Problem Statement and Goals
SFWRENG 4G06 Capstone Design Project

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Table 1: Revision History

Date	**Developer(s)**	**Change**
25 September 2023	AJ, KH, QC, SQ, XY	Initial draft

1 Problem Statement

1.1 Problem

Tai Chi is a complete martial art system practiced chiefly by older individuals for the purpose of health promotion and rehabilitation. It has been described as "meditation in motion" due to its emphasis on slow, gentle movements that have a low impact on the body and joints. During the COVID-19 pandemic, group exercise classes like Tai Chi transitioned to the online format due to the enforcement of social distancing. Therefore, online training for these group exercise lessons is conducted in various forms including offering live sessions with webcams and providing pre-recorded videos. However, it is widely perceived among both practitioners and instructors that current models of teaching Tai Chi virtually fall short compared to in-person instruction. One significant drawback of learning Tai Chi Online is that practitioners may not be able to see all the angles of the instructor's body needed to understand and mimic the movements. Also, the lack of real-time feedback from instructors and interaction among participants is also limiting the learning outcomes and engagement for practitioners. Therefore, a solution is desired to compensate for the limitations

of virtual Tai Chi lessons, and expectedly improve the learning outcomes and engagement for practitioners to a similar or higher level of the in-person teaching model.

1.2 Inputs and Outputs

1.2.1 Inputs

- Video stream of Tai Chi instructors
- Video stream of practitioners
- Audio from both instructors and practitioners, to enable communication during the session
- Annotation preference of practitioners

1.2.2 Outputs

- Tai Chi virtual lessons with audio and real-time annotations
- Personalized streaming interface

1.3 Stakeholders

- Professor of SFWRENG 4G06, Dr. Spencer Smith
- Supervisors of the project, Dr. Rong Zheng, Andrew Mitchell
- Tai Chi instructors and practitioners

1.4 Environment

Software Windows, Linux or Mac OS

Hardware Computers with a camera and optionally a microphone

2 Goals

Learning and teaching experience improvement The product should provide at least three types of visual effects to show the instructor's motions in Tai Chi lectures, making it easier to see the instructor's motions in video calls.

Minimizing the hardware requirements for end users The product should be accessible to users as long as they have a device that supports video conferences. Users should be able to use the product seamlessly as long as they can access the Internet.

Real-time video post-processing The speed of video processing and visual effect generation should not be noticeable. There should be no significant lag (¡ 3 seconds) in the instructor's and practitioner's video calls.

Safety of User Data The application should secure user data and minimize the chance of data leakage.

Ease of use The application should be intuitive to use and no further instruction is required. People of all age groups should be able to learn all the features of the application with ease.

3 Stretch Goals

Accurate annotations The instructor's body annotation should give the best representation of the instructor's body motion.

Form recognition and captioning The application should be able to recognize the Tai Chi form based on the instructor's motion and display the name of the form as a caption on top of the video stream.