# Self-Rehab

An Application For Helping Physiotherapy Patients To Perform Their Therapeutic Exercises On Their Own.

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Introduction

Physiotherapy is an area that serves many people with injuries requiring rehabilitation and helps the patients to have a normal life. However, it experiences some issues that have been addressed in this project:

- A lack of technical support as therapeutic exercises requires the direct supervision of a therapist.
- Most patients have difficulty performing the prescribed exercises correctly on their own.
- Injuries may occur due to incorrect performance of exercises.
- Difficulty of sticking to exercises schedule.
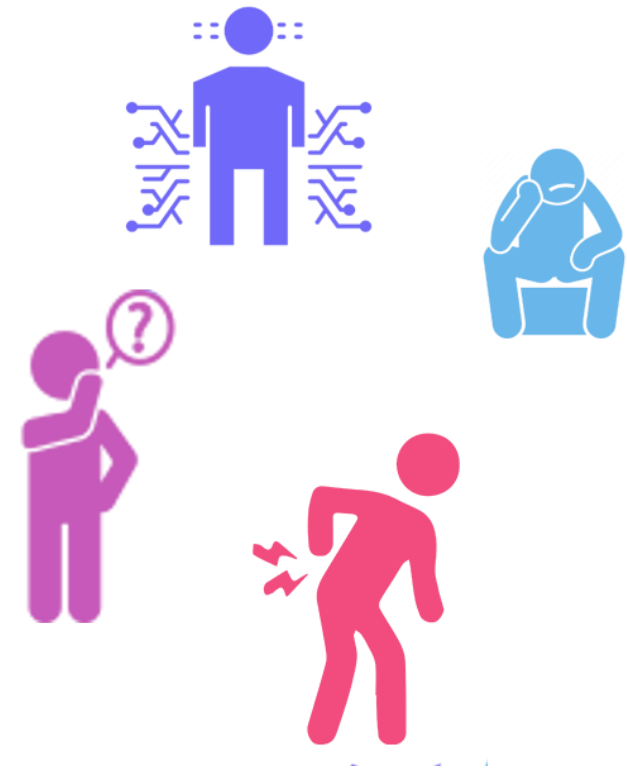
To ensure performing therapeutic exercises accurately, patients need immediate feedback.

This can be achieved while reducing the need for a therapist and clinic by using both Augmented Reality and Artificial Intelligence.

Methodology
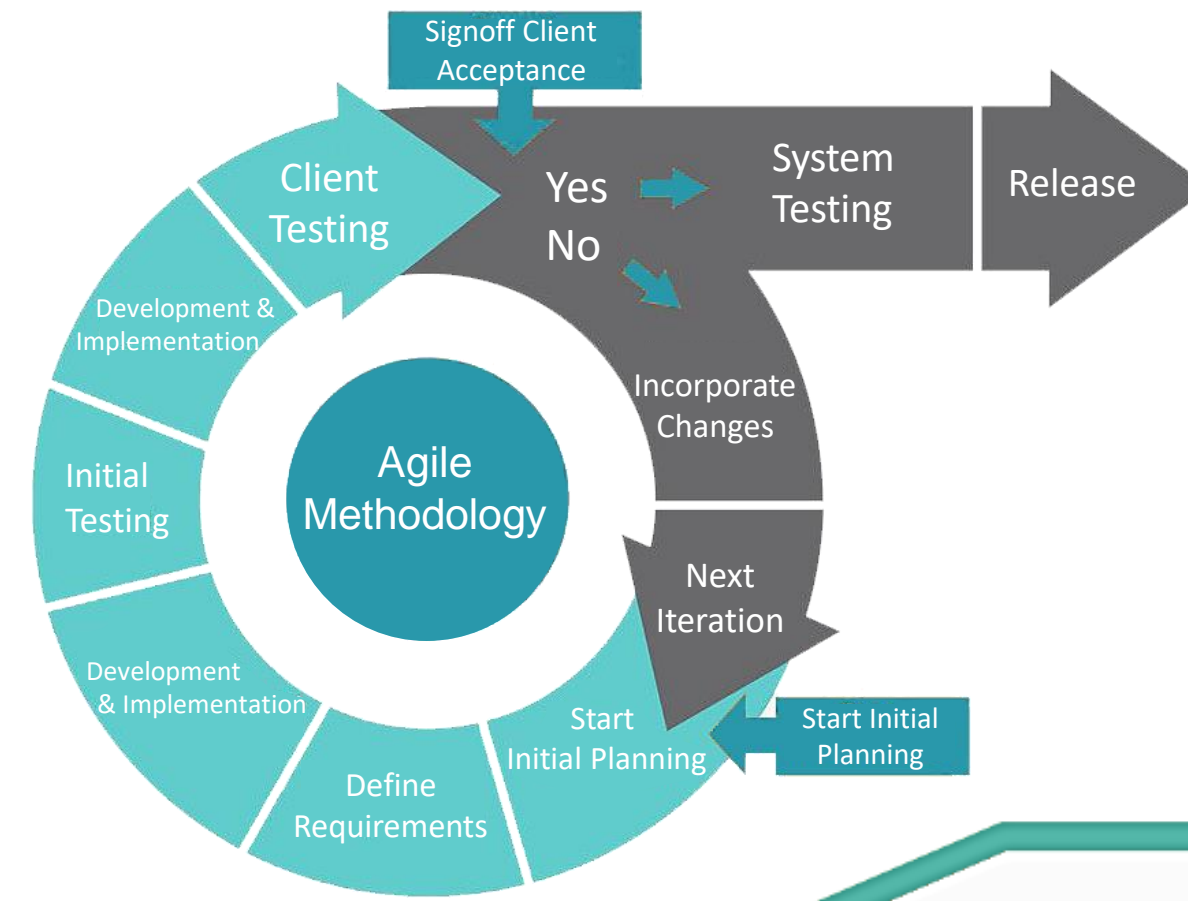
Agile methodology has been used to develop this project.

It has been selected for several reasons:

- Worldwide approach
- Greater Agility
- Delivering incrementally
- Good quality software
- Customers' Needs Met

Statistics

The following chart shows a summary of the therapeutic routine daily bases of physiotherapy patients on their own. It has been gathered from more than 300 citizens and residents in Saudi Arabia.

77.6%
78.6%
39.6%
65.7%

- +30 min in transportation to the clinic
- Difficulty remembering exercises
- Injuries occurred due to incorrect exercise performance
- Prefer relying on Videos/Supervisor during exercise
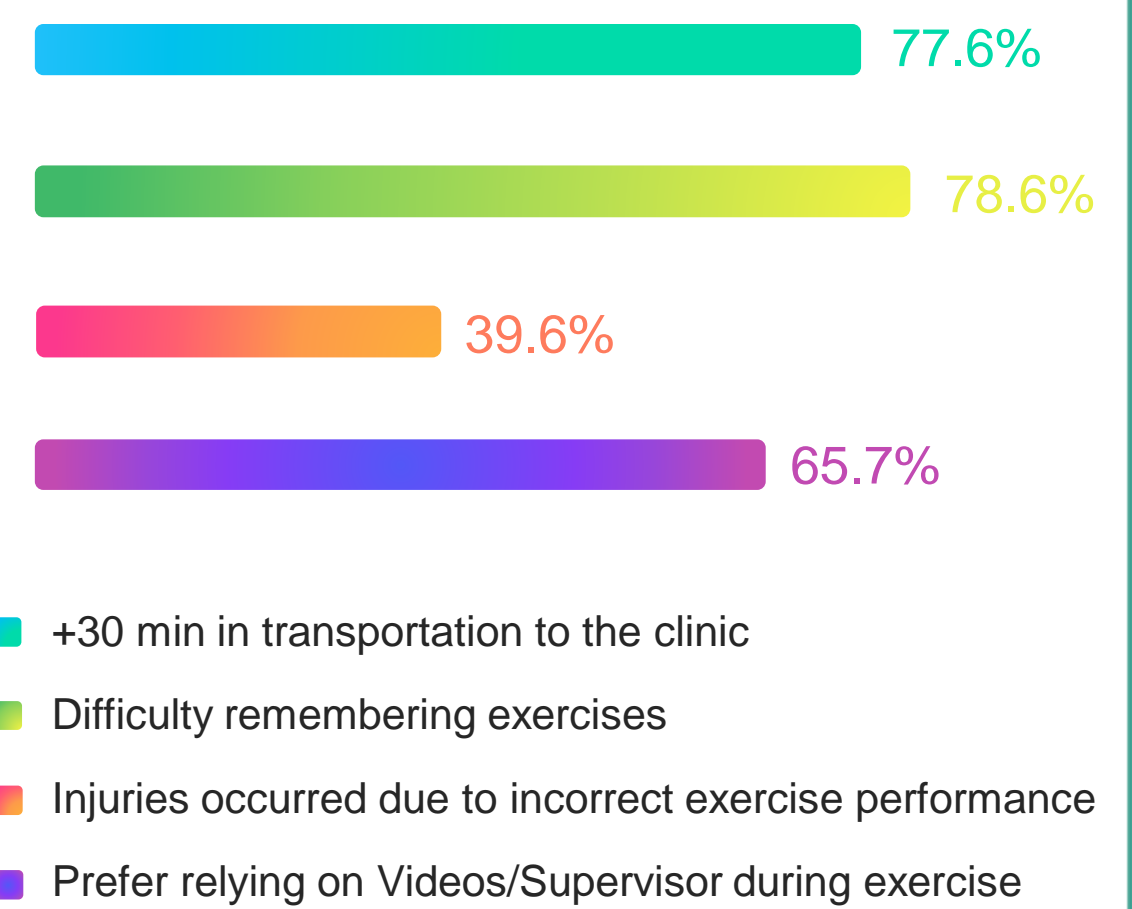
Pose Estimation

a computer vision technique that predicts and tracks the location of a person's parts. Typically done by identifying the major parts/joints of the human body in images or videos.
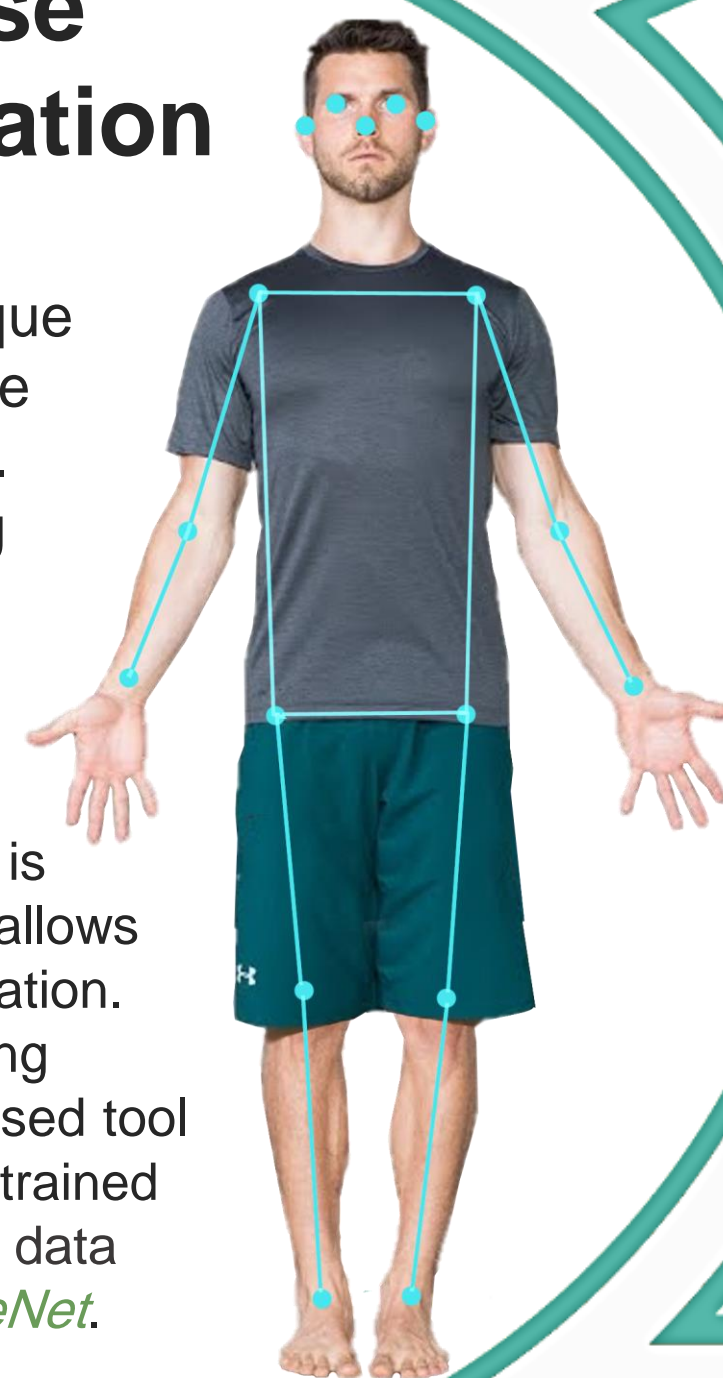
The used framework in this app is *PoseNet* framework, where it allows Real-time Human Pose Estimation. It has been implemented using Teachable Machine web-based tool that uses *MobileNet* pre-trained model, and the training data that is called *ImageNet*.
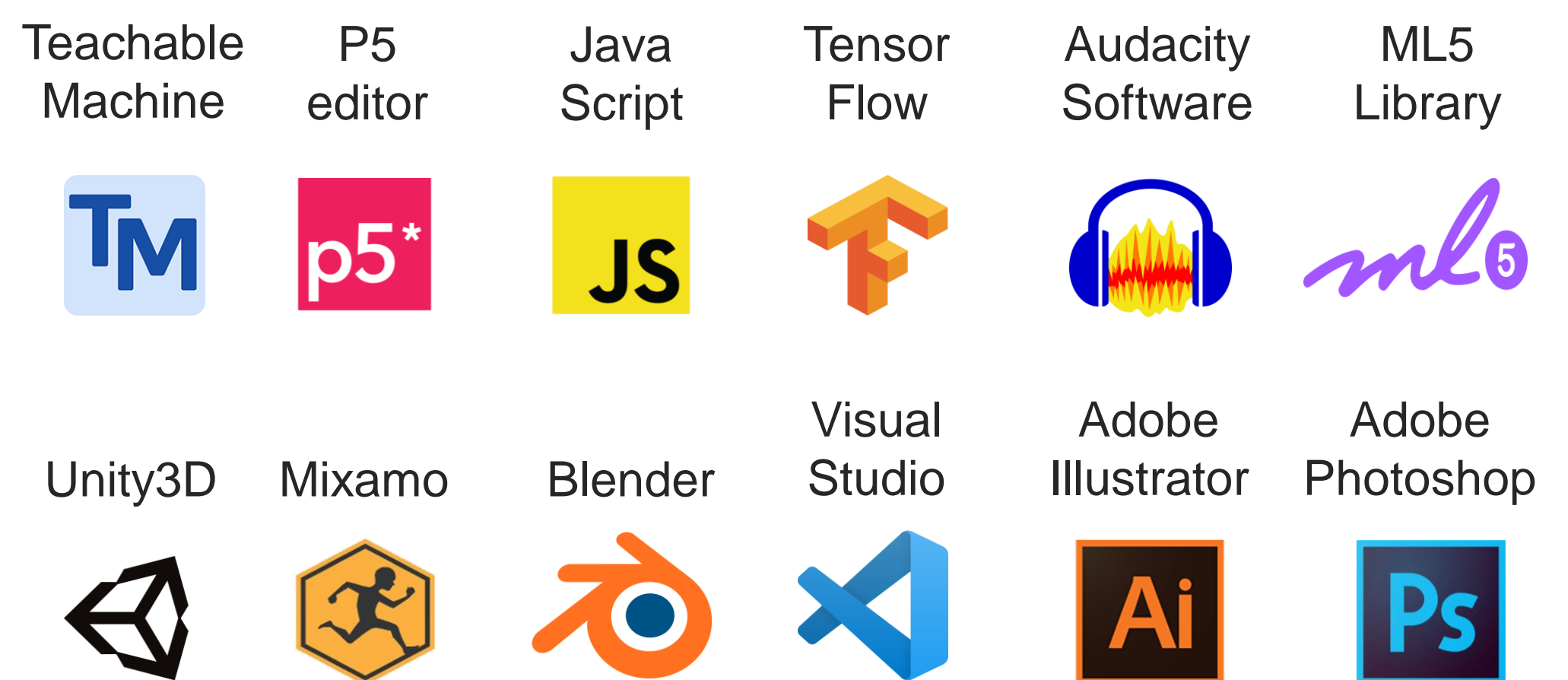
Results

The project is capable of:

- Display 3D animation for the prescribed exercises
- Detect the patient's body movements via camera in real-time
- Detect whether the patient is performing the exercise correctly or not in real-time
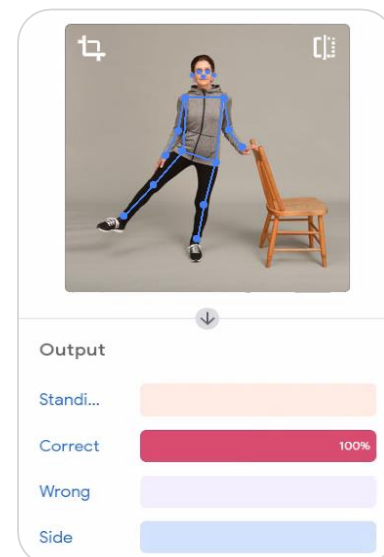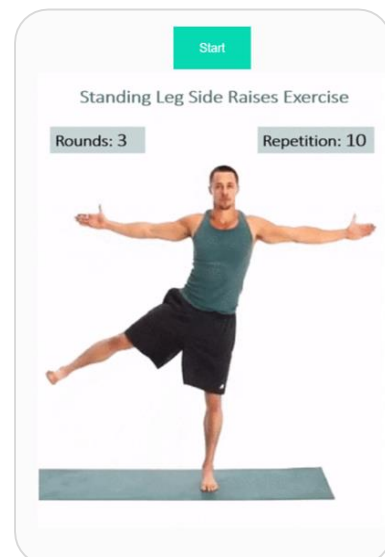
- Display rounds and repetitions completed during performing the exercise
- Inform the patient about their exercise performance in real time
- Issue an immediate feedback as played sounds during performing the exercise

Tools

Teachable Machine	P5 editor	Java Script	Tensor Flow	Audacity Software	ML5 Library

Unity3D	Mixamo	Blender	Visual Studio	Adobe Illustrator	Adobe Photoshop

Conclusion

Self-Rehab is a mobile application that helps the patients in need of physiotherapy to perform their exercises accurately offline the direct supervision of a therapist. The application involves both AR and AI technologies, and it falls under Supervised Machine Learning and Computer Vision AI's categories.

In Future Plans, more features will be covered as follows:

- Connect the patient and their progress with the therapist remotely
- Cover all kinds of therapeutic exercises
- Show actions taken for each injury cases

References