# Redback Operations

Data Science and Analytics team

*Trimester 3 2022*

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## Team

**Senior Students:**

Andrew Mayes

Nithini Bogahawatta

Lang Ning Bao

Quintin Xu\*

**Junior Students:**

Mark Telley (lead)

*\*Working with more than one team.*

## Overview, Goals, and Objectives

- The Data Science and Analytics (DSA) team is made up of four students (three of which are senior students) and one additional student working across more than one team. The team is relativity small, and each student will be driving their own projects forward vs. working on a single project collectively.

- The DSA team are inheriting a few projects from Trimester 2, 2022 with the aim of further developing the specific projects. Some projects will continue into Trimester 1, 2023 whereas some will be completed (handed over) at the end of Trimester 3, 2022.

- A key objective is to procure more data concerning workout/session data to further support analytical and modelling efforts, thus improving precision, recall and accuracy performance. The indirect benefit of procuring such data will help inform the requirements for being able to export session data from the bikes located in the labs as means of uploading session data to 3rd party applications such as but not limited to Strava, TrainingPeaks etc.

- A key objective will be to further develop the Oxygen uptake prediction model that use both data from the bikes located within the lab and procured bike (workout) output data.

- A key objective will be to begin finalising the Sales data analysis and visualisations and to facilitate a handover to the UX/Web/Mobile teams to integrated into web/mobile website.

- A key objective will be to begin working on new projects; Posture analysis, Workout Analysis and User specific visualisations using Tableau. By adding new projects to the DSA list of projects, this both allows for continuity in project output carrying into Trimester 1, 2023 and further increasing Redback Operations product development efforts.

- A key non-project led objective is to ensure handover documentation is detailed and transparent in anticipation for a highly effective handover to the Trimester 1, 2023 team; this will be delivered via strong and consistent documentation standards such as but not limited to; operating manuals, access details (database, datasets, Tableau accounts) and technical documentation concerning any model or analysis led projects.

- Work on at least 4 out of the 5 listed projects within this document; allow for one project to be rolled over to Trimester 3, 2023 should timing constraints materialise.

- Secure an updated Risk Assessment that liberalises operating (use) restrictions of the bike trainers within the respective Deakin (Burwood) lab.

## Project A – Risk Assessment and Standard Operating Procedure

### Overview, Goals, and Objectives

Redback Operations is operating two indoor cycling trainers (Wahoo Kickr and Wahoo Climb, Avanti Montari 2 MTB 29" frame) to support product development and research. Given the dynamics of this equipment, there are obvious but very manageable risks. Deakin Health and Wellbeing have previously expressed concerns regarding the operation of this equipment due to safety issues such that operating the equipment has been heavily restricted. Wahoo Kickr’s are used safely in various settings; amateur and professional e-racing events and as part of research efforts (Zadow et al., 2016, Zadow et al., 2018) across Australia. Wahoo Kick’s also meet the relevant Australian standards and is sold both within the public and commercial markets. There are clear (existing) paths to operating the equipment safely and Deakin’s Health and Wellbeing Team need to be reengaged to provide fair and reasonable operating requirements that allows students to use the equipment as it was designed to be use and to liberalise current operating restrictions.

### Aims for Trimester

1. Able to operate/use bike trainers freely but safely.
2. Document a safe standard operating procedure.

### Deliverables

1. Update risk assessment to allow Students to use the trainers within the lab.

### Project Members

Mark Telley – Student Lead; responsible for coordinating Risk Assessment.

Akan Cosgun – Teaching Lead; responsible in helping support student lead.

Adrian Grigo – Support; Provide support where required as company lead.

## Project 1 - Sales Visualisation and Data Analysis *(existing)*

### Overview, Goals, and Objectives

Existing research, data analysis has been conducted to deliver meaningful insights from gaming sales data along with market information on the prospect of Health & Fitness video games. Such efforts continue to support Redback Operation’s ability to make data-drive strategic decisions both in the short and long term. The goal over the duration of Trimester 3 is to further develop Sales data analysis and visualisations.

### Aims for Trimester

* Finalise Sales Tableau Reporting and Visualisations.
* Continue to formalise and report on key data insights.
* Handover the Tableau product to the UX and front-end development teams in preparation for web deployment.
* Produce high quality handover documentation concerning access details, data location access, technical documentation etc.

### Deliverables

1. Finalise current Tableau reporting visualisations.
2. Handover of Tableau reporting and visualisation to UX and front-end teams.
3. Handover Documentation available within DSA GitHub repo.
4. Develop a pipeline of potential future data analysis efforts/areas of focus to inform possible projects for future members of the DSA team.
5. Develop a pipeline of potential future improvements regarding Tableau to inform possible projects for future members of the DSA team.

### Project Members

Nithini Bogahawatta – Lead; responsible for deliverables

Mark Telley – Tester; User based testing to support Team Lead.

## Project 2 Oxygen uptake prediction model with sensor data from bikes *(existing)*

### Overview, Goals, and Objectives

A considerable amount of work has been invested in Oxygen uptake prediction modelling. As previously identified, measurement of oxygen uptake is expensive and not everyone can afford to have such expensive tools. The purpose of continuing research and development efforts is to continue refining algorithms/models that can predict the oxygen uptake for cyclists using an alternative method. This adds great value to Redback Operation’s product development as it would be a highly desirable user feature, particularly for users interested in fitness development and improvement. A key goal is to facilitate handover to the development teams to integrate the modelling into the in-game experience.

### Aims for Trimester

1. Assess all existing research and development (algorithms, data analysis, datasets etc) and identify and further areas of focus.
2. Continue refining and developing the existing models.
3. Develop handover documentation (to other teams).
4. Develop a pipeline of future calculators that future DSA teams could continue working on.

### Deliverables

1. Document testing and model performance metrics (precision, recall, accuracy etc)
2. Thoroughly document modelling technical specifications.
3. Thoroughly document key handover materials and upload to the DSA github repo.

### Project Members

Nina Zhang - Lead; responsible for deliverables.

Andrew Mayes – Support; Assist Project Lead.

Quintin Xu – Tester; User based testing to support Team Lead.

## Project 3 Continue Researching data for cyclists as part of developing calculator tools *(existing)*

### Overview, Goals, and Objectives

Cycling is a data intensive sport such that many different data points can be collected/recorded and thus can be reported on. Given the array of potential data points, several calculators can be developed to provide the User with key insights into their performance. Being able to develop calculator tools that can be used both by Users and Development teams further improves the User experience and allows the Development team to utilise and incorporate accurate and relevant calculations within the in-game experience.

### Aims for Trimester

1. Existing documentation with DSA’s GitHub repo is inconsistent, not immediately obvious, or easy to find; improving documentation transparency is a key aim for this trimester. This should further support handover efficiency for the Trimester 1, 2023 teams.
2. Continue to develop, test, refine and handover over calculator tools to the broader Redback Operation’s team. Moreover, the aim to complete (handover) at least one calculator tool.

### Deliverables

1. Document testing and respective calculation performance.
2. Thoroughly document respective calculator technical specifications.
3. Thoroughly document key handover materials and upload to the DSA github repo.
4. Handover at least one calculator tool to respective Redback Operation teams.

### Project Members

Lang Ning Bao – Lead; responsible for deliverables.

Andrew Mayes – Tester; User based testing to support Team Lead.

## Project 4 Posture Analysis Model *(new)*

### Overview, Goals, and Objectives

The posture of a bike user influences several variables, indirectly and directly. Moreover, posture can be used as a qualitatively (indirectly) particularly when accessing the bike user’s energy levels i.e., if you see a competitor in complete control of their breathing and posture you could assume the competitor is ‘in control’, or they could be bluffing – controlling posture can provide a competitive psychological edge particularly in a racing environment. Posture also directly impacts performance metrics such as speed and power i.e., When riding at speed (>40kph) on a flat surface or descending down a hill, the posture into those circumstances plays directly into aerodynamics. Therefore, being able to analysis a user’s posture during the in-game experience will allow a more realistic simulation of actual outdoor cycling by rewarding good posture and penalising poor posture based on the specific circumstance. Features like this will continue to innovate Redback Operation’s product developing efforts.

### Aims for Trimester

1. Initiate project (scoping) documentation capturing key technical considerations, research, deliverables etc.
2. Develop technical documentation regarding key hardware being used an how to use the hardware i.e., Cameras.
3. Assess posture positions and map them to respective cycling scenarios.
4. Research possible models that can analyse and predict a user’s posture on the bike.
5. Begin testing possible models.

### Deliverables

1. Handover key project (scoping) documentation.
2. Test at least one posture prediction model and document key findings.
3. Thoroughly document key handover materials and upload to the DSA GitHub repo.

### Project Members

Andrew Mayes – Co-lead; responsible for deliverables

Quintin Xu – Co-lead; responsible for deliverables

Mark Telley – Testing participant.

Adrian Grigo – IOT team lead; Technical support (use of camera hardware)

## Project 5 Workout Analysis Model and Data Visualisation *(new)*

### Overview, Goals, and Objectives

Whether a bike user is using an indoor trainer, cycling outdoors, or using Redback Operation’s VR product, being able to provide post-workout analysis and succinct data visualisations to the user is a critical component in the user experience. Being able to develop analytical models and tools to analyse workouts will also benefit Redback Operation’s ability to develop popular/in-demand structured workouts. Furthermore, by beginning to analyse user data, Redback Operations can begin ranking user vs users thus creating a competitive in-game environment.

### Aims for Trimester

1. Initiate project (scoping) documentation capturing key technical considerations, research, deliverables etc.
2. Conduct competitor research regarding visualisation and post workout analysis features and standard.
3. Procure a meaningful amount of workout data to support model analysis and training efforts.
4. Uniformly organise and clean procured data into respective datasets and a single, easily accessible database.
5. Draft a plan to integrate data analysis efforts with Projects 2 and 3 i.e., included calculators and oxygen prediction model within the data visualisations.
6. Develop at least one prediction-based model i.e., Workout category prediction (climbing, HIIT, recovery etc).
7. Begin developing Tableau based reporting visualisations.

### Deliverables

1. Thorough Project documentation.
2. Thoroughly conduct competitor research specific to the project scope.
3. Organised data location of procured data.
4. Prototype of data visualisation within Tableau concerning post workout analysis.
5. Deployment (and testing) of one predictive learning model.
6. Thoroughly document key handover materials and upload to the DSA GitHub repo.

### Project Members

Mark Telley – Lead; responsible for deliverables

Quintin Xu – Tester; User based testing to support Team Lead.

### REFERENCES

ZADOW, E., KITIC, C., WU, S. S. X. & FELL, J. 2016. *Validity of the Wahoo KICKR Power Trainer*.

ZADOW, E. K., KITIC, C. M., WU, S. S. X. & FELL, J. W. 2018. Reliability of Power Settings of the Wahoo KICKR Power Trainer After 60 Hours of Use. *International Journal of Sports Physiology and Performance,* 13**,** 119-121.