MICHIGAN STATE
U N I V E R S I T Y

Project Plan Presentation
Robotic Job Coaching

The Capstone Experience

Team Michigan State University CSE

Adam Cohen

Kaiwen Jiang

Olivia Pal

Stavro Polis

Kyle Roleson

Ekene Umobi

Department of Computer Science and Engineering

Michigan State University

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From Students…
…to Professionals

Project Sponsor Overview

- Michigan State University (MSU) was founded in 1855 as the Michigan Agricultural College under the Land-Grant College Act.
- Department of Computer Science and Engineering (CSE) was established in 1969.
- Professors involved in this collaboration are :
  - Prof. Charles Owen
  - Prof. Ranjan Mukherjee
  - Prof. Hung Jen Kuo

Project Functional Specifications

- Increase job coach agency and ability to help their clients
- Streamline connecting coaches with clients
- Facilitate more effective assistance without requiring coaches to be in-person
- Robotic arm allows for more control over remote presence
- Improve job coaching experience, especially for those with cognitive disabilities
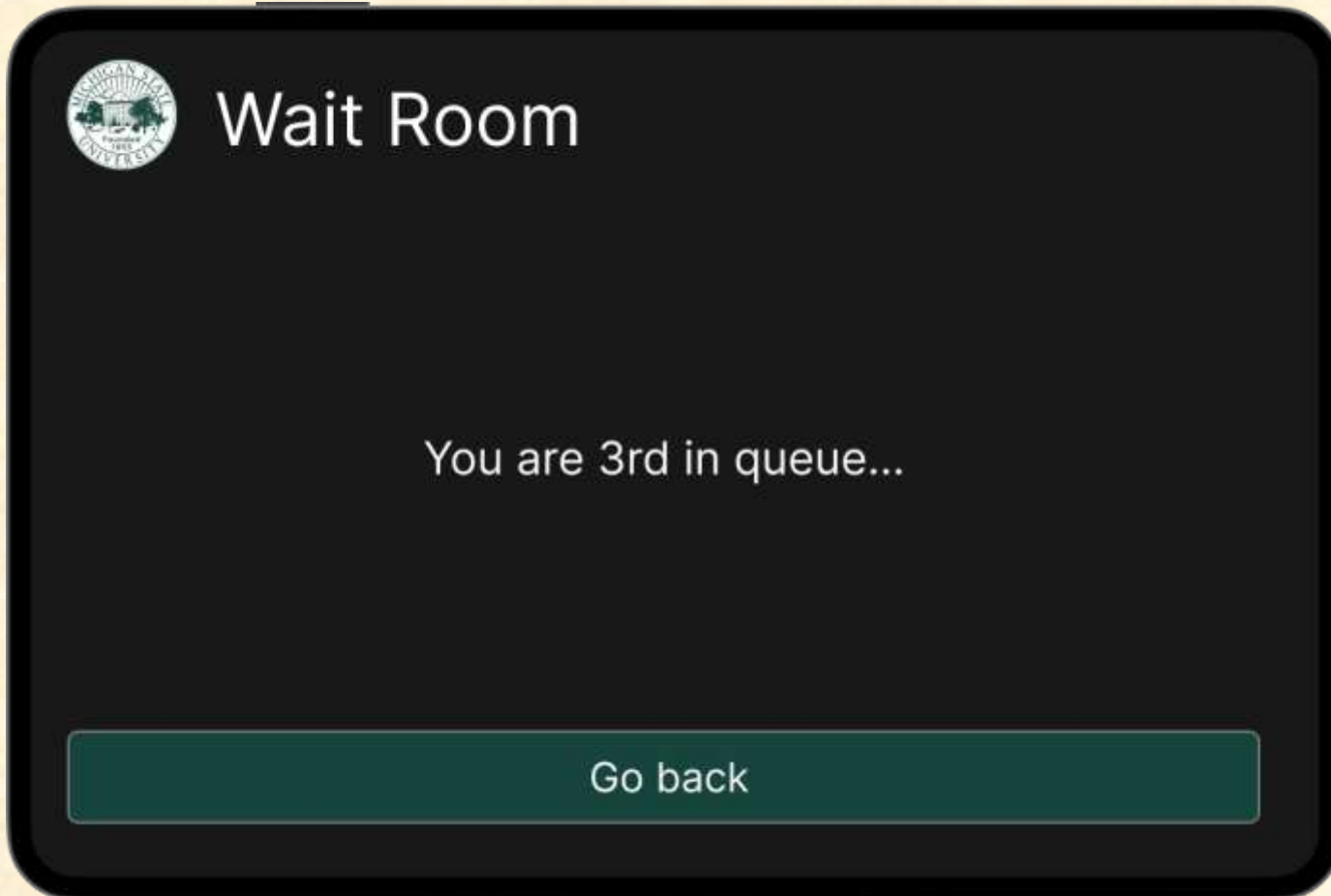
Project Design Specifications

- Focused on simplicity, ease of use, and quick times to connect to a coach
- After logging in, the client app is simply a button to connect to any coach, and a button for each specific coach
- The coach app shows their specific queue of clients, and options to jump to any client station
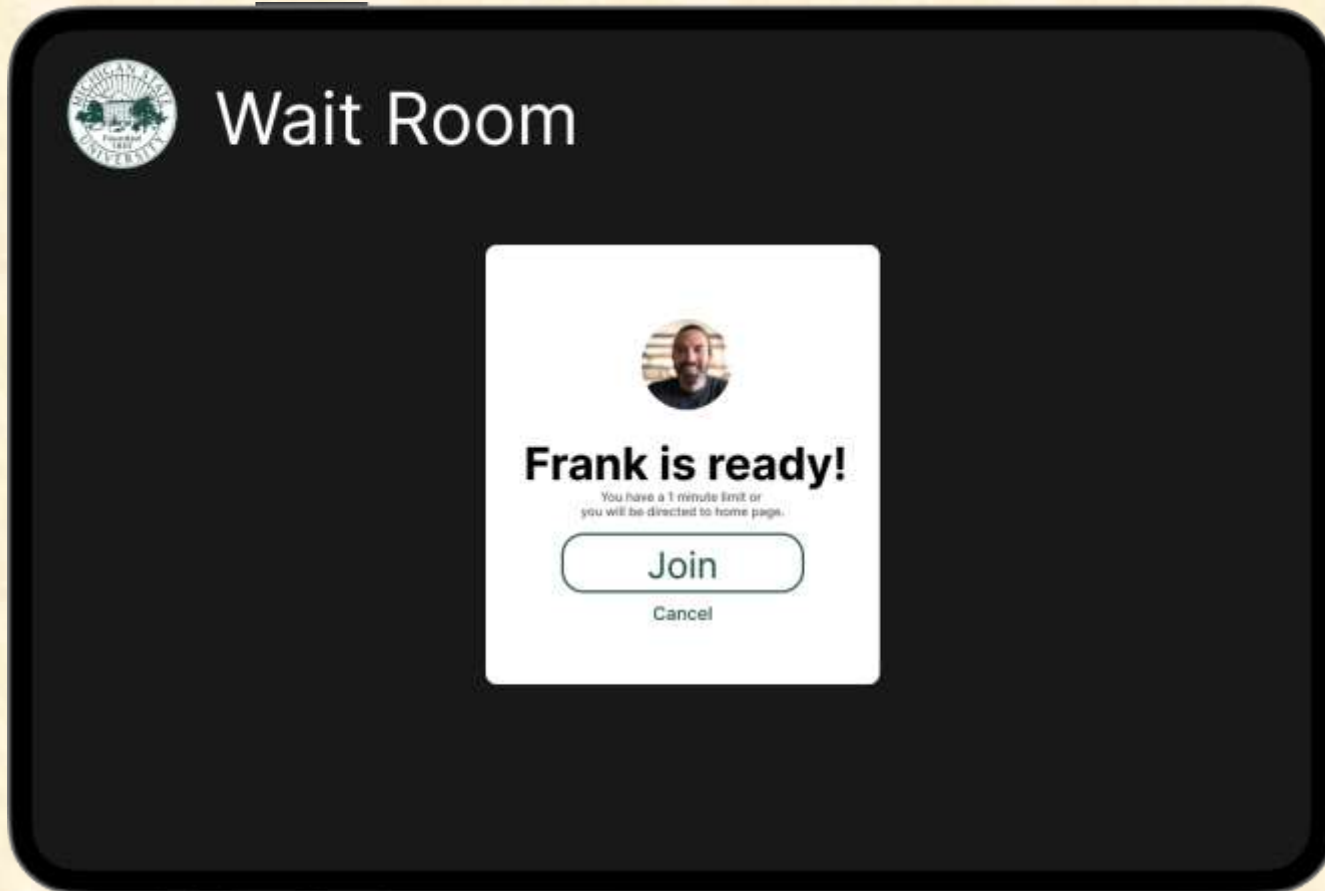- Robotic arm mirrors the motions of coach's iPad
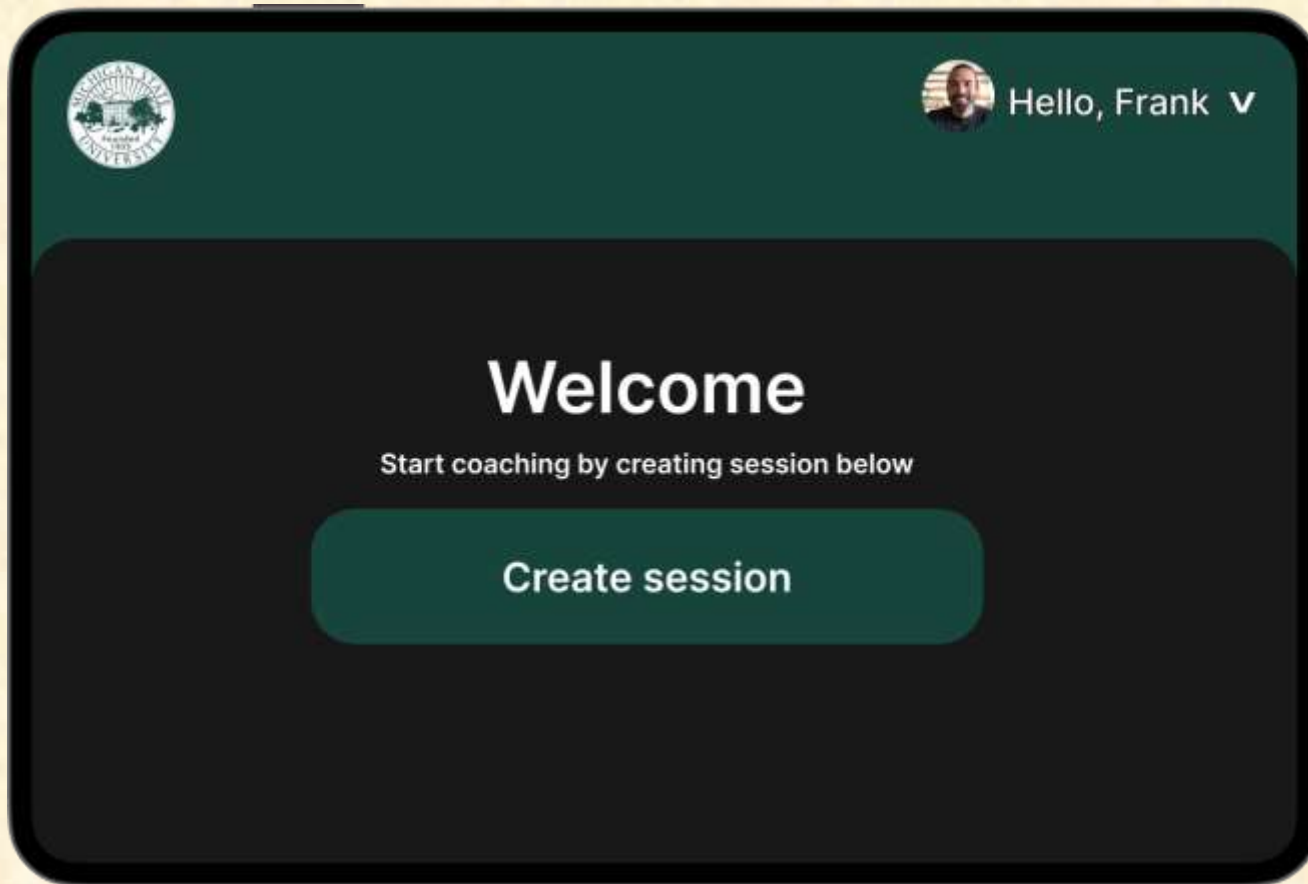
Screen Mockup: Client Homepage
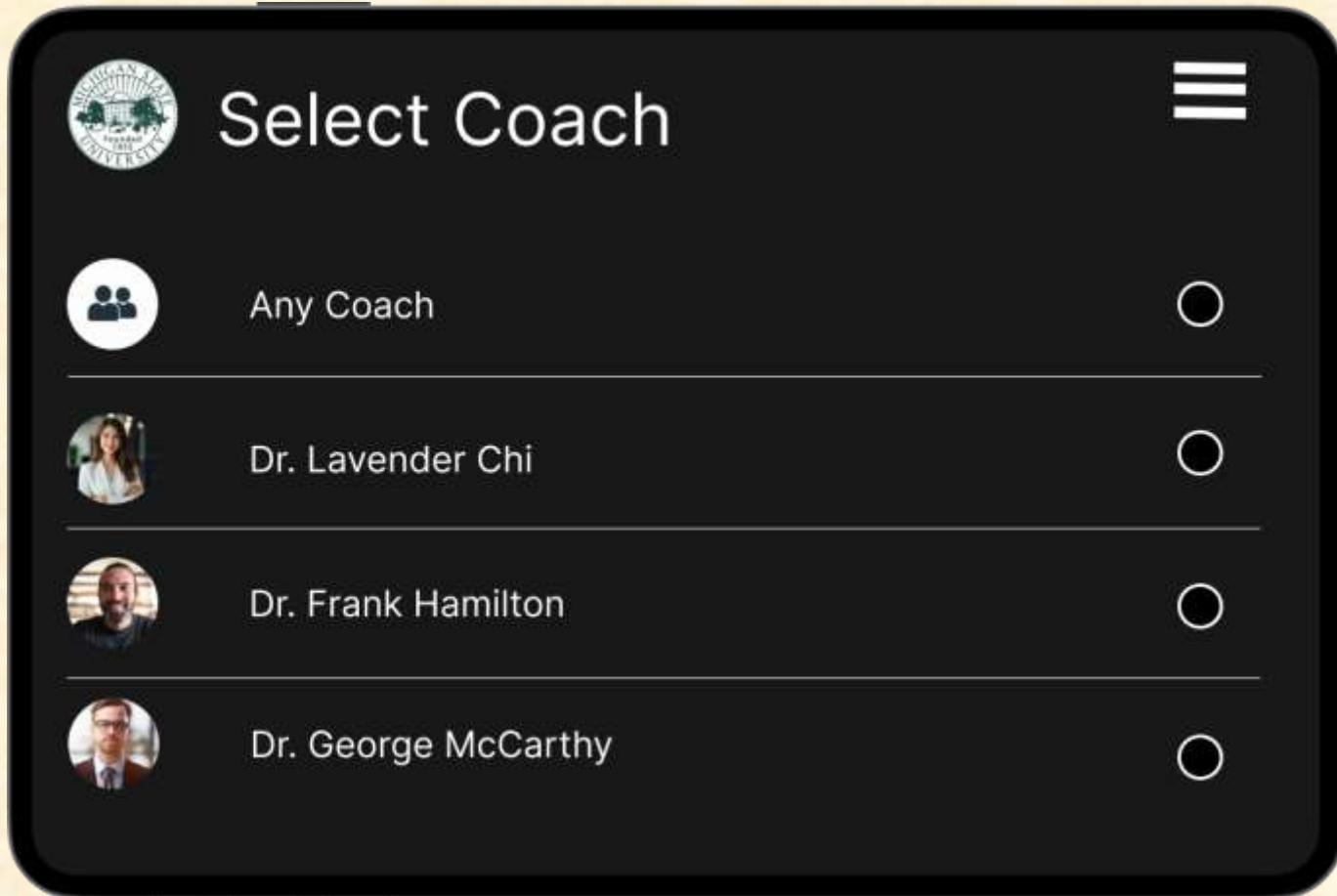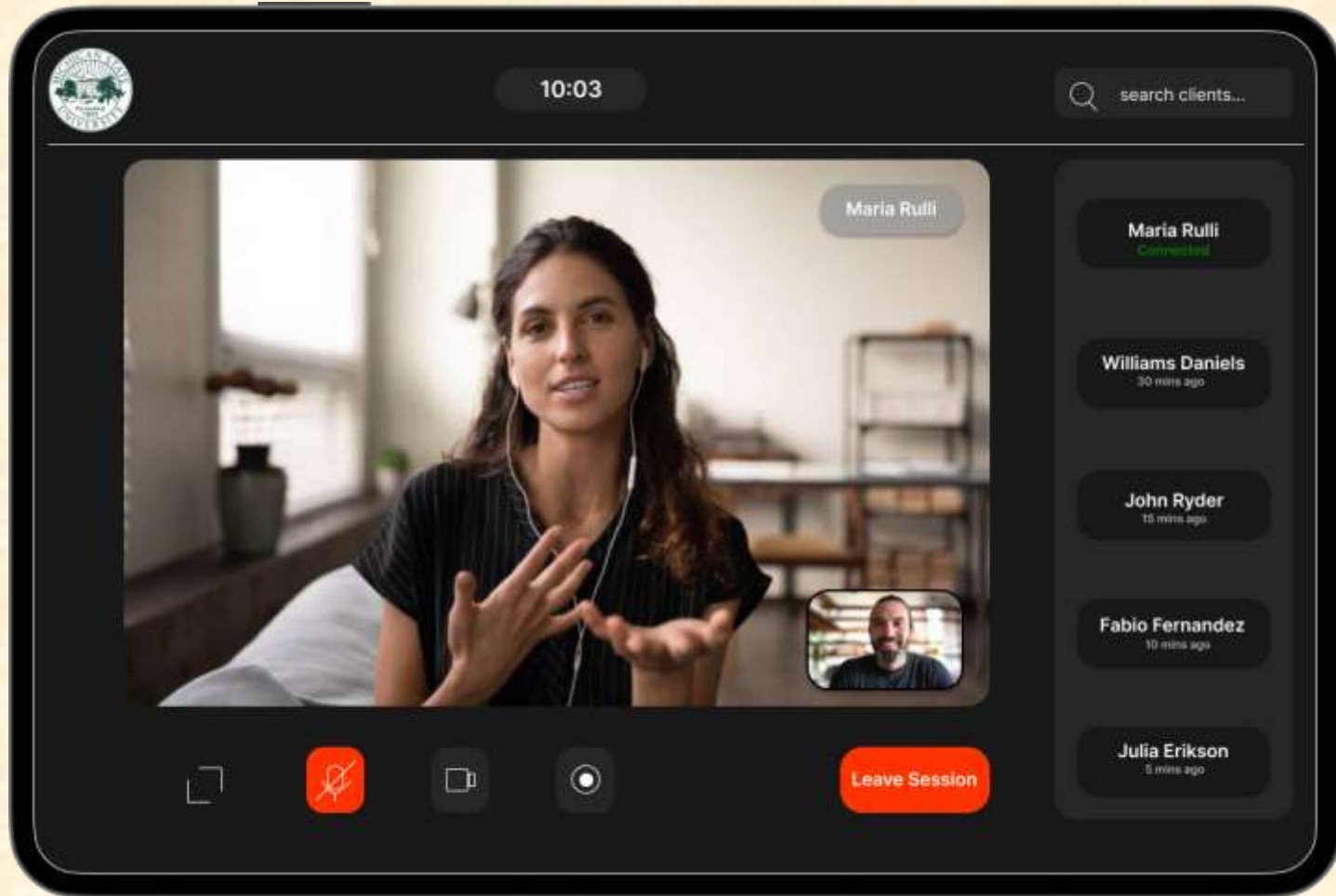
Screen Mockup: Client Wait Room

Screen Mockup: Client Wait Room 2

Screen Mockup: Coach Homepage

# Screen Mockup: Coach call/Queue Page

Project Technical Specifications

- Two separate iOS applications
- Which communicate to a connection server using the WebSocket protocol
- In order to pair clients with coaches, and initiate a peer-to-peer WebRTC connection between them
- The coach app also uses gyroscope, accelerometer, camera, and lidar data to track its position and rotation
- Which is sent alongside the video call, and then to the robotic arm to be replicated on the client side

Project System Architecture
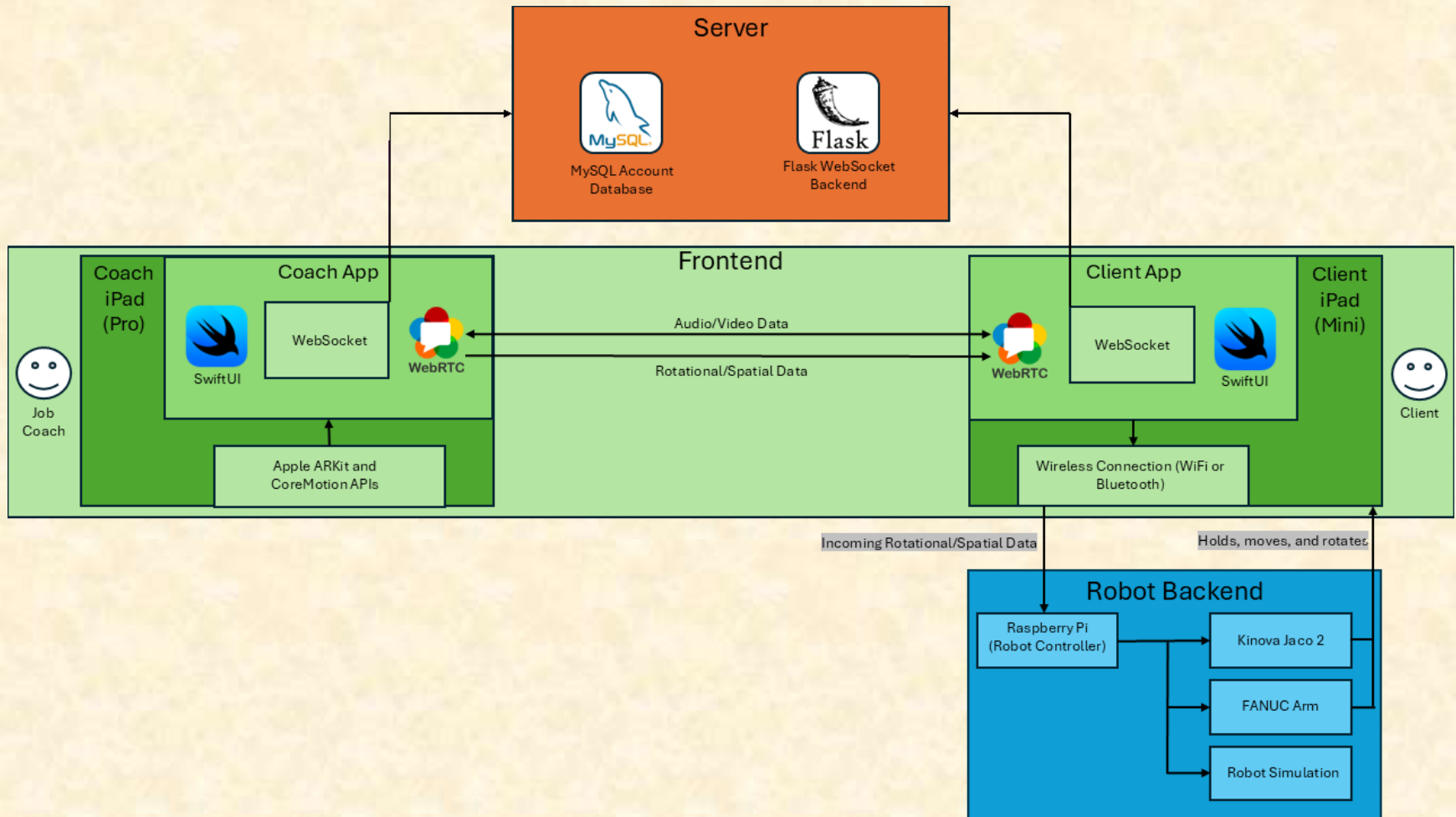
Project System Components

- Hardware Platforms
  - iPad (iOS app and sensor data)
  - Raspberry Pi (iPad → robot interface)
- Software Platforms / Technologies
  - Swift (iOS app language)
  - Python (Server language)
  - Flask (Python framework for server)
  - Fanuc Sim Software (Simulating Fanuc robot)
  - Unity (Simulating Kinova robot)
  - WebRTC (Peer to peer connection between iPads)

Project Risks

- Risk 1
  - Kinova JACO arm is non-functional
  - Arm will be sent in to be repaired and if not returned in a timely manner, simulation software will be used in its place.
- Risk 2
  - Relative Spatial and Rotational Tracking on iPads
  - Investigating and testing Apple's existing API's to ensure the data accuracy needed for the robots movements.
- Risk 3
  - Mounting iPad to Robot
  - Built in claw is not suitable; we will need to ask whether the hand can be removed without damage to the arm, and a mount will need to be designed and created.

Questions?