQTT client implementations from other sensor drivers such as its subscriber programs etc. This has not been fully tested in the laboratory over a full 20 minute workout but will be finalised in week 7. Pull Request can be found here: <https://github.com/redbackoperations/iot/pull/63>

Repo location (Local Implementation not yet merged):

https://github.com/Thumbness/iot_Redback/blob/main/Drivers/FTP/intial ftp_workout.py

Trello board link

<https://trello.com/b/ppGeEiQf/iot-and-embedded-systems>

Project Members: Thomas Morgan

Deliverable: KICKR won't start/ stops publishing bug

It was an issue such that the incline/resistance control scripts that handled the initialisation of the KICKR connection to the raspberry pi was not working, this had been an issue for quite a while and became urgent to complete as MQTT data being sent to the CMS website required by other teams was necessary for completing tasks,

Key Progress: *Fixed on the 11/04/2023*

Several members worked several days in the lab of troubleshooting, testing and finally implementing a fix that has been documented in the current Trello board ticket, as below

- *Seemed that the kickr device mac addresses needed updating*
- *Ran the Drivers/lib/ble_devices_scan.py script to scan for any BLE devices near rpi.*
- *Got mac address thats aligned with wahoo kickr alias (prefix alias dependant on the kickr model)*
- *In raspberry pi, cd to home/pi*
- *Ran 'ls -la' to see hidden files*
- *Ran 'nano .env' to open hidden environment file in command line nano text editor (good luck)*
- *Navigated to and update KICKR_MAC_ADDRESS value to value found from running ble_devices_scan.py.*
- *Saved and exit*
- *Prayed to the heavens (Most important) ☺*

Link To Trello: <https://trello.com/c/GsZhExZl/89-kickr-wont-start-stops-publishing-bug>

Now when running the script that starts the kickr/incline, it connects and successfully publishes speed/cadence/power/resistance/incline data to the CMS sit via MQTT.

Updates to the GitHub troubleshooting tab will be added that will contain step solutions if the same issue occurs for future team members as it may seem likely that over a period of time MAC address tables may be refreshed

Team Members:

Ella Zarandi: *Identified the issues, sprite planning, assigned tasks and deadlines*

Ella Zazrandi: *Tested/checked out the CMS to be sure the values>0 is also transported*

William Djojodiredio ,Jarrod Tong, Thomas Morgan: *troubleshooting, testing and finally implemented a fix and documented to the Trello board*

Deliverables: Setup remote access to the Raspberry Pi

Description: Some of our team currently working as a cloud student so the setting up the remote access to Raspberry Pi was vital,

Key Process:

Completed by Ella Zarandi

Conducted research and following solution was found and passed to IOT team, to be implemented:

To connect remotely, SSH and VNC must be activated on Raspberry Pi. Click on the main menu and choose Preferences > Raspberry Pi Configuration. Choose the Interfaces tab and set both SSH and VNC to Enabled. The VNC icon appears in the menu bar

- *Conducted research on application we could use for our remote access and shared the result with IOT team (specifically William) to use the ada.deakin.edu.au link to search up about Apps and Desktops (ADA). ADA is Deakin's virtual app environment, enabling students to use select Deakin software from anywhere.*

Completed by William Djojodiredio

Discovered that Deakin has a VPN using Cisco AnyConnect that allows us to access Deakin's services. Utilizing this application, we can now access Raspberry Pi remotely from anywhere in the world.

Trello Ticket: <https://trello.com/c/a7n9jKvI/99-research-on-application-to-setup-remote-access-for-raspberry-p>

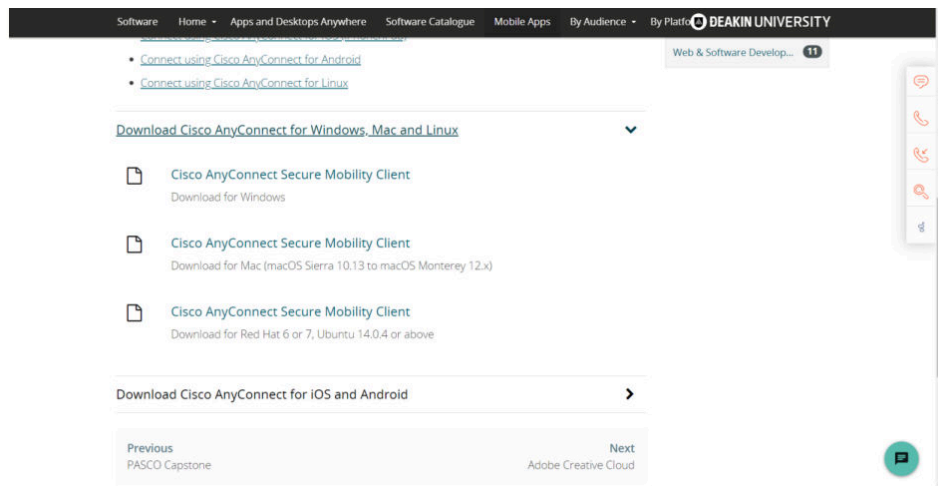
Below is the instruction, which documented by William Djojodiredio

To access the Raspberry Pi remotely, we need to have an internet access and Deakin VPN. Our internet access goes through Deakin VPN which make us a guest of Deakin Wi-Fi even though we are not connected to Deakin Wi-Fi. Below is the instruction to access Raspberry Pi remotely.

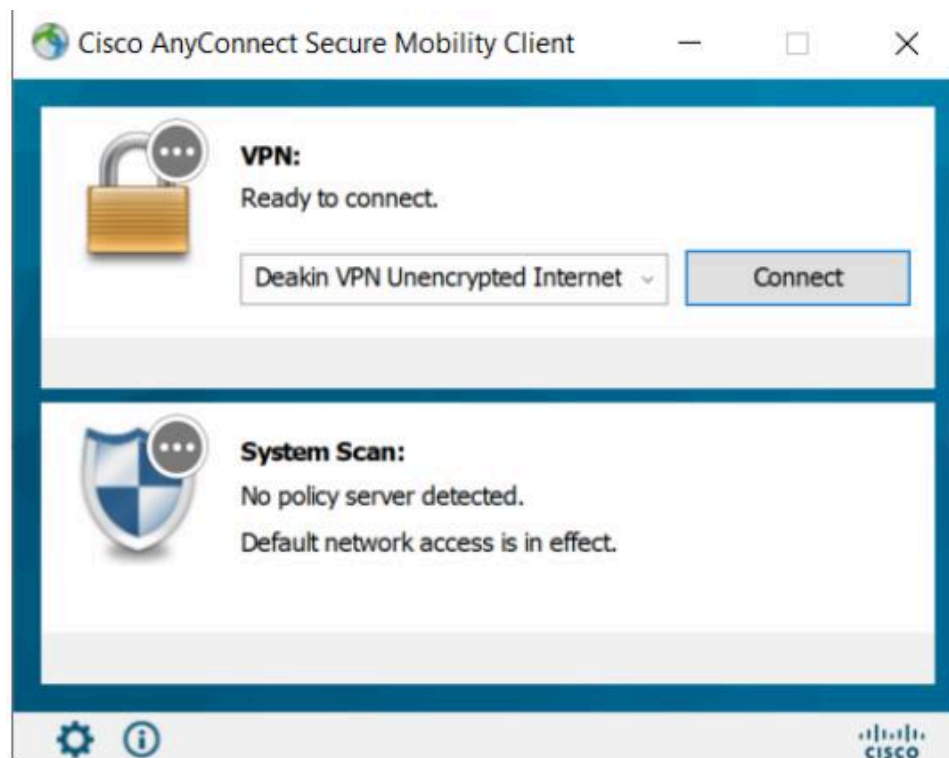
Steps:

- 1. First thing first, we need to download the Cisco AnyConnect (Deakin VPN) from the link below.*

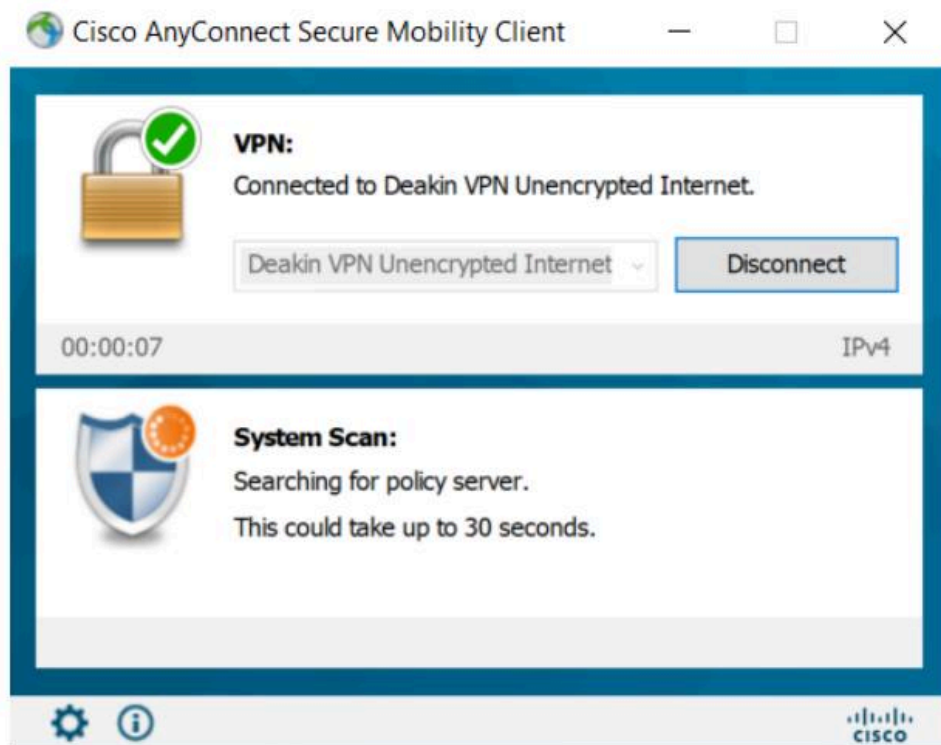
<https://software.deakin.edu.au/2019/04/16/cisco-anyconnect/>



2. Make sure that you download link for your Operating System.



3. Open Cisco AnyConnect and press "connect". Make sure you have your Deakin's credentials ready because it will redirect you to Deakin login page



4. The interface should show like this after you successfully connect to Deakin VPN

5. Open terminal/command line in your computer

```

Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\willi> ssh pi@10.150.186.55
pi@10.150.186.55's password:

```

6. Type "ssh pi@10.150.186.55" in your terminal and it will prompt you a password.

```

pi@bik000001: ~/iot
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\willi> ssh pi@10.150.186.55
pi@10.150.186.55's password:
Linux bike000001 5.15.61-v7+ #1579 SMP Fri Aug 26 11:10:59 BST 2022 armv7l

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Mon Apr 17 04:29:10 2023 from 10.224.224.184
pi@bik000001:~$ ls
iot start_all.sh test_incline.sh
pi@bik000001:~$ cd iot
pi@bik000001:~/iot$ ls
Archive Database docs Drivers MQTT README.md Research scripts sensors-backend sensors-cms-frontend Unity
pi@bik000001:~/iot$

```

7. Enter “capstone374” as the password and you have now connected to Raspberry Pi through SSH.

Deliverable: Heart rate stops publishing bug

Description: Heart rate seems to be published for a few seconds (and received by the subscribers), and after a few seconds it continues to report it is successfully published but nothing is received.

Team Members:

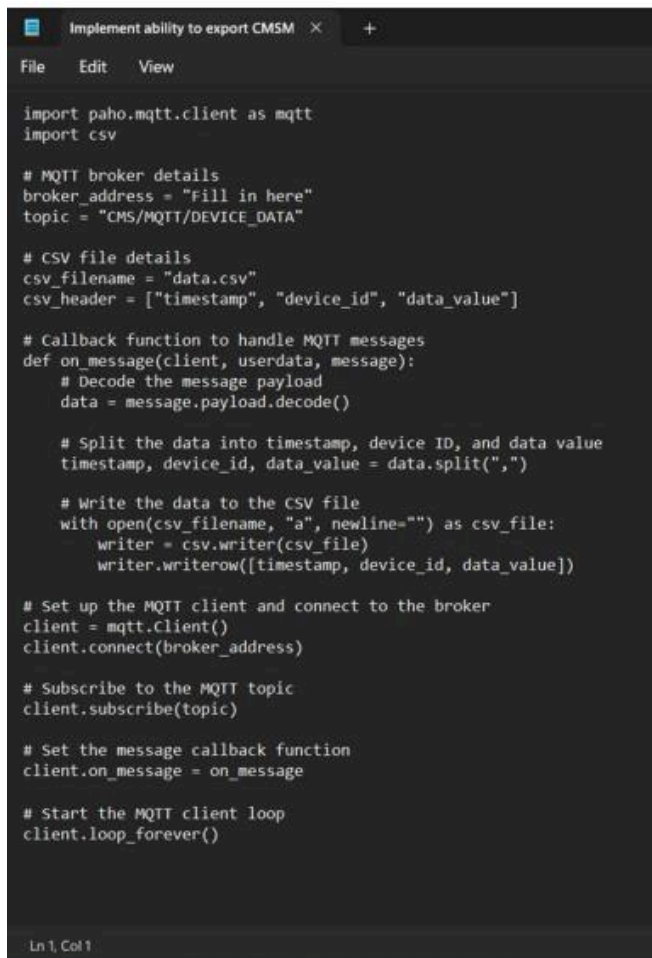
Momin Butt , Will be starting from week 7

Deliverable: To develop an API to present the data stored in CMS in our website

Description: Allow the Front end website to publish a file with all the data from the sensors

Key Progress:

- Conducted a research on what the front-end page consisted of to find a solution about implementing*
- Worked towards progress and coded a potential script to export the data from the device itself that it gets whilst the sensors are on (See below code)*



```
import paho.mqtt.client as mqtt
import csv

# MQTT broker details
broker_address = "Fill in here"
topic = "CMS/MQTT/DEVICE_DATA"

# CSV file details
csv_filename = "data.csv"
csv_header = ["timestamp", "device_id", "data_value"]

# Callback function to handle MQTT messages
def on_message(client, userdata, message):
    # Decode the message payload
    data = message.payload.decode()

    # Split the data into timestamp, device ID, and data value
    timestamp, device_id, data_value = data.split(",")

    # Write the data to the CSV file
    with open(csv_filename, "a", newline="") as csv_file:
        writer = csv.writer(csv_file)
        writer.writerow([timestamp, device_id, data_value])

# Set up the MQTT client and connect to the broker
client = mqtt.Client()
client.connect(broker_address)

# Subscribe to the MQTT topic
client.subscribe(topic)

# Set the message callback function
client.on_message = on_message

# Start the MQTT client loop
client.loop_forever()

Ln 1, Col 1
```

This project has been paused, as now Data/AI is working on that. It may be investigated further if it is needed to implement the export feature though.

Team member:

Jarrold Yong

Deliverable: Scripts to start processes on RPi

Description: Developing a 'start_all' script project

Currently to get the bike start working, we are required to run several .sh scripts to enable the Drivers (.py files) to publish data, which each script needs to be executed individually,

The aim of this project is developing a single .sh script that able us to start all the .sh, so as soon as Pi is plugged in, we have it ready to publish the data to the cloud or receive the commends to transfer it to the sensors.

Key Progress:

Completed by Ella Zarandi

- *Clarified the project to the members*
- *Following up with the progress and providing feedback and solution when needed.*
EX: As currently the fan itself is dependent on the Unity game engine, so we decided to not including the fan into the “all-start” scrip project and work on the fix separately.
- *Updating the Trello board*

Completed by William

Previously, if we run this script, we couldn't stop the script from running. William updated the script and now we should now be able to stop it.

Ethan Benjamin

Will be starting to work towards this project from week7

Deliverable: Workout to process strength etc with more flexibility

Description: In order to target improving strength vs endurance, cyclists may wish to train at various percentages of their maximum sustainable output. Measuring VO2 Max is difficult but Functional Threshold Power is a possible surrogate.

Key Progress:

Completed by Ella Zarandi

Defined the problem and provided solutions as below:

Problem: *The workouts are getting start, stop and picked using the app,*

The app is now down and we are not able to run and test the workouts,

Based on my research over the handover doc, to be able to run the app right now we need to download both repositories (app-frontend and backend) and ensure to use the extra-data-fields branch of the backend.

Also changes for laptop's IP address are also required so the phone knows to use the local instance of the backend on the laptop. I think Android might still have the same issue not being able to get the App working as I don't think anybody focused on this last trimester.

Suggested Solution :

-To deploy the backend in GCP, so everyone could use that and then there is no need to hard code the IP address in the app.

-We work on implementing the workouts just from an IOT perspective,

Currently in IOT we are going with the second option.

I have changed two of our members' project and assigned them with the following tasks:

-Search up how to run and start the first workout without using the app,

-Implement and develop Strength and Endurance workouts in their IOT side

Ahmad Riaz, Momin Khalid Butt are assigned to work on this project

Deliverable : Deliverable: Rate limit sending data from Pi (to avoid GCP fees)

Description: The Fan would keep publishing data,(even when it is off, still it would publish 0s,

Key progress:

Completed by Ella Zarandi

Suggested the solution by modifying the project to also be able to control the fan's operation using IOT's product, for the times that we don't have access to the VR and App's products.

Currently the fan is dependent on the Unity game engine connections and also the heart-rate monitor, so we are not running the fan script at all, unless the VR game or Mobile application is running, as they are solely responsible for changing those values.

As now the App is not working, so it has been advised as a solution to modify this project to Integrate MQTT bike KICKR speed into actuating FAN speed mode.

So some research conducted about how we could use kickr's data values to control/adjust the Fan's operation, so When the speed is 0, stop sending data to reduce the cost of GCP, also I believe It makes more sense that the fan output is assimilated with the 'speed of the bike', so we want to have the KICKR speed MQTT output to be fed into the FAN python script, such that the Wahoo fan speed increases/decreases as the KICKR speed increases.

Ethan Benjamin, Thomas Morgan

will start working on this project from week 7

IOT Team members

Name	Level	Role
ELLA KARIMI ZARANDI	Senior	Team Leader
WILLIAM DOJODIREDJO	Junior	Team Member
JARROD YONG	Junior	Team Member
ETHAN BENJAMIN	Junior	Team Member
AHMAD RIAZ	Junior	Team Member
THOMAS MORGAN	Junior	Team Member
MOMIN KHALID BUTT	Junior	Team Member
AHMAD RIAZ	Junior	Team Member

Project 2: Project Sun Cycle

A virtual reality game called Project Sun Cycle is played with an exercise cycle. The player can explore and travel around the post-apocalyptic tribal environment in this single-player experience, fulfilling quests like delivering supplies between the various tribes on their hover skater-bike. The goal of this project is to develop an enjoyable and engaging experience that will motivate people to exercise more by allowing them to play a video game at the same time.

Overview, Goals, and Objectives

By converting little virtual steps into bigger actual steps, Redback Operations aims to provide you with a smarter, fitter, and better environment. No of the weather, our organisation wants to put facilities in your hands. a lot of traffic? You won't need to worry, though, as our Smart Bike Project will dramatically revolutionise your indoor cycling experience and also provide you access to the outside world through a usable mobile app and an entertaining VR experience. In the workout VR game Project Sun Cycle, players use specially designed exercise bicycles to travel across the post-apocalyptic game world while delivering deliveries on a hover bike.

Aims for Trimester

In general, the goal of working on a VR project is to take advantage of the technology's unique characteristics to give users a more interesting, immersive, and useful experience. Continue the preceding project's incomplete portion's completion. Including additional components in the game. We'll release the manual documentation and UI design that how overall game will look like.

- Improve User Experience: Virtual reality (VR) offers a compelling, immersive experience that can greatly increase user engagement and project satisfaction. We will add more features where users can engage with the project more meaningfully by building a virtual environment.*
- Visualizing Design: VR can assist architects, designers, and engineers in more realistically visualising their designs.*
- Work on different tools like Trello and Figma design.*
- Learn more about Unity.*

Deliverables

- 1. Add different option for choosing bikes for the users.*
- 2. To make more challenging environment we will add obstacles.*
- 3. Add timer to the game in which user will reach or deliver within the given time.*

4. Add bonus star through which player can increase their time while reaching to destination.
5. Create Speedometer to know how fast player is moving.
6. Creation of Game Design Document for the Cycling Against Friends/Ghosts feature to thoroughly document the specifics of the feature.
7. Finish off Figma designs for the Cycling Against Friends/Ghosts feature for the mobile application.
8. Create UML diagram.

Key Achievement

- Figma designs for the Cycling Against Friends feature for the mobile application - **Daniel Isla**
- Adjustment of the main camera from single person view to third person -**Hilal Irshad**
- Done with the countdown coding and the UI text on the game canvas – **Hilal Irshad**
- Created the GITHUB Repository -**Steven Markis**
- Successfully created one the bike model- **Steven Markis**
- Half of the game design is completed, and the remaining will be complete in coming weeks – **Nathan and Jiahao Feng**
- Fixed the bug within the unity and some bugs adjustment with the gameplay view- **Hilal Irshad and Steven Markis**

Project Members

Name	Role	Tasks
Hilal Irshad	Leader	Timer and obstacles for the environment and implement Speedometer in the game.
Jarrold Yong	Member	Create UML diagram for the project and the SRS doc.
Steven Markris	Member	Create objects like bikes and add features to environment and implement that object inside virtual game
Daniel Isla	Member	Figma designs for the game interface and mobile UI.
Jiahao Feng	Member	Create Game Design Document and complete SRS doc.

Mobile Application Team

Team Trello: <https://trello.com/b/cNxiN0iZ/mobile-app-development>

Project 3: Mobile Application

Overview, Goals, and Objectives

The Mobile App is one of the Redbacks products that the user can engage with. It is about developing an app that will comprise one of the possible experiences Redback customers use when they are exercising. The problem it aims to solve is providing customers with an accessible and portable solution that can be used to track their fitness. A mobile app can easily be downloaded and set up on exercise machines or for workouts when the user is on the move. The overall goal of the project is to provide a friendly and engaging user experience that will impact stakeholders by building a brand image for Redback giving it value while also strengthening customer loyalty. The main deliverable for the project will be an app with all the necessary pages so that there is a complete experience from when the app is opened, and a workout is completed.

Aims for Trimester

- *The main goal for this trimester is to finish the undone part from the last trimester:*
 - *Continue to finish the pages from Figma (the FAQ page and the Contact Us page)*
 - *Researching the way to make the app responsiveness to fit all screens.*
 - *Integrating the workout selection on the home screen*
 - *Fixing the current bugs from the roadmap at the workout screen and login screen*
 - *Adding previous trimester screens to the correct order.*
 - *Redesigning the current UI to the newest UI in Figma.*
 - *Learning a new programming language – Flutter.*
- *Possible Implementation:*
 - *Implementing authentication and verification for the Login from both backend and frontend side*

- *Implementing Marketplace features from the new Figma*
- *Adding comment for the function and file*
- *Save workout to Firebase.*

Deliverables

- *Focusing on finish the undone page from the Figma.*
- *Improving app performance due to the app is not responsive to fit all screens.*
- *Fixing the UI issues and Re-designing UI*
- *Improving backend performance*

Key Achievement

- *Fixing app responsive to fit all screens (Login screen and Workout screen) - **Seth Tan***
- *Refactoring code, improving code design and connecting some of the previous screens to the correct order - **Pengyu Xiao, Tung Truong***
- *Improving backend, connecting backend with the Firebase so the user can sign up account through options (normal registration or google account registration) - **Manusha Umayanga, Raveen Yashod***
- *Designing new screens (Setting screens) and updating new UI for previous screens (Login screens, Sidebar screen) - **Seth Tan, Manusha Umayanga, Raveen Yashod, Pengyu Xiao***
- *Fixing old bugs (signup bugs and bugs related to Flutter not being competitive to the new XCode version) - **Manusha Umayanga, Tung Truong***

Project Members

<i>Name</i>	<i>Level</i>	<i>Tasks</i>	<i>Role</i>
<i>Tung Truong The</i>	<i>Senior</i>	<i>Front-end Developer, improving app performance, managing member tasks and the mobile team works</i>	<i>Team Leader</i>

<i>Seth Tan</i>	<i>Junior</i>	<i>Front-end Developer, fixing current bugs, designing new screens, updating UI</i>	<i>Team Member</i>
<i>Manusha Umayanga</i>	<i>Senior</i>	<i>Back-end Developer, improving backend performance, updating UI, leading backend team</i>	<i>Team Member</i>
<i>Raveen Yashod</i>	<i>Senior</i>	<i>Back-end Developer, fixing current bugs, improving the backend, updating UI</i>	<i>Team Member</i>
<i>Pengyu Xiao</i>	<i>Senior</i>	<i>Front-end Developer, improving app performance, designing new screens, fixing current bugs</i>	<i>Team Member</i>

Dev/ops Team

Project 4: Git App Repository Google Cloud Deployment

Overview, Goals, and Objectives

The main objective of this project was the deployment of the project contents from GitHub into the Google cloud platform. To define more clearly, the culmination of all works from the Redback Operations Team was created into a GitHub repository ready for access by all its team members and by the public. However, the plethora of code-files need to be uploaded as a web application in an online platform. For this process, we are using Google Cloud Platform as our deployment structure. Moreover, the code-files are created to accommodate for “containerization” of the applications. Some great advantages of this are cost cutting and easy test and deployment cycles. So, our project focusses on deployment of these docker applications into the Google Cloud Platform. Which prepares the “containerised” for access to the internet.

Aims for Trimester

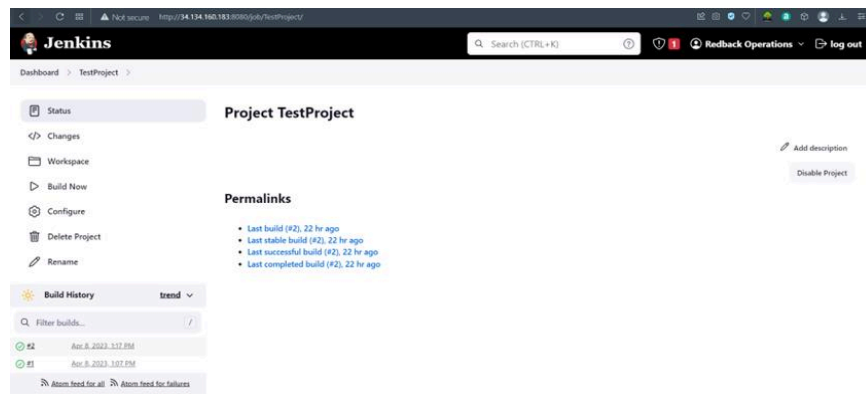
- *Our primary aim is to automate the code workflow by developing the CI/CD pipeline and gain in-depth understanding of various tools and technologies used in the process*
- *Secondly to create documentation that can act as step-by-step guide of creating CI/CD pipeline with Google cloud platform.*
- *Thirdly to provide handover documents highlighting about the deliverables accomplished and the deliverables that would move to next trimester*

Deliverables

- *Development of CI/CD pipeline in Google cloud*
- *Document highlighting step by step guide of creating CI/CD pipeline with Google cloud platform.*
- *Handover document that can act as reference for next trimester*

Progress

- *Deployed Jenkins server on GCP virtual machine instance and tested its working using a test job.*



- Created documentation to show how to setup a Jenkins server on GCP. Link: [How to Setup a Jenkins Server.docx](#)
- Updated the Trello board to include the new tasks. Trello Board link: <https://trello.com/b/SvbARmmY/devops>
- Working on creating the docker image of the flutter application.

Project Members

Name	Level	Task	Role
Arjodh Singh	Junior	Install GKE, CICD tools, cloud resource. Create the pipeline and Script. Research for creating Jenkins Job / Script.	Team Lead
Astifo Paul	Junior	Install & set up the Logging & Monitoring & Tracing tools. Research for creating Jenkins Job / Script. Network & Security setting in GKE.	Team Member
Adhish Anand	Junior	Create the pipeline and Script. Network & Security setting in GKE. install & set up the Logging & Monitoring & Tracing tools.	Team Member
Sam TitusMenacheery	Junior	Create the pipeline and Script. Network & Security setting in GKE. install & set up the Logging & Monitoring & Tracing tools.	Team Member
Steve Lee	Senior	Create the pipeline and Script. Connect Source repository with CICD tool. Install GKE, CICD tools, cloud resource.	Team Member

Key Achievements

<i>Name</i>	<i>Level</i>	<i>Achievements</i>	<i>Role</i>
<i>Arjodh Singh</i>	<i>Junior</i>	<ul style="list-style-type: none"> Upskilled on DEVOPS stack and deployed Jenkins on VM on private and tested it for integration and deployment Conducted regular meetings and updated all the documents related to project 	<i>Team Lead</i>
<i>Astifo Paul</i>	<i>Junior</i>	<ul style="list-style-type: none"> Upskilling on Jenkins, research and testing done to deploy it on VM. Also, research of CICD pipelines, Kubernetes engine, etc to continue work in DevOps. Organization and attendance of meetings to let all members know of the tasks/deadlines that are due. 	<i>Team Member</i>
<i>Adhish Anand</i>	<i>Junior</i>	<ul style="list-style-type: none"> Deployed Jenkins server on GCP vm instance and created a documentation on the same. Tested the working on Jenkins server using a sample job. 	<i>Team Member</i>
<i>Sam TitusMenacheery</i>	<i>Junior</i>	<ul style="list-style-type: none"> Created a google cloud project. Created VM in google cloud for running Jenkins. Installed Jenkins in VM. Configured Jenkins into VM external link. Downloaded the Jenkins Plugins. Researching on building a Docker image of Git hub application from the git repository. and push the image into Google cloud Container Registry Preparing for the next step by researching Kubernetes cluster technology to host the application 	<i>Team Member</i>
<i>Steve Lee</i>	<i>Senior</i>	<ul style="list-style-type: none"> Tested the working on jenkins server using a sample job. Set up the yaml file for installing the monitoring tool (grafana) on the linux server so that it can be applied immediately after installing kubernetes. Pre-preparation for Kubernetes 	<i>Team Member</i>

		<i>installation completed.</i>	
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※ *Please be informed that the above tasks can be changed and added depending on the project.*

Web Development and Design

RedBack Trello:

<https://trello.com/invite/b/4ueSjoIZ/ATTI2748fd3a90d1e94d2cf01ec6a6fbd0de9FEDCCC0/design>

Team members trello:

<https://trello.com/invite/b/VaGG5QJV/ATTI5b3b328dfa977f2f700857c485a25d6544083928/design-team>

Overview, Goals, and Objectives

- The web development and design team is currently focused on enhancing Redback Operations exist designs and implementing UI designs to code
- We focused on analyzing the existing Figma projects and reconstructing the project to enhance the scalability and maintainability.
- As the designers and engineers work closely together, we make sure our designs not only visually appealing but also feasible to implement within the project time frame and guarantee the outcome of the project come out as expected

The team has been working simultaneously on different projects, with the major achievements listed in the below in the table, summarizing it for all the projects handled by the

	Web	Dev	Team.
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Marketplace Development	Coded the frontend and have developed the foundation for the backend of the marketplace.	Avinash Maurya
Responsiveness of the website	Familiarised themselves with the current code, documented and added comments to each section of the code. Working on stabilizing and making the current website pages mobile / device friendly.	Avinash Maurya Yiannis Doulgerakis Anno Gomes Nicholas James Yeshitha Liyanage Mohit Jurani Evan Mitropoulos
UI/UX	Successfully worked on increasing the efficiency in the current designs and improving the similarities	Web: Brian Dang Enock Nyaundi Harsh Patel Qianhui Meng

	<i>between all the designs and flow across different web pages and apps. Merged or removed redundant pages and improved the designing.</i> <i>Developed the marketplace UI/UX design.</i>	<i>Yeshitha Liyanage</i> <i>Mobile: Han Xia</i> <i>Hokky Kurnia</i> <i>Jack Cousens</i> <i>Nicolas Tomas</i> <i>Robert Bajan</i>
<i>Skill Up Tasks</i>	<i>Successfully completed series of skill up tasks to understand the fundamentals of website/ mobile deign and development.</i>	<i>Brian Dang</i> <i>Evan Mitropoulos</i> <i>Nicolas Tomas</i> <i>Harsh Patel</i> <i>Robert Bajan</i> <i>Hokky Kurnia Gondo</i> <i>Kusumo</i> <i>Qianhui Meng Meng</i> <i>Jack Cousens</i> <i>Yesitha Liyanage</i> <i>Avinash Maurya</i> <i>Han XIA</i> <i>Anno Gomez</i> <i>Mohit Jurani</i> <i>Yiannis Doulgerakis</i> <i>Nicholas James</i> <i>Enock Nyaundi</i>

Project 5 - Mobile application Fixes and Additions

Overview, Goals, and Objectives

The current version of the mobile design developed by the previous team, however, after analyzed and discussed with the team, we have identified many problem with the current project such as all of the components in the design are not created as reusable components which make the project inconsistent very hard to maintain and scale for future improvement. Our final goal for this term is to redesign the blueprint project and improve its aesthetics by making it more aesthetically appealing and user-friendly.

Our team recognised the importance of the project's scalability and maintainability, as well as design consistency. All aspects had to be considered in order to achieve a successful execution with efficient future development possibilities. The consistency component inside

the design should be maintained throughout every phase of its construction. Our commitment is to ensure that the outcome aligns with the goals of the whole project.

Aims for Trimester

Our key goal throughout this trimester is to finish the design and include new features before sending it to the other teams. For example, the front-end design team needed these designs to begin serious work on the actual product. Our goal is to complete the design to the highest potential standard, allowing other teams to use it efficiently.

Deliverables

Our Trimester Deliverables improve design, add new and reconstruct the project to enhance its scalability and maintainability.

The following things will be improve this trimester:

- + Marketplace design*
- + Mobile App*

Our long term objective for this project is to refine and finalize the design to a point where further work is only required for the addition of new features. Although the design is approaching this stage, some additional work is still necessary.

Project Members

- **Avinash Maurya** – Team Lead
- **Brian Dang** - Design Leader / UI Designer /UX researcher/ Developer
- **EVAN MITROPOULOS** - Design sub leader / UI Designer / UX researcher
- **Nicolas Tomas** - Design sub leader/ UI Designer / UX researcher
- **Dio Kyrou** - UI Designer /UX researcher
- **Harsh Patel** - UI Designer / UX researcher
- **Robert Bajan** - UI Designer / UX researcher
- **GERALD FERNANDO MINI FARFAN** - UI Designer / UX researcher
- **HOKKY KURNIA GONDO KUSUMO** - UI Designer / UX researcher
- **QIANHUI MENG MENG** - UI Designer / UX researcher
- **JACK COUSENS** - Designer / UI Designer / UX researcher
- **YESITHA LIYANAGE** - UI Designer/ Developer

Project 6 - Website Design Project

Overview, Goals, and Objectives

Our primary goal for this effort is to make significant changes and improvements to the website's design. The focus would be on making it more visually appealing while also ensuring that its expandability and maintainability are improved.

The strategy currently lacks critical components and has inconsistencies that make it difficult to manage.

The goal is to overcome the barriers by focusing on the venture's reconstruction. Our goal statement includes creating an approach that will be robust and successful in the long run, resulting in positive outcomes for Redback's .

The other primary goal will be to implement the design changes in the frontend development of the website by coding all the new and improved web designs. This goal will also include making the website more functional with working buttons and other where it needs.

Looking at the previous year's report, the website needs to go live which is another goal we aim to achieve from the backend side of things.

Once again, as many in the team are not very experienced with little knowledge when it comes to frontend and backend web development, this is going to raise many barriers to overcome. But by finding the right strategy and time management and team effort, all of these barriers can be bypassed.

Aims for Trimester

The objective of the current project is to revamp the website design to align with the company's image and maintain consistency with other projects. We aim to prioritize this task as it is crucial to ensure that the design language resonates with the company's branding. Our end goal for this trimester is to achieve uniformity in design across all projects.

Deliverables

Our goal with this project is to create a design that will stand the test of time. This necessitates developing an appealing, changeable strategy that can be sustained for extended periods of time without necessitating extensive changes at future intervals. Finally, our primary goal is to build a structure that is unaffected by changes in its particular markets or technological breakthroughs.

During this trimester, our team has prioritized improving the design of our project and delegating completion duties to other groups. We recognise that success in this attempt will take more work than we have previously given; yet, we remain firm in our belief that dedicating ourselves to establishing an enduring and trustworthy design will result in significant benefits down the road. We are dedicated to designing designs that are not only visually appealing but also run at optimal efficiency while keeping to excellent quality standards.

Here is the list of frame will be improved this trimester:

- *Daily report*
- *Community*
- *How to Participate*
- *Signup*
- *Login and Signup landing*
- *Yoga*
- *Workout*
- *Project*
- *Product*
- *Contact-us*

Project Members

List the members and their roles – clearly identify the lead student(s).

- **Avinash Maurya** – Team Lead
- **Brian Dang** - Design Leader / UI Designer /UX researcher/ Developer
- **EVAN MITROPOULOS** - Design sub leader / UI Designer / UX researcher
- **Nicolas Tomas** - Design sub leader/ UI Designer / UX researcher
- **Dio Kyrou** - UI Designer /UX researcher
- **Harsh Patel** - UI Designer / UX researcher
- **Robert Bajan** - UI Designer / UX researcher
- **GERALD FERNANDO MINI FARFAN** - UI Designer / UX researcher
- **HOKKY KURNIA GONDO KUSUMO** - UI Designer / UX researcher
- **QIANHUI MENG MENG** - UI Designer / UX researcher
- **JACK COUSENS** - Designer / UI Designer / UX researcher
- **YESITHA LIYANAGE** - UI Designer/ Developer

Project 7: Web Development Frontend

Overview, Goals, and Objectives

Developing a web application allowing user to track their fitness data.

The goal of this project is implementing exist UI designs into reliable web application and getting the website live as well as making it more functional.

To implement designs changes where needed and improving the overall user friendliness and neatness of the website.

Objective is implement the rest of the UI design frames from last trimester.

Aims for Trimester

The aim for this trimester is to complete the remaining frames left from the previous team which include Product Devices, Exercise History, Your Daily Report with Exercise, Exercises, and User Dashboard, Contact Us and if possible get the website running live.

Deliverables

This trimester deliverable is:

- *Product Devices*
- *Exercise History*
- *Your Daily report with exercise*
- *Exercises*
- *User Dashboard*
- *Contact-Us*

Our long term objective for this project is continuing implementing new features and pages provided by the design team and constantly improving web application responsiveness.

Project Members

- **Avinash Maurya** – Team Lead
- **Yiannis Doulgerakis** - Developer
- **Brian Dang** - UI Designer /UX researcher/ Developer
- **NICHOLAS STAVROPOULOS** - Developer
- **ANNO GOMES** - Developer
- **YESITHA LIYANAGE** - UI Designer/ Developer

Cyber Team

Overview, Goals, and Objectives

The cyber team aims to implement necessary security measures to protect critical systems and all sorts of data involving RedBack activities from theft and damage. Establishing and maintaining user trust by developing a secure system is imperative for the company's long-term success. We are going to provision Security Incident & Event Management (SIEM) uses big data to receive firewall and security logs from cloud resources and does analysis to discover indications of compromise (IOC) and a platform that provides more visibility for incident tickets raised. The list below includes the key objectives of the cyber team in this trimester.

- *Create/implement Security Incident and Event Monitoring system*

- *Create/implement firewalls*
- *Utilise both incident monitoring and firewalls in a manner which prevents data compromise for users and the company.*
- *Create/implement 2FA*

Project 8: Implementation of a SIEM System

Overview, Goals, and Objectives

SIEM is fundamental and one of the essential 8 mandated cyber security requirements for companies in Australia. SIEM fundamentally consists of big data that stores logs and events which are analysed through playbook searches for correlations. Detection occurs with any indications that matches with a compromise which is then raised as a security incident to be actioned.

Upon completion of this project, IT resources provisioned on google cloud for Redback tenants, will be configured to feed their logs and events to SIEM.

Aims for Trimester

In this trimester the cyber security team would like to implement the following for the SIEM project.

- The basic functionality for SIEM system which will be provisioned in google cloud.
- A big data storage environment where the log stores will get set up.
- Define the feeders and log ingestions.
- Implement and deploy a few workflows, playbooks and dashboards.

Deliverables

- A SIEM with basic functionality implemented into our google cloud environment
- Processes and documentation around the SIEM system

Completed

Caitlin: Spun up a VM that allows access of Wazuh through Docker without installing on personal device. – Caitlin

Carla: Has installed and upset up Wazuh Agent (cross platform end-point security agent)

Adam: Spun up a VM for OpenCTI and Docker and created templates for yaml and .env files. Connected with AbuseIPDB and AlienVault to pull threat feeds. -Adam

Stephen: Connect Wazuh to GCP

On Going

- Connect OpenCTI with OpenSIEM
- Write up and centralise all documentation for SIEM project for handover.
- Connect and set up Wazuh dashboard

Project Members

Member Name	Role	Task
Adam Bainey	Team Member	Incident monitoring (research and implementation/strategy to place in GCP environment)

<i>Carla Estella</i>	<i>Team Member</i>	<i>Incident Monitoring (Research and Implementation)</i>
<i>Caitlin Parker</i>	<i>Team Leader</i>	<i>Incident Monitoring (research and implementation/strategy to place in GCP environment and create documentation for the system)</i>
<i>Stephen Tobechukwu Uzoka</i>	<i>Team Member</i>	

Project 9-Factor Authentication (2FA) Continuation

Overview, Goals, and Objectives

The project aims to continue the previous trimester's 2-factor authentication implementation, with the motivation being secure and safe logins which ensure user authenticity and prevent malicious users gaining access to the company websites and databases. The overall goal is to work with previous works and ensure that a functional 2FA system is implemented at the website without any bugs or implications.

This positively impacts stakeholders as by implementing a 2FA system the attack space is reduced, and the likelihood of attack is minimised. Therefore, the cost of recovery to the company is diminished greatly, as well as the risk for negative publicity which may lead to distrust from clients.

Aims for Trimester

- *Locate deliverables from Trimester 3*
- *Assess the implementation of 2 Factor Authentication as it stands*
- *Enhance the existing infrastructure so that we have a fully functioning 2 Factor Authentication service at login*

Deliverables

- *Full project documentation*
- *Demonstration of successful login with 2FA*

Completed

Tahlea: *Located the deliverables from Trimesters 3.*

Jikuan: *Created an Application Programming Interface allow external users to obtain QR. The QR can be used to acquire 6-digit code.*

On Going

- *Cooperate with Front-end team to integrate the two projects (front end project and 2FA project). – Group as a whole*
- *Implementing a truly random generated secret key.*
- *Centralised documentation for all the 2FA project for handover.*
- *Develop a second Application Programming Interface for verification of users using a one-time password.*

Project Members

Member Name	Role	Task
Tahlea Grant	Team Member	Find deliverables from trimester 3 and assess
Jikuan Liu	Team Leader	Assess the implementation of 2 Factor Authentication as it stands.
ASH FRICKER	Team	Research and Test 2FA, find improvements and enhance

	<i>Member</i>	<i>the security.</i>
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Project 10- Implement Vulnerability Management Process

Overview, Goals, and Objectives

Vulnerability management is one of the essential 8 recommended by Australian government, and a key security control to track and monitor vulnerabilities of information technology assets. Vulnerability management system commonly, discover network connected devices and enumerates hard hardware, firmware/software of target devices and correlates with a database of known vulnerability/resolution to report vulnerabilities and track remediation assignments to service owner to resolve it (e.g. install a patch).

Aims for Trimester

- System requirement collection **(Completed – week2 by Nasim)**
- Vendor analysis and selection **(Completed - Week 5 by all members - Reported to ELT team).**
- Access to GCP and SCC module enablement **(completed by all members – week6)**
- SCC Asset discovery and reporting dashboard setup *(In Progres - Starting Week 6 by Harshana)*
- We need SCC to be enabled with required privileged roles that can collect reports from all resources.
- Presumably needs back-and-forth communications with the cloud tenant team to get that properly assigned.
-
- SCC finding report to SIEM (SCC and SIEM Integration) *(In Progres - Starting Week 6 by Nasim)*
- Discovered issues will be reported to (the security incident and event management) system SIEM, to appear as an incident and get actioned in SIEM workflow. SIEM is currently under deployment by our sibling team, and we just integrate our dashboard into their feed-in logs.
-
- Vulnerability scanner (static code scanner) deployment *(In Progres - Starting Week 6 by Sanjay)*
- An alternative vulnerability scanner needed to be used as the SCC-supported one isn't free. The aim of the deployment is to use an open-source static vulnerability scanner, that is free and can be used to scan source codes. The scanner also needs to support the coding language used by the development team. The plan for the deployment is to research different scanners to find the most reliable and effective one. Then run tests with normal and self-made malware codes to test the scanner. The last step for the deployment is to write a guide on how the scanner can be used.

Deliverables

The long-term deliverables for RedBack Operations would consists of:

- System requirement and scope definition.
- Vendor and product analysis and selection
- Project tenant initiation.
- Periodic Network Asset Discovery and publishing finding in a dashboard.
- Vulnerability code scanner for static code analysis.
- SCC and SIEM integration (Raising SIEM incident upon vulnerability finding)

The trimester deliverables for Redback Operations would consist of:

- *System requirement and scope definition.*

Completed at week 2 by Nasim Emadi. The “VM System Requirement. Docs” is uploaded into the project GitHub repo.

- *Vendor and product analysis and selection.*

This is completed by Week 5, collaboratively by all 3 team members each member did one specific vendor analysis in the first part and then collaboratively decided and document a report on which vendor is selected. Vendor documents and the final vendor evaluation report are uploaded into Project Repo under the “Vendor Selection” folder.

- *Project tenant initiation.*

This has been action completed by the GCP tenant cloud service owner which communications (access request form submission, etc.) is completed by Nasim Emadi in Week 5 and all 3 team members got to access the same week. (No Artefact is required).

- *Periodic Network Asset Discovery and publishing finding in a dashboard.*

Started in Week 6 by Hashana. It’s still in progress. Documents will be uploaded upon progress and completion.

- *Vulnerability code scanner for static code analysis.*

Started in Week 6 by Nasim. It’s still in progress. Documents will be uploaded upon progress and completion.

- *SCC and SIEM integration (Raising SIEM incident upon vulnerability finding)*

Started in Week 6 by Nasim. It’s still in progress. Documents will be uploaded upon progress and completion.

Project Members

Member Name	Role	Task
<i>Nasim Emadi</i>	<i>Team Lead</i>	<i>Leadership, and SCC integration with SIEM</i>
<i>SANJAY MEDIKONDURU</i>	<i>Team Member</i>	<i>Vulnerability code scanner</i>
<i>HARSHANA THILANGA</i>	<i>Team Member</i>	<i>Project tenant initiation and Asset Discovery</i>

Data/AI team

Project 11: FIT File Handling and Data Pipeline

Overview, Goals, and Objectives

The FIT File Handling and Data Pipeline project aims to handle FIT files from the Wahoo KICKR Live, convert them to CSV format, and upload the data to a database. It will aim to provide real-time performance metrics through a rudimentary user interface using basic JS, HTML, and CSS as an MVP (only data points). The project will offer guidance to the web/application team on integrating the data within the game experience. A Python script will communicate with the KICKR, download, and convert FIT files to CSV, and integrate the data into the data warehouse project for storage. The project will provide a comprehensive solution for handling KICKR Live FIT files, making the data easily accessible for analysis and real-time performance metrics.

Top of Form

Aims for Trimester

- Develop a Python script for communicating with the Wahoo KICKR Live via Bluetooth connectivity and Wahoo API, downloading, and converting FIT files to CSV, and uploading data to a database.*
- Create a rudimentary user interface using basic JS, HTML, and CSS to display real-time performance metrics as an MVP.*
- Provide guidance to the web team on integrating the data within the game experience.*

Deliverables

Long-term Deliverables:

- A comprehensive solution for handling KICKR Live FIT files, making the data easily accessible for analysis, and providing real-time performance metrics.*
- A scalable and secure data pipeline that integrates with the game experience.*

Trimester Deliverables

- Completed Python script for downloading, converting, and uploading FIT file data using the Wahoo API and Bluetooth connectivity to the KICKR Live.*
- Rudimentary user interface displaying real-time performance metrics as an MVP.*
- Documentation on Python script usage and deployment.*

- *Guidance for the web team on integrating data within the game experience, including instructions on how to access the data through the data pipeline.*

Project Members

- *Mark Telley – Product Owner*
- *Sindhuja – Product Lead*
- *Prastut – Stakeholder (Data warehouse)*

Key Progress:

1. *Clear Pipeline Design and is being implemented*
2. *Set up bigquery sandbox enviroment for centralised data storage for other Data/AI team members.*
3. *Wahoo API application approved*
4. *Wahoo API development in progress*
5. *Github - https://github.com/redbackoperations/data-analysis/tree/main/Trimester_1_2023/Project%2011%20FIT%20File%20Handling%20and%20Data%20Pipeline/wahoo_connection*
6. *Implementation of pycycle as a means of pulling data out of the wahoo machine*
7. *Github - https://github.com/redbackoperations/data-analysis/tree/main/Trimester_1_2023/Project%2011%20FIT%20File%20Handling%20and%20Data%20Pipeline/wahoo_connection*

Project 12 : Develop a "Consultation Platform"

The aim of this project is to implement a foundational tool to collect data from users to be able to provide them with a regular fitness routines and workouts suitable for their body type, to ensure that the exercise they are performing is effective.

The tools will be used to gather data, include case studies, health information, record of previous performances, checklists, interviews, , surveys and questionnaires

- Corporate Reporting Project

The Corporate Reporting project aims to create the static reports mentioned below, using SQL queries on the underlying tables.

- weekly summary reports
- Ranking analysis reports
- workout summary reports

There will be views created which will pull out the data required from the tables and produce the reports.

This project will also aim at creating dynamic dashboards (Power BI or Tableau) that pulls data from database every time we need reports and generates the reports.

Key Progress:

Completed by Ella Zarandi

- Research on Strava schema,
- Consultation platform features
- What data we are collecting/needed to be collected

Completed by Sindhuja Manduru

Conducted a research about the current collected data fields which we are going to use to generate the reports

- Feedback analysis models Project

This project aims to train and prepare a “feedback analysis model” to be used at for the “feedback” feature to collect data in order to be used in our Consultation platform project

As currently we don't have a “Feedback” feature in our products, so I will be using an “Amazon food reviews and rating” dataset in csv format (which are text reviews and rating the food out of five stars)

What is done:

Conducted some research about the technologies to implement this feature, and based on the result, I decide to use the following two main techniques:

- *Vader Model which is a NLTK (python's natural language toolkit) module that provides sentiment scores based on the words used*
 - *Roberta model which is a pre-trained transformer model*
-
- ✓ *Will explore using some huggingface pipelines for making analysis quick and easy*
 - ✓ *Will conduct analysis and evaluation of the models’ performance*

Key Progress:

Completed By Ella Zarandi

The Vader Model is developed with the result of 80% accuracy. Below shows the taken steps to develop this model:

Vader is an NLTK module that provides sentiment scores based on the words used. It is a rule-based sentiment analyzer in which the terms are generally labeled as per their semantic orientation as either positive or negative.

- Ran EDA to get an idea of what the data set looks like
- Value count on Score column to see the number of times each score occurs
- Ran NLTK word tokenizer to splits the sentence into the parts of each word in the sentence
- Ran the nltk pos tag for part of speech tagging
- Grouped the Tokens into chunks of text
- Implemented and tested the Model
- Sentiment scores generated and added to the original fields
- Ran Plots based on the positive neutral and negative scores
- The plots confirm that our Vader Model is valuable in having the connection between the score of the text and sentiment score and it does relate to the actual rating review of the reviewers

Project Members:

Ella Zarandi, Sindhuja Manduru

Project 13: The Cyclist/User Categorisation Project

The Cyclist/User Categorisation Project aims to employ machine learning algorithms, including k-means clustering, hierarchical clustering, and principal component analysis (PCA), to comprehensively categorise cyclists based on their unique cycling behaviour patterns. The data used in this analysis will be collected from the Wahoo Kickr or Wahoo Bolt devices and Heart Rate monitor, analysed to develop a system of labels, spanning Pro, Semi-Pro, Amateur, Casual, Climber, and Sprinter cyclists. These labels will be further developed through data-driven analysis and may undergo changes, based on the outcomes. The insights gained from this categorisation will be vital in developing SunCycle and to compete with other competitors such apps such as Zwift or Strava, that matches cyclists with similarly skilled riders. Furthermore, the results of the analysis could be used for targeted marketing, sponsorships, and product development.

Aims for Trimester:

- *Pre-process and clean the existing data set of FIT files.*
- *Perform exploratory data analysis on the data set to identify patterns and trends in cyclist behaviour.*
- *Apply unsupervised learning techniques such as k-means clustering, hierarchical clustering, and principal component analysis (PCA) to categorise cyclists based on their behaviour.*

- *Evaluate the effectiveness and accuracy of the categorisation results and refine the techniques as necessary.*

Deliverables:

- *Cleaned and pre-processed data set of FIT files – Create a specific dataset.*
- *Exploratory data analysis report outlining patterns and trends in cyclist behaviour.*
- *Categorisation report outlining the identified groups of cyclists based on their behaviour.*
- *Evaluation report detailing the effectiveness and accuracy of the categorisation results.*
- *Documentation outlining the project methodology, including data cleaning, and pre-processing steps, algorithm selection, and evaluation criteria.*
- *User guide and technical documentation for the updated library of algorithms and techniques.*
- *Handover documentation outlining the necessary steps for future maintenance and development of the project.*

Project Members

- *Mark Telley – Product Owner/Lead*
- *Ella Zarandi – Product Lead*

Key Progress:

1. *Research conducted*
2. *Data sets have been prepared for the analysis*
3. *Scripting will commence from week 7*

Project 14: Sentiment analysis (language processing) and Community standards - User/Community comments

The objective of this feature is to create a welcoming and inclusive environment for SunCycle community. SunCycle users have the option to leave comments on each other's activities as means of increasing engagement. To ensure that the comments are appropriate and to keep track of language usage, this project will analyse comment data, develop a model, and classify user comments. Further work will focus on documenting community rules (policy) and how a model confirms with modern day AI ethics.

Aims for Trimester

- *Document community guidelines.*
- *Research different models.*
- *Procure data sets for training purposes.*
- *Implement various machine learning model that can classify user comments.*
- *Analyse model performance and best fit.*
- *Documentation of entire process.*
- *Live demo application*

Deliverables

- *Community guidelines*
- *Python files with different models*
- *Documentation of working progress*
- *Live demo*

Project Members

- *Tianqi Liang (Yvette) – Lead; responsible for deliverables*
- *Ella Karimi Zarandi – Support*

Key Progress:

Summary of work completed to date / progress

In Week 3:

Cleaned dataset

Created a word cloud

Use word_tokenize to split words and created a new feature to sum up number of words

TfidfVectorizer method to select features from comments

Constructed logistic regression model (0.619371875)

Calculated accuracy score

In Week 4:

Used non-negative matrix factorization (NMF) for dimensionality reduction

Constructed a multinomial Naive Bayes model (Accuracy: 0.58)

Performed grid search cross-validation to select the parameter (alpha)

Used pca method for dimensionality reduction

Constructed a support vector machine model (slow model)

Performed grid search cross-validation to select the parameter (C)

In Week 5:

Random Forest (Accuracy: 0.55)

In Week 6:

Stanford CoreNLP on Google Colab (Accuracy: 0.55 - 0.36175)

Summary of work in flight

I am working on feature engineering, including different dimensionality reduction methods (t-SNE), using nltk and sklearn package and stanford coreNLP in order to improve model accuracy.

Summary of work planned in future

If the current model can achieve an accuracy score of approximately 70 - 80%, I will choose another model such as Gradient Boosted Trees (GBT), Convolutional Neural Networks (CNN), or Bidirectional Encoder Representations from Transformers (BERT) to see if I can reach an accuracy of 90%.

List any issues encountered

*Accuracy is only slightly better than random guessing;
Featuring engineering should be refined.*

Project 15: User Ranking - Engagement

Overview, Goals, and Objectives

One of the main goals in our SunCycle community is to keep riders motivated and engaged in a regular base. We aim to develop a ranking system to achieve that purpose and enhance engagement among riders. The system is going to rank the users based on how many points they achieve, which will be calculated based on their engagement. We will collect their activity data, prepare it, and use it to build the system. To give an example, a rider could earn 'X' number of points if they ride in two consecutive days. Also, this project aims to use machine learning to provide the users with their ranking projected path, based on their previous engagement, which is expected to be a purpose for motivation.

Aims for Trimester

- *Researching on ranking systems (Mostly related to sports)*
- *Establishing clear worked out calculations of how and when users earn points.*
- *Researching methods, technologies to be used, and implementing the algorithm (First implementation)*
- *Data collection and preparation for testing*
- *Documenting the whole process*
- *Researching possible machine learning implementations*

Deliverables

Trimester 1 – 2023:

- *Points ranking system based on users' activity data (Working prototype)*
- *Short report on the mechanism of the system*
- *A handover document for the next team*

Long-term:

- *Detailed analysis of users' engagement and rankings*
- *Machine learning features implementation (E.g., Projected path) based on previous research.*

Project Members

Saeed Alnaqeeb – Lead; responsible for deliverables

Mark Telley – Support.

Key progress:

Completed Work:

Researching, gathering information and requirements needed

Project Plan

Upskilling in some areas needed for the work in upcoming weeks
Exploring and examining a sample dataset
Defining the basis of ranking the users

Work in Flight:

Data analysis
Upskilling in Python and SQL
Reviewing ranking rules
Ongoing documentation

Planned Work for the upcoming weeks:

More upskilling needed
Model development
Data acquisition
Implementation of the system

Encountered Issues:

Lack of time due to some personal enrolment issues in the beginning of trimester
Needed a lot of time for researching before starting any actual work

Project 16: Performance Ranking (User)

Based on training peaks [StackUp](#) – The following will be implement a feature that allows users to see their performance and how they rank or ‘stack up’

Overview, Goals, and Objectives

The main goal of this project is to keep users engage with our product by giving them information regarding their performance. The performance analysis will be available in real time and users will have access to their historical performance. We will create dashboards where users can see their performance evolution. We will create different categories of performance and give them one final score. Users will be able to set goals for each performance category and track their progress on interactive dashboards this will create a competitive in-game environment.

Aims for Trimester

Describe the aims of the project for this trimester.

- Start the project documentation: Research and Setting objectives (deliverables).*
- Develop a comprehensive understanding of performance KPIs in cycling.*
- Gather and analyse the necessary data - making sure we have the data we need to create analysis and dashboards.*
- Create user-friendly interactive dashboards of user performance analysis.*
- Prepare documentation for handover to the next team.*
-

Deliverables

Trimester 1 – 2023:

- Performance score calculation system based on users’ activity data.*
- User-friendly Interactive dashboards of user performance*
- Real-time performance analysis and historical performance tracking.*
- Tableau-based reporting for data visualisation.*
- Documentation of the project's progress and findings for handover to the next team.*

Long-term:

- Detailed analysis of users’ engagement by tracking their own performance.*
- Elaborate predictions of future goals based on their historical performance.*

Project Members

Miriam Llaue Cotrina – Lead; responsible for deliverables

Tejas Varun Baskar – Support

Key Progress

Summary of work completed to date:

The project that I am currently working on is User Stats Visualization. So, to attain the final visualization we uptake many small processes to attain the final visualization. The first major small process is data cleaning. The data that was provided to was a very large data set (Stats for every second) and had a few missing values as well and the data was also not generalized. So as of today, I have completed the shrinking of the data set (to daily stats), I have also worked on the missing values by substituting the missing values with the mean values of that specific column and I have also removed few null values as it does not very necessary for the visualization and finally, I generalized the final data set as the many of the values had more than 4 decimal values so now it has been reduced to 2 decimal points.

Summary of work in Flight:

The next stage of the visualization is selecting the perfect graph or chart for a specific metric or attribute. so, this task is done using the tool PowerBI and tableau to choose the right graph for the final visualization. This task will be done as a team with my teammate Miriam to avoid the possibility of choosing the wrong graph or chart.

Summary of work planned for the future:

The ultimate goal of this project is Visualizing a specific users stat in the form of a dashboard to see the progress that they have made over the course of 2 years (according to the provided dataset). The final dashboard will display the stats of all the important metrics in a page or two depending the size of selected graph. This can be used as to give the user better view on their progress in a more understandable way.

List of Issues encountered:

I have not specifically encountered any issues. But I had to learn more on the dataset as the current dataset that I am using was a very new topic for me. So, I had to spend more time on understanding about each metrics and their uses to efficiently use them for our project.

Project 17: Workout Categorisation

Overview, Goals, and Objectives

The objective of this feature is to categorise workouts for Smart Bike users into workout types to tailor the experience to the requirements of each user and further gamify their training sessions. Whether a user is attempting to lose fat, improve cardiovascular fitness or simply increase endurance different workout types will provide different outcomes and we can highlight the benefits, recommend workouts that best suit their needs or identify if the user is not meeting their chosen goals. This project will analyse user outputs to develop a clustering model to label workouts based on similar features. Once these labels are assessed as appropriate, these labels can be used for further workout recommendations.

Aims for Trimester

- *Identify appropriate datapoints for the dataset.*
- *Research different clustering models.*
- *Implement and assess different clustering models.*
- *Analyse model performance and validity of clusters.*
- *Develop a workout recommendation engine.*
- *Documentation of process steps.*

Deliverables

- *Clustering model – Trimester 1*
- *Recommendation engine – Trimester 1*

Project Members

Feature lead – Nicholas Manning

Key Progress

Work Completed

- *I established the goals and aims for workout categorisation and clustering project, which are currently on track to meet completion by the end of the trimester.*
- *I researched clustering models to determine that initial testing would be conducted using K-means, followed by further testing to confirm results using K-modes, and a Gaussian Mixture model. Initial testing has shown positive results validating the choice of models so far.*
- *I determined that the performance metrics used to judge model success would include a combination of the elbow method, silhouette scores and visualisations. These have been able to identify an appropriate number of clusters and identify broad cluster types.*
- *I have determined the appropriate data cleaning measures. Pre and post cleaning results show a clear improvement and more distinct clusters.*

Future Work

- Lockdown the final dataset to train the model on as currently I have only been using a test dataset. Once the dataset is received I will be able to better tune the final model.
- Confirm through further and broader testing the appropriate model and amount of clusters, and decompose the clusters to label each one as a specific workout type.
- Develop a workout recommendation model to provide users with options for further exercise based on their current sessions.
- Document the process steps and results to ensure an accurate transparent approach.
- Provide ongoing support and feedback on my progress and the progress of my colleagues to the Data and AI team through our various forums: meetings, Trello board, GitHub.

Issues Encountered

- Bottlenecks with our BigQuery site importing real bike data.

Project 18: Data Warehouse

Overview, Goals and Objectives

The data for the Data and AI teams of Redback Company are temporarily stored in BigQuery environment. As BigQuery is a cloud-based environment and therefore has a limited database security option. As there is no infrastructure to manage and does not need a database administrator it can further expose the data to more vulnerabilities. So, we aim to provide an effective and long-term solution for the temporary measures that we have taken. The data will be pipelined into a Relational Database Management System (RDMS), and we aim to provide it through MSSQL. The data warehouse will consist of various layers from extracting Raw data to creating data marts for the business. In this project the primary focus would be providing an effective data warehouse architecture following data integration strategies, governance and security but not limited to modelling and analytics strategies.

Aims for Trimester

- Defining an architecture for the warehouse which includes data ingestion methods, storage options, and software and hardware specification, among others.
- Establishing data privacy, data security and data quality process.
- Development of logical models, data schemas and data marts.
- Establishing pipeline for the raw data connection and designing ETL pipelines.
- The ability of handling large chunks of data with continuous monitoring and optimizing.
- Development of master database.

Deliverables

Long-term

- A permanent solution to the extraction and storage of data.

- *Integration of Extract, Transform and Load (ETL) workflows which extracts data from the source, transforms as per the architecture and requirements of the data warehouse, and loads into the warehouse.*
- *An effective data quality and governance framework.*

Trimester

- *A visual representation of the data structure in the data warehouse.*
- *A detailed description of how data from various sources are integrated and transformed.*
- *A master documentation that consists of comprehensive documentation of the data in the warehouse along with system and user documentation.*
- *A beta version of the integration of ETL through the proposed data warehouse architecture*

Project Members

Prastut Sapkota – Project Lead

Saransh

Ankit

Key Progress

Summary of work completed:

- *Architecture has been designed.*
- *Raw database of the warehousing has been created.*
- *Staging database of the warehousing has been created.*
- *A few master database tables has been added into Warehouse.*
- *A sequential workflow for the alteryx design has been created.*

Summary of work in flight:

- *Creation of production database in the warehouses.*
- *Testing the warehouse in a dedicated server.*
- *Integration of FIT file directly through API into Alteryx.*
- *Team support related to alteryx and databases.*

Summary of work planned in future:

- *Creation of data marts for current team.*
- *Airflow deployment.*
- *Warehousing of other data sources.*

List any issue encountered:

- *Sequential workflow through alteryx has taken a lot of research and development time.*

Project 19: Google Analytics/Hotter Analytics/MixPanel/App Analytics (Marketing and UX)

Overview, Goals, and Objectives

We are using existing data from Google Analytics to create reports to study user's behaviour and get meaningful insights about their out-of-game engagement to create a feedback loop for product owners which will enable them to view and address product statistics, bounce rates and various other issues.

Aims for Trimester

- *To formalise report on key data insights*
- *Attempt to harmonise various data sources.*
- *To capture the behavioural & consumption pattern*
- *To collect details of other products of same specification*

Deliverables

- *Develop a pipeline for potential areas of focus for better allocation of resources.*
- *Develop functional model viz-a-viz product vs customers.*
- *Integrate with online data warehouse to store key data points such as the bounce rates and other critical user metrics, from various sources.*
- *Provide working example of software engagement metrics.*

Project Members

Kunal Tripathi - Lead

Key Progress

Summary of work completed- *Used GA(Google Analytics) for a travel website to find the constitution of the in-flow of users, detailed statistics (acquisition, behavior and conversions, etc.) of the site for various durations and their comparisons, demographic (Age, gender, etc.) of the users as well as the visualization of all the data from all the popular browsers.*

Summary of work in flight- *Checking the statistics with other tools like hotjar/mixpanel and comparing them with the findings from GA*

Summary of work planned- *Design custom based tools using our own algorithm to pull more relevant data pertaining to work/task. The tool designed will be able to pull relevant data for understanding the dynamics of the people hitting the site and convert large chunks into sales. Integrate the tool with the other ongoing projects in the next trimester like the data warehouse project, as well as with mixpanel and hotjar.*

List of Issues encountered-

1. *The data was preset as per the designers view point and therefore the project had to be tailored according to the designers views*
2. *Limitation on acquiring the data set. The data set was not enough to come to precise conclusion*
3. *Few minor admin issue like erratic Wifi*

Project 20: Posture Analysis

Overview, Goals, and Objectives

This project involves using pose estimation algorithms to detect postures and facial expressions and analyse them to better improve user experience during cycling. We can use gesture analysis to detect discomfort, exhaustion or enjoyment and provide the appropriate stimulation for the users or alerts. Moreover, we can also use posture analysis to recommend and monitor pre-workout warm-up stretches, cycling posture, and post workout cooldown stretches. The data can be used to improve the algorithm and provide insights for improving the environment or the bike.

Aims for Trimester

- *Research of previous studies relating to facial gestures and posture during exercise*
- *Selecting the most suitable pose estimation algorithm as a base*
- *Collecting cycling and cycling related video and photo data*
- *Developing an analysis model that sorts and analyses the data, then creates a usable output for further use or storage*
- *Documenting the functionality of the model and its results*

Deliverables

- *Report on the information gathered from previous studies*
- *Cleaned and organised data*
- *A pose analysis model*
- *Documentation for project handover*

Project Members

Samuel Borough Kamau-Lead

Key Progress

1. *Summary of work completed to date / progress:*
 - *Implemented a Python algorithm using OpenCV, Mediapipe, and TensorFlow to detect cycling posture and technique in real-time from video.*
 - *Used the algorithm to analyze cycling posture and technique and detect common errors such as incorrect elbow, hip, and knee angles and wrist flex.*
 - *Validated the algorithm's output using visual inspection and feedback from a small group of cyclists.*
 - *Optimized the algorithm's hyperparameters to improve its performance on the test dataset.*
2. *Summary of work in flight:*

- *Analyzing the algorithm's performance on different types of bicycles and in various lighting conditions and camera angles.*
- *Adding a more interactive and intuitive UI to better improve user experience*
- *Comparing the algorithm's performance to existing tools for analyzing cycling posture and technique.*
- *Conducting a longitudinal study to assess the algorithm's long-term impact on improving cycling posture and technique.*

3. *Summary of work planned in future:*

- *Collecting a diverse dataset of cycling videos to test the algorithm's performance on different cycling styles and body types.*
- *Using an objective measure of posture and pedaling technique such as motion capture or force plates to validate the algorithm's output.*
- *Conducting a pilot study with a larger group of cyclists to obtain feedback on the algorithm's usability, accuracy, and effectiveness in improving posture and pedaling technique.*
- *Analyzing the algorithm's performance in terms of its ability to detect and correct common posture and pedaling errors.*
- *Optimizing the algorithm's hyperparameters such as the detection confidence thresholds and the scale factor to achieve the best performance on the dataset.*
- *Evaluating the algorithm's performance under different lighting conditions and camera angles to ensure its robustness.*
- *Testing the algorithm's performance on different types of bicycles such as road bikes and mountain bikes to ensure its generalizability.*
- *Collecting user feedback on the algorithm's usability, accuracy, and effectiveness and using it to further optimize and improve the algorithm.*