<p style="text-align:center">**Project Requirements Document v2**</p>
<p style="text-align:center">**VCare**</p>

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Introduction

Problem:

Mental health care is a prevalent issue in the world right now that goes right through many people's heads. Every year, around 300 million people suffer from some form of anxiety or depression. In the United States, 1 in 5 people suffer from mental health problems. Nearly 70 percent of people who need the help never end up getting it at all. The demand for mental health care far surpasses today's current supply of effective solutions. Why is it so hard to receive help? What can we do to make it easier for people to get the help they need?

Motivation:

We looked at how therapy sessions can either be offered in person or they can happen online via video calling applications such as Zoom or Google Meets. The issue with having one-on-one talk between a therapist and a patient over video is that you lose some level of personal interaction that you would have during an in-person meeting. Patients don't feel as emotionally invested into the session as they probably would if they were face to face with the therapist. The environment doesn't feel authentic in an online setting. On the other hand, having sessions offered in-person can be tough due to the patient having to physically travel to the location. The patient could have legitimate reasons as to why they can't travel or they simply just don't want to move at all. So the motivation here is this: how do we bridge the gap between online meetings and in-person meetings for therapy? How can we make the experience as close as possible (or even better) to an in-person therapy session and keep it at the comfort of the patient's own home?

Our Solution

The Project - VCare:

We are going to build a VR app for mental therapy sessions! By building this, we are creating a way for patients to have an immersive experience with their therapist without having to actually leave their house. This gives us the opportunity to experiment with things such as changing environments based on the patient's mood and background, adding ambient sounds, and other potential features that can keep the session interactive and engaging. This could potentially be even more valuable of an experience than an in-person therapy session for the patient.

Core Project Components:

This therapy app will have three main components:

1) Establishing a connection between patient and therapist and putting them into the same server so that they can interact. This includes logging in and out of the app as well.

2) World-building. Creating the actual environment(s) through Unity XR and making it visible, traversable, and interactive. This is probably the most involved component of this project and has the greatest potential to expand on for immersiveness

3) Real-time analysis and collecting data from the user through their voice and a transcription. The data will go through NLP and tone analysis for monitoring the patient over time. This information could then later be used to assist the therapist in seeing the patient's mental state transition from start to finish. Other reach goals are possible, which will be explained below.

Team Goals

Our goal is to build a VR online therapy app that is able to make patients feel more connected with doctors during online therapy. Plus, we are aiming to add more functionalities which can assist therapists to better understand patients' physical and mental situation during online therapy on our platform.

As explained above, we want to bridge the gap between regular online video therapy sessions and in-person therapy sessions by immersing the patient into a virtual world where they can become more engaged and, hopefully, more satisfied with their experience. Our minimum goals are to create a functional environment (or set of environments) that allows for smooth interactions between both patient and therapist and to be able to collect and process continuous

data on the patient, both in real-time and for later use in a saved log if the therapist needs it for later.

Some reach goals that we have involve being able to change the environment in real-time based on the world's analysis of a patient's mental state. As for collecting data, we would also like to make use of an Apple Watch to collect information on a patient's health status such as their heart rate for real-time processing. Based on the sentiment analysis and the heart rate metrics, we are able to determine their comfortability in the environment. We can then adjust the parameters in the VR environment in order to allow for the patient to be at ease but still make progress in the therapy session. We would also like for the users to be able to customize their own avatars, or have a patient be able to customize their therapist's avatar if it calms them down. Optionally, the therapist could also make use of realtime video capture converted into 3D avatar animations instead of actually using a VR headset if they wish to do so (a "VTuber" avatar). Items in the environment and interaction with these items would also be a neat feature that could be expanded on. There will most likely be more ideas along the way.

A specific case we have targeted are patients with social anxiety. We perform this by initially placing a user in a small crowd. Depending on the heart rate metrics and the sentiment analysis of their speech, we can then tweak the number of people in this crowd. If the metrics indicate their heart rate is low and they are comfortable with their environment, we can then increase the amount of people in the crowd. If the metrics indicate that they are nervous, we can decrease the amount of people.

Assumptions:
- Users using our software is a mental health patient and is in therapy or is a licensed therapist
- Users will be able to sign up on our web application and are provided a VR headset and an Apple Watch
- Both patient and therapist will be in an environment that has enough space for a VR headset
- User interface for web app and Virtual Reality will be intuitive and user friendly
- Transcript of session will be easily accessible and navigable for therapists

Requirements (User Stories and Acceptance Criteria)

1. As a patient, I want to log in with email and password, so I can attend a meeting with my therapist

2. As a patient, I want to select a new session environment based on my liking, so I can feel more relaxed during the session

3. As a patient, I want to interact with items in my environment, so that I can indicate how I am feeling through body language and/or demonstration

4. As a therapist, I want to view my list of patients, so that I can select the correct patient's information before our session

5. As a therapist, I want to change my avatar to appeal to my patient

6. As a therapist, I want to review the logs of today's session, so that I can search for parts of the session that I felt were important

7. As a therapist, I want to review the portions of today's session flagged as significant by the computer, so that I make sure I did not miss anything significant.

8. As a therapist, I want to keep an eye on the heart-rate stats of my patient, so that I can look out for anomalous behavior flagged by the computer during our session.

9. As a therapist, I want to log in with my email and password, so that my patients' and my information is protected.

10. As a therapist, I can choose whether the environment automatically changes or adjusts on my choosing

System Architecture Overview
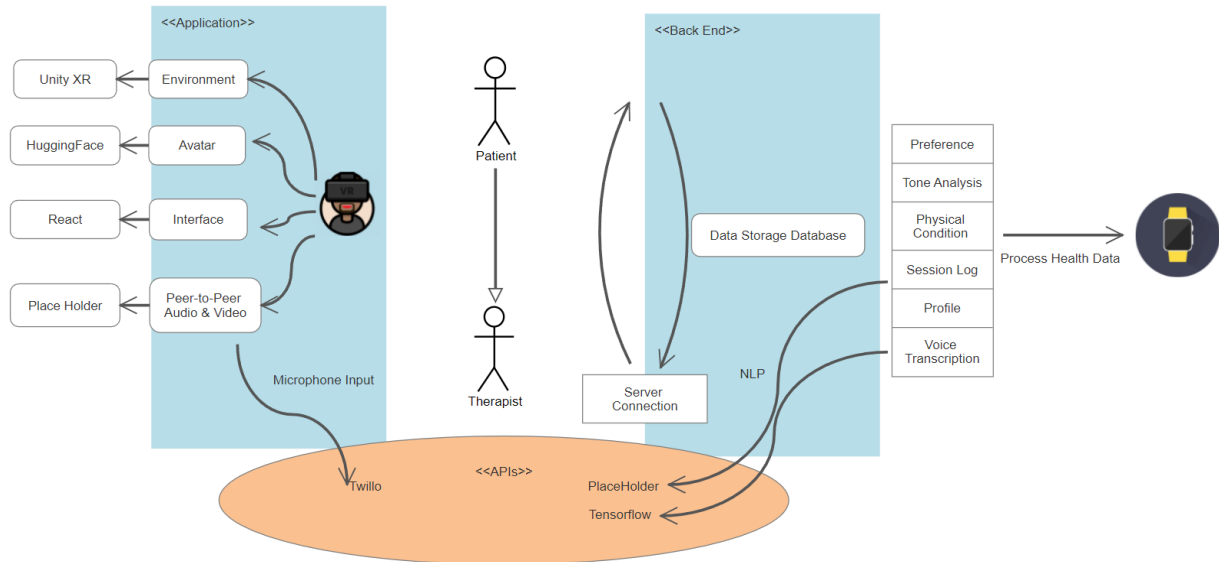
Appendix

Technologies:

- Unity XR
- Firebase
- AWS, Transcription, Comprehend
- Django
- Tensorflow
- NumPy
- HuggingFace(BERT)
- Microsoft Azure, Computer Vision