# Summary

**GitHub link:** https://github.com/tandung1309/seic-project

## Overview

* Around 300 million people suffer from some colorblindness
  + Colorblindness is a spectrum, so each person’s symptoms can be different, but there is no doubt that this interferes with their everyday life.
* Over 5% of the world’s population (430 million people) suffer from hearing loss (defined as being unable to hear sounds more significant than 35dB) (World Health Organization: WHO).
* It is harder to collect data regarding mute people due to:
  + Muteness is not classified as a diagnosis like deafness but more like a symptom from:
    - Physical impairments
    - Anxiety disorders
  + Lack of data because organizations like WHO focus on extensive studies on deafness and other impairments.
* With that being said, it is more likely that people who have deafness also have some degree of speech impairment.

## Problem Statement

* One incident that caught my attention regarding challenges around people with disabilities was stand-up comedy shows. I noticed that there’s usually a sign-language interpreter for people with hearing impairments, which is very friendly and should be implemented more.
  + Sadly, the truth is that we don’t have the resources to provide an interpreter at all places
* This is only one of the challenges that people with disabilities face because of something that happened to them, something they didn’t choose
* Another problem that involves people with color blindness is navigating traffic systems. Depending on how severe they are on the color blindness spectrum, determining colors on traffic lights or taillights of other cars can be difficult.
  + It wouldn’t be fair to say that they shouldn’t drive, but it’s also not fair to put other people in danger when people with colorblindness have problems navigating traffic properly.

## AI Models

In efforts to address these problems, two AI Models were developed. One is used for translating sign language into text, and the other is used for assistance in navigating colors for people with color blindness.

### **Sign-Language-Detecting AI**

* **AI used:** TensorFlow.js; Teachable Machine
* **Coding Language:** HTML5, CSS3, JavaScript (ES6+)
* We created an AI that detects sign language and translates it into text. Right now, it is a learning tool for people who wish to learn and try sign language. However, we believe this model has the most potential if developed correctly. It can exceed far more than simply translating between sign languages and text. Using databases from existing sign languages, it can be trained to capture tone, emotion, and expression, giving people with disabilities the full context of the conversation.

### **Color-Detecting AI**

* AI Used: Canvas API, ImageData API, WebRTC API
* Coding Language: HTML5, CSS3, JavaScript (ES6+)
* Designing an AI model to help people on the color blindness spectrum was tricky as we had to try to see things under their scope. For people with no seeing impairments, seeing and understanding color has become an unconscious thing. It just exists in our life. However, some people at the end of the color blindness spectrum have a completely different concept of color; they might not even understand what color is.
* Instead of trying to explain the concept of color, we use AI to identify and symbolize colors, giving them meanings that people on the color blindness spectrum can understand
  + **Pros:** Giving meanings to colors might help people on the color blindness spectrum understand the concept of color in their way and, more importantly, to know how they are used in everyday life
  + **Cons:** Unfortunately, symbolizing and giving meanings to colors is one of the most practical ways to help people at the end of colorblindness. With our technologies, giving them the “understanding” and “feelings” of color is almost impossible as a normal person does.

## Evaluation

* The product was able to yield some results. However, with the limited time given, a lot of development to these ideas still stays as potential for future implications
* The potential for sign-language-detecting AI is immense. Implementing a database of sign language with their variations taking emotions into account would be a huge development, allowing people with hearing impairments to understand the tone, emotion, and feelings of other people in a conversation.
  + Furthermore, developing the AI translation of speech-to-sign-language would allow people with hearing impairments to fully engage in conversation with people who don’t speak sign-language
* The potential for Color-Detecting AI is not as high as the other model. The main reason is that there are more practical uses for developing the sign-language AI model. There are endless possibilities for people with impaired hearing waiting for the development of OpenAI to be able to translate speech-to-sign language. We are not there yet, but we are very close to it.
  + On the other hand, detecting colors has been around for a while, and there are now fewer practical uses when developed further. With that being said, there are still features regarding this AI model that can be developed and would help people with impaired hearing tremendously.