FIT3164 Semester 1, 2024:
Project Management Report

Team: MDS02

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Table of Contents

1 Introduction to Project

This project focuses on lymphedema prediction using machine learning approaches. According to Fu et al. (2018), lymphedema is swelling caused by the accumulation of lymph fluid in the body. Lymph nodes work like drains in a sink which help to clear fluid but blockages prevent this process which cause fluid retention. The National Cancer Institute (2023) stated that breast cancer treatment is most commonly linked to lymphedema due to the disruption of the lymphatic system during surgeries such as mastectomy or lymph node dissection, and radiation therapy targeting the lymph nodes. Unfortunately, there exists no cure for lymphedema currently but early detection is essential for timely intervention which aims to alleviate swelling, prevent its exacerbation, and prevent associated symptoms (Cancers for Disease Control and Prevention, 2023).

Current lymphedema prediction methods often rely on subjective manual assessments like limb measurements and medical imaging. Moreover, current machine learning models have shown some limitations such as self-reported data and inconsistent performance. Hence, this project aims to develop an enhanced machine learning model using available datasets related to breast cancer-related lymphedema. Subsequently, the enhanced model is integrated into a website for predicting lymphedema which provides early detection, personalized risk assessment, enhanced patient care, and advancement in cancer care.

This project is led by three members that is supervised by Dr. Ong Huey Fang. The members include Chan Jia Xin as the project manager, Pang Eason as the quality assurance and Liaw Yi Hui as the technical lead.

2 Project Management

2.1 Introduction

Project management is the practice of applying expertise, capabilities, resources, and methodologies to execute a sequence of activities with the aim of delivering benefits and obtaining a specific goal (Project Management Institute, 2024). According to National University (2024), project management is important as it ensures timely, budget-conscious, and quality completion of projects, while also addressing risks, optimizing resources, and keeping stakeholders engaged.

In this project, we have strictly adhered to the project management plan by applying the Agile methodology. This methodology emphasizes continuous collaboration and improvement by following a cycle of planning, executing, and evaluating (Atlassian, 2024).

The following sections delve into the methodology employed in this project, the resources allocation, risk management, limitations encountered, and reflection on this project's success.

2.2 Methodology

2.2.1 Explanation of Methodology

Throughout the entire project lifecycle for our Lymphedema prediction software and its accompanying website prototype, our team has chosen to practice and implement **Agile methodology** as the approach for project management within our team. The reason for this was due to the need for adaptability and flexibility in the process of development by taking into account the complexity of our software and its changing needs.

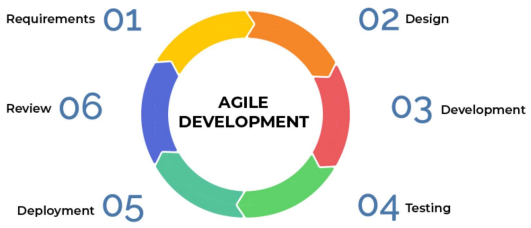

Figure 1: Agile Development Phases

Based on Figure 1, Agile methodology typically consists of six phases in the development. Our team has successfully concluded the first and second phase in the previous semester (FIT3163), and now we are right in the development phase and beyond in this current semester (FIT3164). In today's dynamic and rapidly changing real-world environment, Agile methodology has proven to be super efficient by its practical and flexible nature. It highlights its difference as opposed to the Waterfall approach, where Agile emphasizes continuous dynamic planning, sub-sectioning large processes into smaller bits, as well as recurring enhancement to the outcome (CPrime, n.d.). Agile also ensures customer satisfaction by continual delivery and enhancement of the software, thus fostering effective communication and involvement of all parties in the entire Agile development process, in order to build functional software bit by bit, and make necessary testing and improvement along the way, instead of building a software in one go (i.e., Waterfall approach), that we may not know that it may not be functioning at the very end.

The implementation of Agile methodology brings several advantages to our team working on the lymphedema prediction software and website prototype project. The flexibility that Agile fosters enabled our team to respond promptly and embrace the changing requirements (Bhaskar, 2024). For instance, even when our team was halfway through the development phase, we were still constantly performing research online and seeking constructive feedback from our supervisor, Dr Ong for any possible technological advancement or improvement to ensure that our software remains relevant and efficient. Our team wasn't afraid to accommodate any incoming inputs or changes as we were able to refine our software incrementally, even late in our software implementation, as we just have to perform minor revision (i.e., undo till the previous functioning checkpoint) to our software, instead of developing everything from scratch again, whenever modification is needed.

Besides, our team also utilizes the **Scrum** framework in Agile methodology, that divides the entire project lifecycle into segments known as **sprints**. Each sprint follows a duration of 2 weeks. In the beginning of each sprint, our team will discuss and decide which tasks from the product backlog are to be taken into the current sprint backlog for development. This iterative approach also allows us to perform a sprint review, retrospective and backlog refinement at the end of each sprint where all of the team members reflect on which part we did successfully and what could be improved, and also refining our product backlog to review all of the tasks in it once again. This will definitely benefit us as we make crucial planning and adjustments before we move onto the next sprint.

However, we have made a slight modification to the usual Agile methodology in order to fit in and adapt to our team's unanimous preference. We have introduced or added additional checkpoints on top of just the usual Agile activities (i.e., sprint planning, daily stand-ups, sprint review, sprint retrospective and backlog refinement) within each sprint that are tailored to our unique Lymphedema project. The incorporation of these dedicated checkpoints for reviewing medical literature consistently, and also obtaining professional consultations from our supervisor or even the medical experts, definitely benefit us in a way to validate our predictive model against our clinical data. By performing this, we could ensure that our predictive model is informed by the latest research, and the critical importance of accuracy and reliability in our prediction model to make precise predictions while maintaining flexibility and collaboration.

All in all, Agile methodology that fosters flexibility, adaptability, improved collaboration and team ownership, stands out when we were selecting the optimal project management methodology in our project lifecycle. Hence, by the implementation of Agile methodology and the continuous embracement of its benefits while we continue to embark on the project lifecycle journey, we will succeed in delivering a high-quality solution that meets the stakeholders' requirements and expectations.

2.2.2 Execution of Methodology

Agile methodology plays a crucial role in our dynamic project management lifecycle by offering a structured and flexible approach to our Lymphedema prediction software development. Throughout the entire lifecycle, we have incorporated several sprint cycles into our Agile scrum framework, with each sprint following a duration of 2 weeks. We have also segmented each sprint into five distinct stages or what we called as Agile ceremonies, which include **sprint planning, software development and implementation, sprint review, sprint retrospective** and **backlog refinement** to portray our team's dedication to adhere to the Agile methodology principles and manifesto in order to achieve the goals and objectives of our project. The Agile ceremonies conducted were summarized below in Table 1.

1. Sprint Planning	During the beginning of a sprint, our team performs a sprint planning meeting on Zoom and collectively defines the scope, goals and expectations for the upcoming sprint. During the sprint planning, our team selects the tasks from the product backlog that will be carried out in the current sprint and move them into our sprint backlog. We will actively exchange ideas and prioritize tasks that are on the top of the product backlog, as well as based on the story points of each task. The tasks will then be strategically broken down into more manageable subtasks, and delegated equitably based on the known skill sets and responsibilities of each team member (Agile Alliance, n.d.). Hence, by conducting sprint planning, each team member will be determined to work towards our defined goals in the upcoming sprint. It also allows us to demonstrate our capability in completing different components of our projects concurrently, by first planning the amount of tasks that could realistically be completed in the specific sprint timeframe.
2. Software Development and Implementation	After we have made thorough planning for the sprint, we proceed to execute Trello tasks or cards that have been delegated to each of us in order to build our working Lymphedema predictive software. Daily stand-ups on Zoom were also conducted every Wednesday from 8:00 pm to 8:30 pm as a session for team members to address any arising issues, progress sharing as well as challenges resolution. Coding, testing and features integration all occurred during this stage. Each of the team members also updated the Trello sprint board regularly (i.e., update the status of each task or card) in order to ensure alignment and keep everyone informed with the team's progress. On top of that, we also utilized WhatsApp text messages for ad-hoc discussion to address matters deemed to be of lesser significance as to speed up communication without the need of conducting formal Agile ceremonies on Zoom. During this stage, our project manager - Jia Xin regularly checks on the sprint board to ensure that all of the blockers and delays are addressed promptly. Whenever there are urgent blockers or issues, she would assign additional team members to assist on the task original owner, so that these high priority tasks could be managed accordingly. With such a structured framework, all team members are focused on delivering tangible results, momentum is maintained to ensure a steady progress towards the sprint goals.

3. Sprint Review	As to wrap up each sprint, a sprint review session will be held virtually on Zoom with every team member in the scrum team presenting and portraying our accomplishments and what we have achieved that particular sprint to the fellow stakeholders, including our project supervisor - Dr Ong. Constructive feedback will be gathered in the session that is deemed to be crucial for us to evaluate on our deliverables, as well as to ease an iterative enhancement process on our project. Furthermore, the session offered our stakeholders an opportunity to evaluate the results delivered by our team and suggest any necessary adjustments. The valuable input by the stakeholders comprising medical experts and end-users will then be subsequently incorporated into our future iterations.
4. Sprint Retrospective	Moving forward, all of the team members will then be engaged in a sprint retrospective session on Zoom to possibly reflect on any matter that has gone well in the specific sprint and pinpoint areas that require improvement in subsequent sprints. Individual contributions are also evaluated and peer feedback will be given to each team member so that individual performance could be further enhanced. Based on the practical retrospective findings, the team's overall effectiveness and productivity would definitely be leveraged in subsequent sprints (Zoho, n.d.). As an instance, our team has reflected on the efficiency of team's communication after Sprint 2 and we thought that conducting additional formal meetings on Zoom every single time even for trivial matters would be time consuming and inefficient, therefore we have incorporated ad-hoc discussions using text messages on WhatsApp to address minor matters. Moreover, our team also revisited the Gantt chart to identify possible factors leading to delays in our behind-schedule tasks. We have reassessed the entire timeline and performed necessary adjustments on the task allocation strategically for the following sprint when we found issues on the task allocation in the previous sprint, where headcount for each task wasn't ideal and practical. After that, task delays were then significantly reduced.
5. Backlog Refinement	The final stage in a sprint is the backlog refinement session on Zoom, where our team's product backlog on Trello will be revisited. We will reprioritize the tasks inside our product backlog based on the evolving insights and feedback from the stakeholders (Laoyan, 2024). We will also reassess the feasibility of each task, and break them down into smaller and more manageable subtasks if required. Additionally, any new functionality or features that desire new tasks or user stories in the product backlog will then be added during this stage. As a consequence of this process, we experienced improved task granularity as we have a well-groomed and updated product backlog all the time. In short, this has facilitated a clearer roadmap for us in executing our tasks.

Table 1: Agile Ceremonies Conducted

2.3 Resources

2.3.1 Resource Allocation

In this section, we specify the allocation of important resources such as time, human, and technical for each major activity as shown in Table 2. The tasks are distributed evenly among the team members and all members are involved in both technical and non-technical tasks to ensure fairness and a comprehensive understanding of the project development process. Moreover, most of the tasks predominantly require standard hardware such as computers, networks, and hard disk drives, with the exception of web development which requires utilization of the Google Cloud Platform. With this resource allocation, we aim to provide timely project delivery and a well-structured guide to project development.

Task	Person(s) Responsible	Estimated Duration	Software Tools
Conducting studies and research on the literature and data source of lymphedema.	Liaw Yi Hui, Chan Jia Xin, Pang Eason	10 days	Google Scholar, PubMed, Google Docs, Google Drive
Collecting lymphedema data which consists of clinical data or from patient profile.	Liaw Yi Hui, Chan Jia Xin, Pang Eason	15 days	Google Sheet, Google Drive
Cleaning, preprocessing and implementing normalization on the collected data.	Liaw Yi Hui, Chan Jia Xin	5 days	Microsoft Excel, Visual Studio Code, R, GitHub, Google Drive
Analyzing the preprocessed data, software requirements, and hardware requirements.	Liaw Yi Hui, Chan Jia Xin, Pang Eason	10 days	Visual Studio Code, R, Google Docs, Google Drive
Studying and selecting appropriate machine learning algorithms and programming languages.	Liaw Yi Hui, Chan Jia Xin, Pang Eason	17 days	Google Scholar, Visual Studio Code, Python, Google Docs, Google Drive
Developing proposal with literature review.	Liaw Yi Hui, Chan Jia Xin, Pang Eason	16 days	Google Scholar, PubMed, ProjectLibre, Lucidchart, Google Docs, Google Drive

Designing prototype (website).	Liaw Yi Hui, Pang Eason	13 days	Figma
Developing the baseline of performance using different machine learning algorithms.	Liaw Yi Hui, Chan Jia Xin	14 days	Visual Studio Code, R, GitHub
Developing an improved machine learning algorithm to predict lymphedema.	Liaw Yi Hui, Chan Jia Xin	13 days	Visual Studio Code, R, GitHub
Implementing validation and evaluation on the machine learning model performance.	Liaw Yi Hui, Chan Jia Xin, Pang Eason	25 days	Visual Studio Code, R, GitHub
Developing prototype with user interfaces for lymphedema assessment.	Liaw Yi Hui, Pang Eason	15 days	Visual Studio Code, R, GitHub
Reviewing and debugging code.	Liaw Yi Hui, Chan Jia Xin, Pang Eason, Supervisor	5 days	Visual Studio Code, R, GitHub
Implement integration, system and user acceptance testings and develop a test report.	Liaw Yi Hui, Chan Jia Xin, Pang Eason, Supervisor, Users	22 days	Visual Studio Code, R, GitHub, Google Sheet, Google Drive
Writing a report to summarize the machine learning model aspects and overall findings.	Liaw Yi Hui, Chan Jia Xin, Pang Eason	20 days	Google Scholar, PubMed, Google Docs, Google Drive

Table 2: Resource Requirements

2.3.1.1 Time

In this semester, as the workload escalates due to the inclusion of both technical and non-technical aspects, the time commitment for each member in each week has been increased. Besides that, to effectively manage and optimize the time allocation, Work Breakdown Structure(WBS), Gantt Chart, and Sprint Board have been utilized.

The updated WBS shown in Figure 2 below is developed to break down tasks into smaller and manageable components using bottom-up and mind-mapping approaches for easier execution. As shown in the WBS, the major activities are broken down into 5 phases which include Project Planning and Initial Concept, Design, Development, Testing and Finalization.

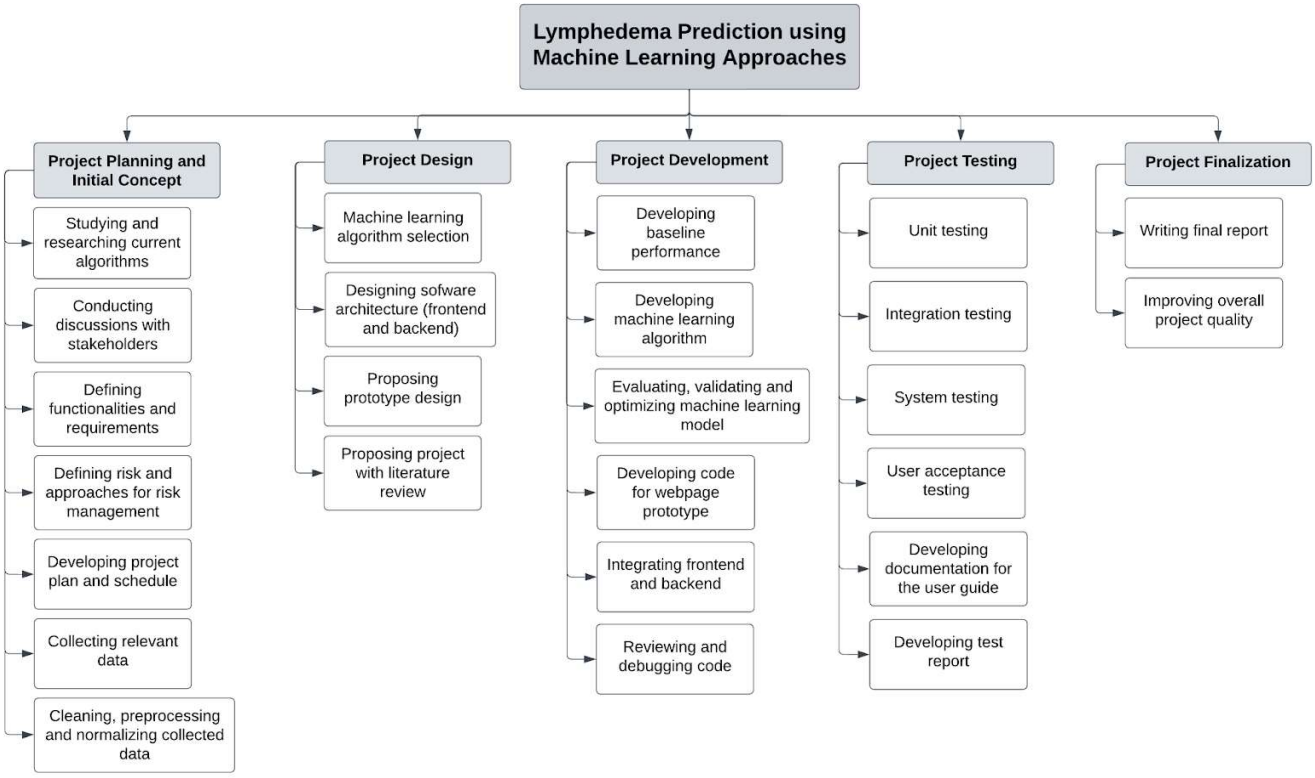

Figure 2: Work Breakdown Structure

The Gantt Chart which was developed in the previous semester was updated as shown in Figures 3 and 4 below. By referring to this updated chart throughout the project's development, the team can maintain a clear understanding of task dependencies, and milestones which provides effective planning and progress tracking. However, the timeline may vary due to unexpected events that can impact the schedule.

		Name	Duration	Start	Finish	Predecessors
1		**Project Planning and Initial Concept**	**30 days**	**8/21/23 8:00 AM**	**9/19/23 5:00 PM**	
2		Studying and researching current algorithms	10 days	8/21/23 8:00 AM	8/30/23 5:00 PM	
3		Conducting discussions with stakeholders	30 days	8/21/23 8:00 AM	9/19/23 5:00 PM	
4		Defining functionalities and requirements	10 days	8/21/23 8:00 AM	8/30/23 5:00 PM	
5		Defining risk and approaches for risk management	10 days	8/21/23 8:00 AM	8/30/23 5:00 PM	
6		Developing project plan and schedule	10 days	8/21/23 8:00 AM	8/30/23 5:00 PM	
7		Collecting relevant data	15 days	9/1/23 8:00 AM	9/15/23 5:00 PM	2
8		Cleaning, processing and normalizing collected data	3 days	9/16/23 8:00 AM	9/18/23 5:00 PM	7
9		**Project Design**	**33 days**	**10/1/23 8:00 AM**	**11/2/23 5:00 PM**	
10		Machine learning algorithm selection	17 days	10/1/23 8:00 AM	10/17/23 5:00 PM	
11		Desiging software architecture (frontend and backend)	17 days	10/1/23 8:00 AM	10/17/23 5:00 PM	
12		Proposing prototype design	13 days	10/18/23 8:00 AM	10/30/23 5:00 PM	
13		Proposing project with literature review	16 days	10/18/23 8:00 AM	11/2/23 5:00 PM	7;10
14		**Project Development**	**52 days**	**3/7/24 8:00 AM**	**4/27/24 5:00 PM**	
15		Developing baseline performance	14 days	3/7/24 8:00 AM	3/20/24 5:00 PM	10;8
16		Developing machine learning algorithm	13 days	3/21/24 8:00 AM	4/2/24 5:00 PM	8;15
17		Evaluating, validating and optimizing machine learning model	25 days	4/3/24 8:00 AM	4/27/24 5:00 PM	16
18		Developing code for webpage prototype	15 days	4/3/24 8:00 AM	4/17/24 5:00 PM	
19		Integrating frontend and backend	5 days	4/18/24 8:00 AM	4/22/24 5:00 PM	18
20		Reviewing and debugging code	5 days	4/23/24 8:00 AM	4/27/24 5:00 PM	19
21		**Software Testing**	**17 days**	**4/28/24 8:00 AM**	**5/14/24 5:00 PM**	
22		Unit, integration, system and user acceptance testings	17 days	4/28/24 8:00 AM	5/14/24 5:00 PM	20
23		Developing documentation for the user guide	17 days	4/28/24 8:00 AM	5/14/24 5:00 PM	20
24		Developing test report	17 days	4/28/24 8:00 AM	5/14/24 5:00 PM	20
25		**Project Finalization**	**20 days**	**5/15/24 8:00 AM**	**6/3/24 5:00 PM**	
26		Writing final report	20 days	5/15/24 8:00 AM	6/3/24 5:00 PM	24
27		Improving overall project quality	20 days	5/15/24 8:00 AM	6/3/24 5:00 PM	24

Figure 3: Listings of Work Breakdown Structure in ProjectLibre

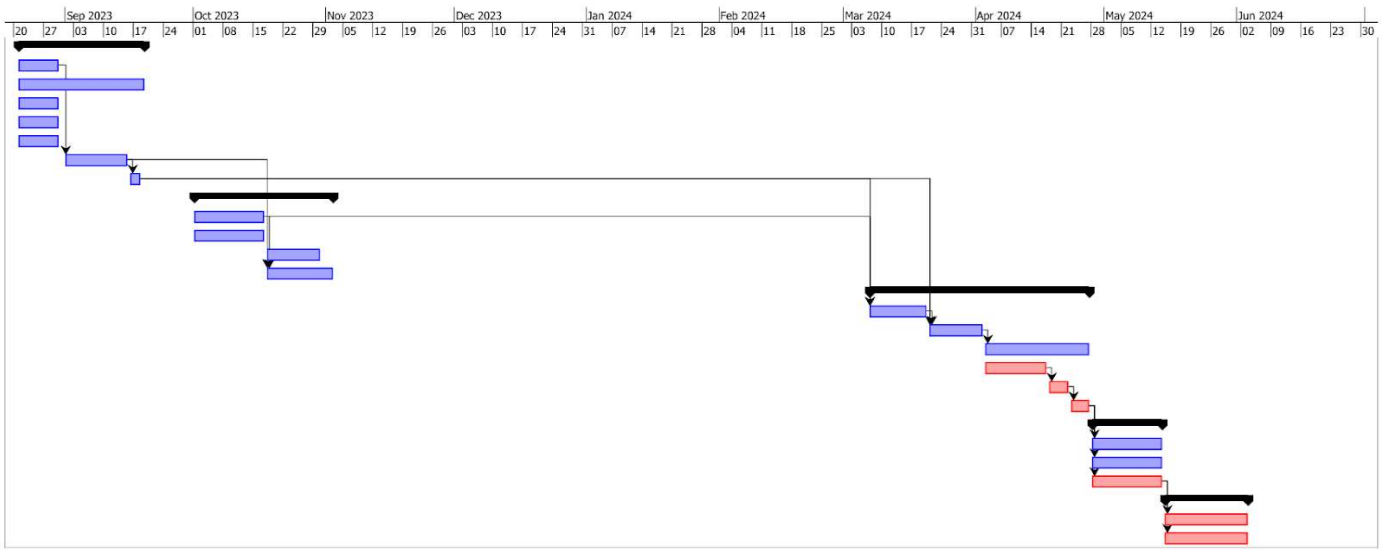

Figure 4: Gantt Chart

Furthermore, a Sprint Board is created as shown in Figure 5 to enhance agility and collaboration within the team that allows iterative task management, quick adaptation to changing priorities, and transparent visibility into the status of ongoing work.

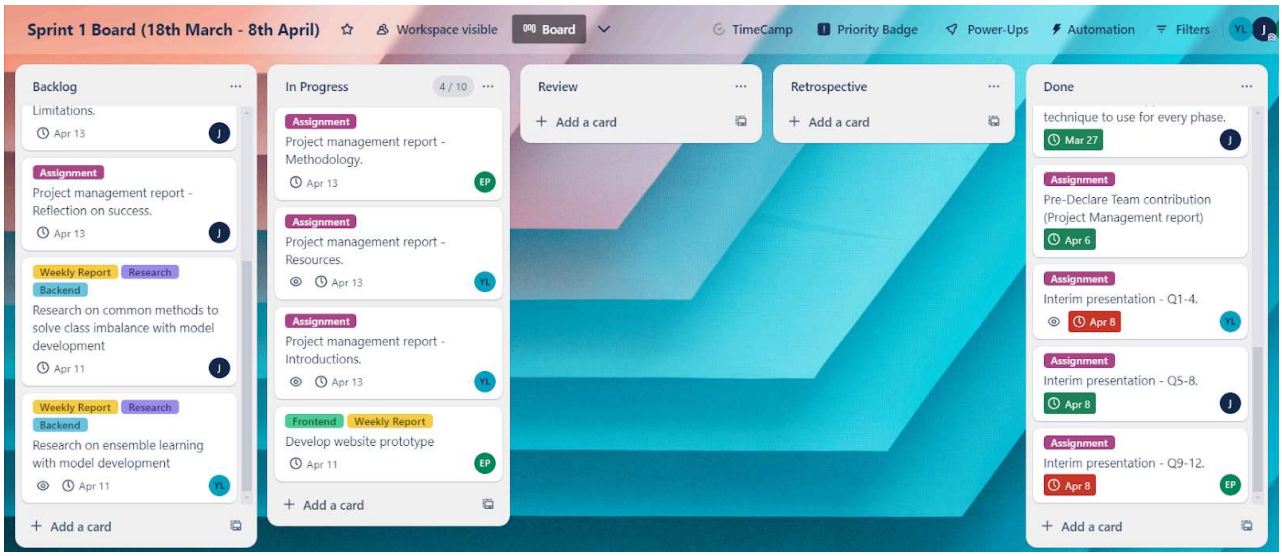

Figure 5: Sprint Board (taken on 08/04/2024)

2.3.1.2 Human

To initiate the project development phase, the main responsibilities based on the roles of each team member and our supervisor are stated in Table 3. The responsibilities are carefully defined and evenly distributed among team members to ensure fairness and minimize potential conflicts. This approach cultivates a collaborative environment and promotes effective teamwork throughout the project.

Member/ Supervisor	Role	Main Responsibilities
Chan Jia Xin	**Project Manager**	• Ensure that the project stays on track and meets its objectives. • Facilitate communication and collaboration among team members to ensure everyone is aligned with project goals and timelines. • Identify potential risks to the project's success and develop strategies to mitigate them. • Handle issues that arise within the team.
Pang Eason	**Quality Assurance**	• Develop a testing strategy to ensure the reliability and usability of the machine learning model and website. • Establish quality standards and guidelines for the project to ensure adherence to best practices. • Conduct rigorous testing of the website and machine learning model, identify and resolve any bugs or issues. • Focus on the user experience to ensure that the website is user-friendly for both healthcare professionals and end-users.
Liaw Yi Hui	**Technical Lead**	• Select the appropriate technologies and frameworks for developing the machine learning model and website. • Design the architecture of the website and machine learning model by ensuring scalability and performance. • Supervise the development process, provide guidance to the development team, conduct code reviews, and ensure code quality. • Troubleshoot technical challenges and issues that arise during the development process and implement effective solutions to keep the project on track.
Dr. Ong Huey Fang	**Supervisor**	• Allocate tasks to each team member. • Supervise project's progress. • Provide feedback on completed tasks. • Provide detailed guidance for the project.

Table 3: Responsibilities of Team Members and Supervisor

2.3.1.3 Technical

The hardware requirements which are used for the project development are listed in Table 4. For software requirements, we have compiled a list of the necessary tools and libraries required for supporting our project's development which is shown in Table 5.

Component	Details
Processor	Intel(R) Core(TM) i5-7200U CPU @ 2.50GHz 2.71 GHz
Graphic Processing Units	Intel(R) HD Graphics 620; NVIDIA GeForce 940MX
Memory(RAM)	16.0 GB
Storage	Local Disk C - total : 118 GB; Local Disk D - total : 931GB
Networking	Intel(R) Dual Band Wireless-AC 8260
Cloud Server Host	Google Cloud Platform

Table 4: Hardware Requirements for Project Development

Software Type	Tools/Libraries
Operating System	Microsoft Windows 10; Apple macOS Ventura 13.0
Programming Languages	Python 3.9.4; R 4.3.3;
External Libraries	**R:** caret, randomForest, glmnet, nnet, dplyr, tidyr, ggplot2
Frontend Web Framework	**R:** shiny
Backend Web Framework	**R:** shiny
Web Application Category	Multiple Page Application (MPA)
Integrated Development Environment (IDE)	Visual Studio Code 1.88.0; RStudio 2023.12.1
Model Evaluation and Prototyping Platform	R studio
Software Quality Control	“unittest” module
Documents/Files Storage	Google Drive
Collaboration of Code	GitHub
Collaboration of Writing	Google Docs
Prototype Design	Figma

Table 5: Software Requirements for Project Development

2.3.2 Project Management Software Tools

The software tools for project management are listed in Table 6.

Tool	Details
Lucidchart	Develop the Work Breakdown Structure(WBS).
ProjectLibre	List down the WBS and develop the Gantt Chart.
Google Docs	Develop meeting minutes and take notes during meetings.
Google Drive	Store and share documents.
Google Chat	Formal communication between team members and supervisor.
Trello	Develop Sprint Boards to plan, track and manage work.
Git	For version control which allows multiple users to work concurrently on the same codebase during software development and tracks code modifications history.
Zoom	Conduct weekly meetings with the supervisor.
WhatsApp	Communication between team members.

Table 6: Software Requirements for Project Management

2.4 Risk Management

During our project, several risks were triggered and one such risk was the issue of data availability. Sourcing datasets related to clinical data online was extremely difficult due to privacy regulations, and most of the datasets found did not meet our project's requirements and standards. To handle this, we had to expand our search parameters, explore other data repositories, and reach out to relevant organizations for potential collaboration. Additionally, one of our team members fell sick and was unable to work, which could disrupt the project progress and impact the team dynamics. However, by referring to the risk register, we handled the situation effectively. We redistributed the tasks among other team members and prioritized the tasks based on urgency and criticality. Lastly, we also faced issues understanding some of the algorithms due to their complexity. To address this issue, we reassessed our approach and explored simpler alternatives. We also seeked assistance and advice from our supervisor on simplifying the algorithm without sacrificing its effectiveness.

The top risks, those with the highest combined impact and likelihood scores, such as the algorithm performance and resource constraints, involve ongoing assessment and proactive management throughout the project lifecycle. For algorithm performance, we continuously assess the effectiveness and efficiency of the algorithms deployed. This involves tracking key performance metrics, such as accuracy, precision, sensitivity, etc. and comparing the algorithm's performance against benchmarks to gauge its effectiveness and identify areas for improvement. As for resource constraints, we regularly review the resource allocation and consumption. Project management tools are utilized to track resource utilization and identify any deviations from planned allocation.

While the existing risk register may be robust and comprehensive, it requires continuous review and improvement to optimize its effectiveness in managing project risks. New risks may emerge, while existing ones may evolve. Table 7 in the appendix represents the most recent version of the risk register. It includes newly identified risks and potential changes in the likelihood or impact of existing ones. We have also improved the mitigation strategies to better address these risks and updated our monitoring approach.

2.5 Limitations

Throughout the development of our project, several limitations were encountered in the project management process, encompassing both technical and non-technical issues. One of the limitations encountered was resource constraints, particularly in the availability of skilled developers. Given that we are students and still in the learning phase, our team consisted of less experienced developers who required additional time for research and skill development. This resulted in a significant amount of time being allocated to research tasks, leading to delays in task completion. For instance, the need for extensive research to understand complex predictive modeling techniques consumed a lot of time, delaying the implementation of critical features and functionalities.

Moreover, ineffective communication between team members became evident in various instances. One such example occurred during the selection of algorithms for our predictive model. There was a miscommunication between the team members regarding the selected algorithm. As a result of this misunderstanding, the team members may have allocated time to familiarize themselves with the incorrect algorithm, potentially leading to inefficiencies and delays in project tasks. Another example was miscommunication between members and supervisor. Despite the vagueness in the tasks assigned, team members hesitated to seek clarification and were reluctant to ask questions. As a consequence, tasks may have been completed incorrectly leading to delays. These examples underscored the importance of effective communication channels and regular engagement between team members and also with the supervisor to ensure alignment and clarity throughout the project lifecycle.

Lastly, scope creep occurred in our project. Initially, our initial scope was to predict lymphedema among breast cancer patients. However, stakeholder expressed interest in expanding the scope to include predicting the severity levels of lymphedema. This expansion introduced additional complexities and requirements beyond the original project scope. For instance, predicting severity levels required development of more advanced predictive models capable of accurately categorizing the severity levels of lymphedema. While addressing this scope change offered potential benefits in providing more in depth insights, it also posed challenges in terms of project timelines, resource allocation, etc.

2.6 Reflection on Success

During our project, we were vigilant about our time constraints and deadlines, which enabled us to make informed decisions when faced with scope changes. We recognized that accommodating the additional feature of predicting severity levels of lymphedema would risk compromising our ability to deliver within the timeframe. Therefore, we stayed focused on delivering the essential functionalities first before considering additional scope enhancements. We also maintained open and transparent communication with our supervisor and kept her informed about our project progress and any potential impacts on the timeline and resources.

However, looking ahead, there are several areas where we could improve for future projects. Our team could benefit from fostering a culture of open communication and collaboration within the team. Encouraging team members to ask questions, seek clarification, and communicate openly about project-related matters can help prevent misunderstandings and improve overall efficiency. Establishing regular meetings with the supervisor to discuss project progress and challenges can also facilitate better alignment and ensure members and supervisor are on the same page. Moreover, it is essential for team members to work together and seek help when needed to leverage each other's strengths and expertise. By doing this, team members can enhance their technical skills through knowledge sharing and mentorship.

Overall, while there were challenges encountered in project management, reflecting on these shortcomings provides valuable insights for improvement in future endeavors. By addressing these areas proactively, we can enhance our project management practices and increase the likelihood of success in future projects.

3 Conclusion

In conclusion, effective project management significantly impacted the successful execution of this project which ensured that the goals were met within constraints such as time, budget, and quality. Throughout this project, a rigorous approach to project management, specifically the Agile methodology, was adopted. By emphasizing continuous collaboration and improvement, the team navigated through the lifecycle of planning, execution, validation, and evaluation with agility and efficiency.

During the project's development journey, the team proactively identified, assessed, and mitigated potential risks and limitations that could impede the project’s success by using the Risk Register as a guiding tool. This approach provided the team with the ability to navigate uncertainties and challenges seamlessly.

All in all, the project management approach adopted played an important role in leading the project towards success by ensuring timely delivery, budget-consciousness, and quality outcomes. Through effective resource allocation, planning, and risk management, we demonstrated our commitment to achieve the project's goals and objectives. This project stands as a testament to the significance of project management in achieving desired outcomes in complex endeavors.

Appendix

Risk ID	Risk Description	Impact	Likelihood	Overall	Monitoring Strategy	Mitigation Plan
RK1	**Miscommunication and disagreements among stakeholders**	8	7	15	Constantly seek for feedback from stakeholders along the entire project lifecycle.	Construct clear and vivid communication plans within stakeholders.
RK2	**Algorithm complexity**	6	7	13	Continuously evaluate the ease of implementing the algorithm.	Emphasize the importance of keeping the algorithm simple during development.
RK3	**Algorithm performance**	9	8	17	Regularly assess the algorithm's performance using metrics.	Use cross validation to ensure robustness.
RK4	**Data availability and quality**	8	7	15	Routinely audit the collected data for accuracy and completeness.	Work closely with medical professionals and stakeholders to ensure accurate and relevant data.
RK5	**User interface design issues**	6	6	12	Continuously observe user feedback and interaction with the interface.	Incorporate design principles that prioritize clear and easy navigation.
RK6	**Resource constraints**	9	8	17	Regularly review resource allocation and consumption based on project needs.	Wisely plan and allocate resources according to project priorities.
RK7	**Team members unable to work due to illnesses or accidents**	9	7	16	Team members regularly update and push their own works onto the project's repository online and review others' works on a regular basis.	Plan and delegate the tasks wisely and allow task allocation to be changed flexibly, or apply for submission extension.
RK8	**Supervisor is not reachable and responsive online due to his or her workload**	7	7	14	Appoint a designated liaison or intermediary who can regularly communicate with the supervisor on project updates, ensuring the supervisor remains informed despite their	Pay a visit directly to his or her office and seek for further clarification, schedule a fixed weekly meeting instead of only contacting the supervisor when in

					limited online availability.	need.

Table 7: Risk Register for Lymphedema Prediction using Machine Learning Approaches (previous semester)

Risk ID	Risk Description	Impact	Likelihood	Overall	Monitoring Strategy	Mitigation Plan
RK1	**Miscommunication and disagreements among stakeholders**	8	6	14	Constantly seek for feedback from stakeholders along the entire project lifecycle.	Construct clear and vivid communication plans within stakeholders.
RK2	**Algorithm complexity**	6	8	14	Continuously evaluate the ease of implementing the algorithm.	Emphasize the importance of keeping the algorithm simple during development.
RK3	**Algorithm performance**	9	8	17	Regularly assess the algorithm's performance using metrics. Compare performance against benchmarks.	Use cross validation to ensure robustness.
RK4	**Data quality**	8	8	16	Routinely audit the collected data for accuracy and completeness.	Work closely with medical professionals and stakeholders to ensure accurate and relevant data.
RK5	**Data availability**	8	8	16	Regular data search updates: schedule periodic reviews of data availability status and adjust search strategies as necessary to explore new sources.	Expand data search, collaboration with organizations for data sharing. Implement data augmentation techniques such as synthetic data generation.
RK6	**User interface design issues**	6	6	12	Continuously observe user feedback and interaction with the interface.	Incorporate design principles that prioritize clear and easy navigation.
RK7	**Resource constraints**	9	8	17	Regularly review resource allocation and consumption based on project needs.	Wisely plan and allocate resources according to project priorities. Utilize project management

						tools to track resource utilization and identify any deviations from planned allocation.
RK8	**Team members unable to work due to illnesses or accidents**	7	8	15	Team members regularly update and push their own works onto the project's repository online and review others' works on a regular basis.	Plan and delegate the tasks wisely and allow task allocation to be changed flexibly, or apply for submission extension. Prioritize tasks based on urgency and criticality.
RK9	**Supervisor is not reachable and responsive online due to his or her workload**	7	6	13	Appoint a designated liaison or intermediary who can regularly communicate with the supervisor on project updates, ensuring the supervisor remains informed despite their limited online availability.	Pay a visit directly to her office and seek for further clarification, schedule a fixed weekly meeting instead of only contacting the supervisor when in need.
RK10	**Scope creep**	7	6	13	Regularly monitor project scope and requirements to identify and mitigate scope creep.	Implement change control processes to evaluate and approve scope changes. Prioritize essential features and functionalities to prevent scope expansion beyond project constraints.
RK11	**Compatibility issues between front and back end systems**	7	8	15	Regular compatibility testing and validation of integrated components to identify and address compatibility issues.	Encourage regular communication, joint code reviews, and knowledge sharing to identify and resolve compatibility issues collaboratively.

Table 8: Risk Register for Lymphedema Prediction using Machine Learning Approaches (updated version)

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Use of generative AI declaration
We hereby acknowledge the use of ChatGPT to shorten and improve sentences. The prompts entered include:

- [sentences] shorten and improve the sentences.

The outputs generated were modified and incorporated into this document.