Problem Statement and Goals
Software Engineering

Team 11, technically functional
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Table 1: Revision History

Date	Developer(s)	Change
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1 Problem Statement

1.1 Problem

According to the Global Burden of Diseases, Injuries and Risk Factors study performed in 2019, individuals that would benefit from physical rehabilitation at least once in their lifetime is upwards of 2.41 billion globally [**?**]. Those with access to a physiotherapist experienced a disconnect with performing a required movement with proper time-under-tension (TUT) and correct form [**?**]. While a physiotherapist can advise these individuals during their assessments and proceeding follow-up appointments, the efficacy of rehabilitation depends heavily on the individual's correct performance of the exercise. In turn, this creates a need for a tool that can ensure users correctly perform the exercise without supervision. This project aims to develop a tool that can provide feedback and corrections for the prescribed physical rehabilitation exercise.

1.2 Inputs and Outputs

Inputs: A recording of the user performing their physical rehabilitation exercise, captured through a smartphone, webcam, or any other device.
Outputs: Feedback or corrections of the demonstrated movement, along with highlighting targeted adjustments to the form as needed.

1.3 Stakeholders

1.3.1 Primary Stakeholders

End users/Patients:
The main audience for this application will be users who have been undergoing physiotherapy treatment for their right leg, and have been given a home exercise plan which outlines the exercise selected by the team. These users will be obtaining accurate feedback and corrections to assist their performance of the exercise from the comfort of their home and without constant input from a physiotherapist.

1.3.2 Secondary Stakeholders

Physiotherapists:
The application can be used as an adjunct tool for physiotherapists, allowing them to evaluate patient performance, recovery changes and whether any modification to the exercise is required.

1.3.3 Tertiary Stakeholders

Regulatory authorities: They will be ensuring and assessing that the application is working in an ethical manner, safeguarding any patient information that is used and ensuring that accurate results and expertise is being provided.
Other healthcare providers: Specialists such as physiatrists and registered massage therapists may benefit from the information provided by the application about their patients.

1.4 Environment

1.4.1 Software

The application will be built using an object oriented programming language with supplementary libraries to enable the use of computer vision technology.

1.4.2 Hardware

The application will run on an Android device with a camera recording ability.

2 Goals

3 Stretch Goals

4 Extras

[For CAS 741: State whether the project is a research project. This designation, with the approval (or request) of the instructor, can be modified over the course of the term. —SS]

[For SE Capstone: List your extras. Potential extras include usability testing, code walkthroughs, user documentation, formal proof, GenderMag personas, Design Thinking, etc. (The full list is on the course outline and in Lecture 02.) Normally the number of extras will be two. Approval of the extras will be part of the discussion with the instructor for approving the project. The extras, with the approval (or request) of the instructor, can be modified over the course of the term. —SS]

Appendix — Reflection

The purpose of reflection questions is to give you a chance to assess your own learning and that of your group as a whole, and to find ways to improve in the future. Reflection is an important part of the learning process. Reflection is also an essential component of a successful software development process.

Reflections are most interesting and useful when they're honest, even if the stories they tell are imperfect. You will be marked based on your depth of thought and analysis, and not based on the content of the reflections themselves. Thus, for full marks we encourage you to answer openly and honestly and to avoid simply writing "what you think the evaluator wants to hear."

Please answer the following questions. Some questions can be answered on the team level, but where appropriate, each team member should write their own response:

1. What went well while writing this deliverable?

   The problem was defined clearly by looking at research on unsupervised performance of physiotherapy exercises. Having two members in the team that were more knowledgeable about the topic helped guide discussions and becoming intrigued by the proposed project. Once the team was in agreement of which direction the project was heading, additional research on the topic was done, which aided in understanding the problem and align on a realistic scope and goals. To allocate the required tasks fairly, the deliverable was sub-divided into manageable sections amongst the members. This strategy provided an additional benefit, and allowed seamless integration of various perspectives as a result.

2. What pain points did you experience during this deliverable, and how did you resolve them?

   One of the major pain points was that the entire body was too broad of a scope. To make the project more manageable, the scope was narrowed to a specific body part, where measurements such as time-under-tension (TUT) and form. TUT will be measured in seconds, and form will be measured using angles and range of movement.

3. How did you and your team adjust the scope of your goals to ensure they are suitable for a Capstone project (not overly ambitious but also of appropriate complexity for a senior design project)?

   As mentioned above, the focus was shifted to a singular body part as opposed the full body. This project involves the integration of multiple technologies related to computer vision into a functional application, which is a complex endeavour. The goals listed above will become more specific and concrete as the project development progresses.

   Maham: This project is a challenging endeavour and requires the use and integration of various systems that we have learned over the course of our

degree. At first, our project seemed too ambitious when the whole body was being considered, but narrowing it down made it more achievable. Some body parts, such as the hand or ankle, were too complex and had too many motions to account for. In the end, it was collaboratively decided that only one exercise would be chosen and that our project would be a 'blueprint' for future development of similar applications.