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Enchancing User Experience in Sign Language Interpretation Technology with Translating Hands
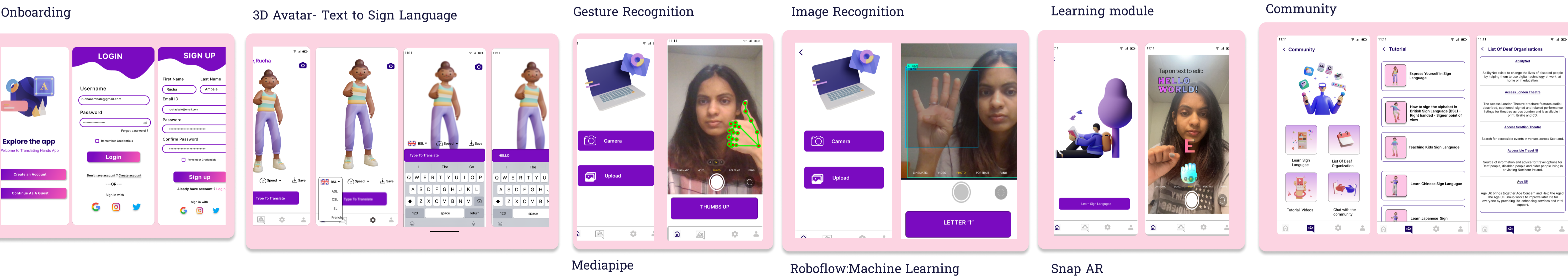
Abstract

This research project is focused on developing an innovative sign language translation app that is targeted to the needs of the Deaf population. The study looks into the communication issues faced by sign language users and Deaf individuals through user-centered methodologies such as interviews, surveys, and usability testing. The study investigates three methods of implementation: Machine Learning Models - Web Based API, Snap AR - Hand Gesture Response Trigger, and Mediapipe Google API. Although the results reveal that Roboflow has limits in reliably identifying sign language gestures, the integration of Snap AR and Mediapipe provides a compelling alternative to improve accuracy, usability, and the app's standard. This integration takes advantage of both technologies capabilities, resulting in a more effective and user-friendly sign language translation tool.

Introduction

Sign language translation technology has the potential to revolutionize communication for the Deaf community. While progress has been achieved, present solutions frequently fall short in terms of accuracy, user experience, and inclusion.(Papatsimouli, M., Sarigiannidis, P. and Fragulis, G.F. (2023). Traditional methods, including machine learning models, lack the accuracy needed to effectively understand complicated sign language motions. Integration of the methods such as Snap AR and Mediapipe can be an alternative to solve the problem.

The document titled "The Health of Deaf People in the UK" provides a comprehensive overview of the callenges faced by the Deaf community in the United Kingdom. Deaf individuals often struggle to communicate effectively with healthcare professionals due to the lack of sign language interpreters and limited access to communication support. This leads to misunderstandings, misdiagnoses, and inadequate treatment.Over 70 million deaf people worldwide, sign language is the primary language for ~30% of deaf individuals (World Federation of the Deaf).The research aims to close the gap between technology and people by creating a user-centric sign language translation app that enables seamless communication between Deaf individuals and the rest of society.
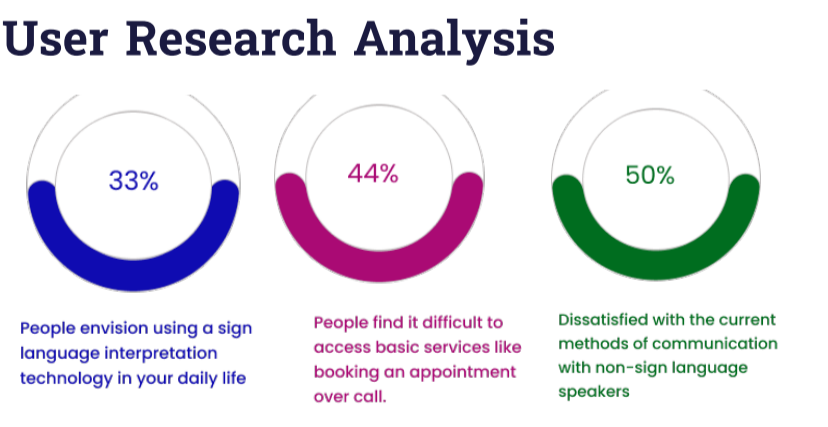
Design

Onboarding

3D Avatar- Text to Sign Language

Gesture Recognition
Mediapipe

Image Recognition
Roboflow:Machine Learning

Learning module
Snap AR

Community

Study Methodology

User Research -Need Analysis: Conducted interviews, surveys with 9 participants to understand their communication challenges and preferences.

Literature Review: Investigated current research on augmented reality, sign language translation, and user-centered design concepts to guide the creation of apps.

Competitor Analysis : Analyzed other apps to find their advantages, disadvantages, and standout characteristics in order to improve te functionality of this app.

Information Architecture,User Personas: Organized app content and navigation to ensure a logical and user-friendly structure.Created detailed user personas representing different segments of the target audience,

Data Collection, Integration of Technology and Technology Evaluation: Built a data set for image recognition in roboflow.

Testing And Research Results

User Research Analysis

33% People envision using a sign language interpretation technology in your daily life

44% People find it difficult to access basic services like booking an appointment over call.

50% Dissatisfied with the current methods of communication with non-sign language speakers
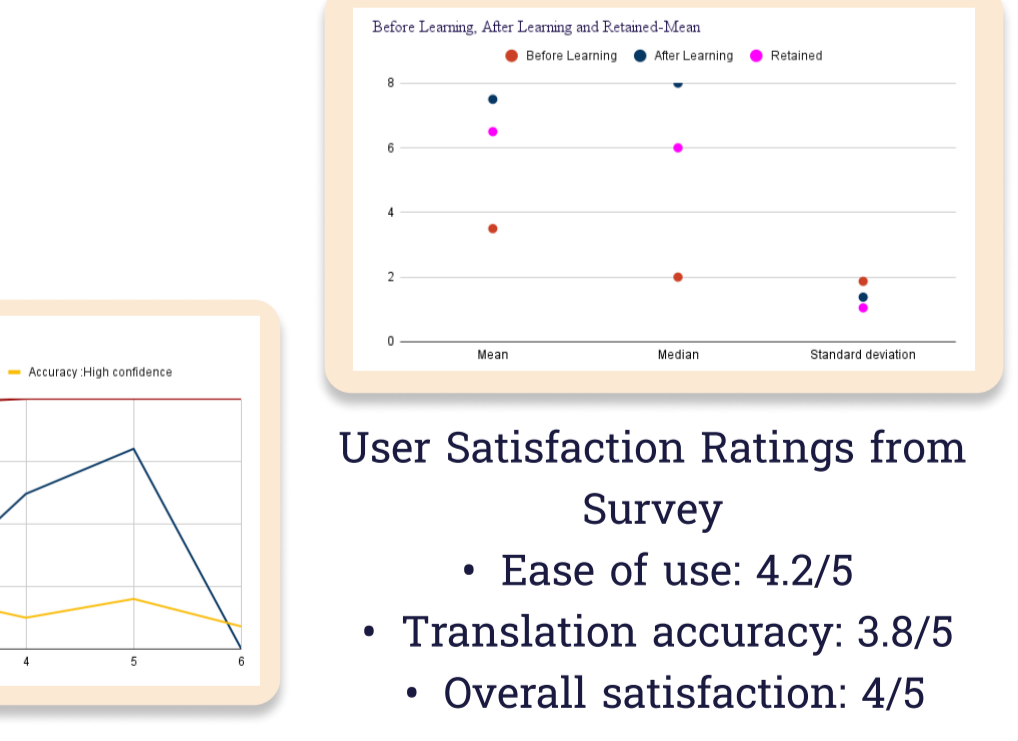
Usability Testing

Real-time observation and user feedback: The app's usability, accuracy, and accessibility were tested by having 5-6 participants complete basic tasks like onboarding, establishing new accounts, translating words, using various capabilities, and answering open-ended questions.

A/B Testing

A/B Testing with different technology:The users were asked to try two different versions of gesture recognition- mediapipe and roboflow to test the accuracy

Mediapipe and Roboflow Accuracy results
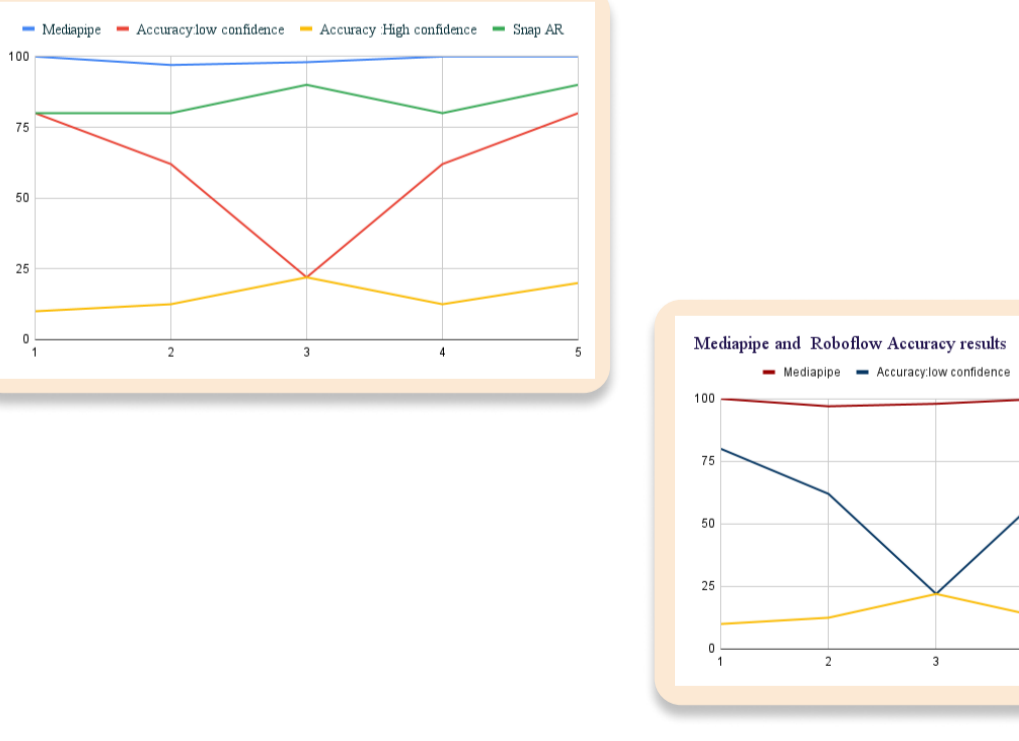
Surveys

After the completion of usability testing,participants were given a Google form to provide their valuable insights and feedback on their experience of the app

Before Learning, After Learning and Retained Information

User Satisfaction Ratings from Survey
- Ease of use: 4.2/5
- Translation accuracy: 3.8/5
- Overall satisfaction: 4/5

Conclusion and Future Work

The research has uncovered the significant influence of user experience design on the usability and inclusivity of sign language translation .The combination of technologies can significantly improve accuracy and user engagement by closely assessing alternatives like MediaPipe, Snap AR, and Roboflow. The thorough design of the app, which was carefully designed to meet user preferences and demands, emphasizes the crucial role that user-centered design plays in encouraging meaningful relationships between various communities.

In the future the app's scope extends to global accessibility, Government & NHS Integration- online appointments and video translations as suggested by the participants during the usability testing, facilitated by the integration of SDKs of mediapipe,machine language and snap AR all together to improve efficiency and collaborative coding efforts with the help of software development team.