



Our Team



Archisha Bhattacharya
AI Developer
Full-Stack Developer
Technical Architect



Brooklyn Coulson
Front-End Developer
Documentation Manager



Jasmeet Singh
AI Developer
Full-Stack Developer
UI/UX Developer

Project Introduction





Did you know?



Studies show that as of 2017, 67% of individuals who suffer hearing loss experience underemployment or unemployment, often due to communication barriers and lack of accommodations in the workplace.





BUSINESS NEED



Existing Technology Inventory

	Interpreters and Translators	Pen and Paper	Text Messaging Apps	ASL Gloves
Time	✗			✗
Accessibility and Inclusivity		✗	✗	
Cost			✗	✗

Interpreters and Translators: Represented by two people at a desk. Status: ✗ (Time), ✗ (Inclusivity).

Pen and Paper: Represented by a pen and a sheet of paper. Status: ✗ (Inclusivity).

Text Messaging Apps: Represented by a smartphone with a speech bubble icon. Status: ✗ (Time), ✗ (Inclusivity), ✗ (Cost).

ASL Gloves: Represented by a hand with fingers spread. Status: ✗ (Time), ✗ (Inclusivity), ✗ (Cost).

Icons for Accessibility and Inclusivity: Two stylized human figures. The figure on the left has a checkmark above its head, indicating high accessibility/inclusivity. The figure on the right has an 'X' above its head, indicating low accessibility/inclusivity.



WHAT'S THE SOLUTION?

VisuSpeak



	VisuSpeak
Time	✓
Accessibility and Inclusivity	✓
Cost	✓
Suitability for Organizations	✓

A screenshot of a web browser displaying the VisuSpeak Help Desk. The page has a teal gradient background. At the top, there's a navigation bar with 'Admin', 'Resources', and 'About Us'. Below that, a main heading says 'Welcome to VisuSpeak's Help Desk' with a sub-instruction: 'If you prefer to communicate in American Sign Language (ASL) simply click the button below to connect with our administrators.' A large 'Start Conversation' button is centered. At the bottom, there's a 'Features' section with three cards: 'One-on-One Conversations' (with a video camera icon), 'Quick Service' (with a clock icon), and 'Safe and Reliable' (with a shield icon). A 'Learn More' link is located at the bottom right of the features section.

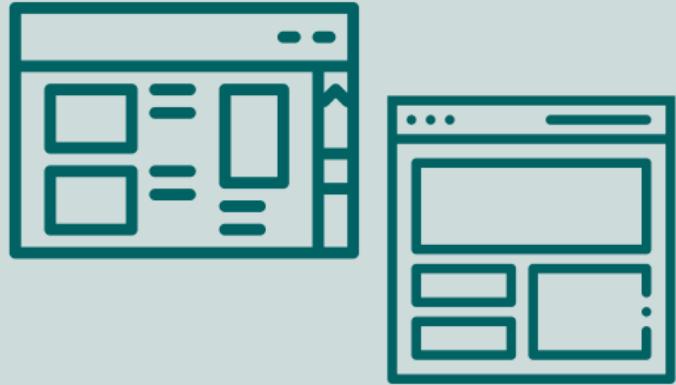
Demo





OUR DEVELOPMENT PROCESS

User Interface



Our Initial Vision



Landing Page

Welcome to VisuSpeak
Your ASL Companion

Login Sign Up

ASL Resources About US

VisuSpeak

This wireframe shows the landing page of the VisuSpeak application. It features a header with the VisuSpeak logo, navigation links for ASL Resources and About US, and a user icon. Below the header is a main area titled "Welcome to VisuSpeak" with the subtitle "Your ASL Companion". It includes two "Login" and "Sign Up" buttons. The central part of the page displays a 3x2 grid of video feeds. The top row contains a gray placeholder box and an orange placeholder box. The bottom row contains an orange placeholder box and a gray placeholder box. At the bottom of the page is a footer with the VisuSpeak logo.

Chat Page

New Chat

ASL Resources About US

VisuSpeak

Start New Chat

This wireframe shows the "New Chat" interface on the Chat Page. It has a header with the VisuSpeak logo, navigation links for ASL Resources and About US, and a user icon. The main area is titled "New Chat" and contains a large video feed placeholder with a camera icon. Below the video feed are four small control buttons labeled "REC", "Reconnect", "Open Call", and "Close Call". At the bottom of the page is a footer with the VisuSpeak logo and a "Start New Chat" button.

Transcript History

ASL Resources About US

VisuSpeak

Transcript History

Chat Date: mm/dd/yy View Delete

Close

Start New Chat

This wireframe shows the "Transcript History" page. It has a header with the VisuSpeak logo, navigation links for ASL Resources and About US, and a user icon. The main area is titled "Transcript History" and lists four transcript entries, each with a date and "View" and "Delete" buttons. At the bottom of the page is a footer with the VisuSpeak logo and a "Start New Chat" button.



User Test Groups

ASL Expert



Patricia Spicer

Vocational Worker, Early Childhood & Family Services
Saskatchewan Deaf and Hard of Hearing Services (SDHHS)

Industry Expert



Rob Anderson

Manager
SaskPower



Jasmine Owens

Accessibility Officer
U of R Student Wellness Centre



Feedback from Testing

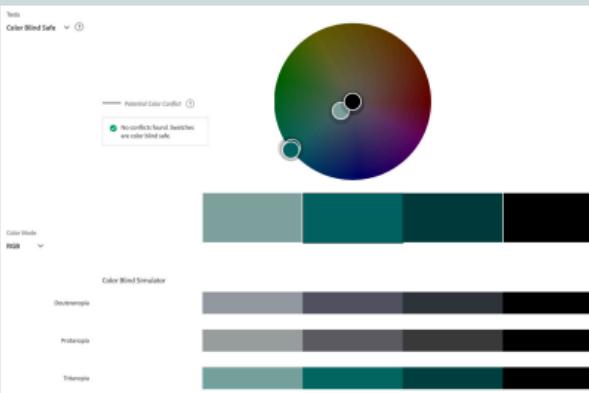
Initial Feedback

	Rob	Patti	Jasmine
	<ul style="list-style-type: none">• Ensure that the app is accessible in regard to AAA standards• Improve visibility of labels.• Focus on improving accessibility resources section.	<ul style="list-style-type: none">• UI design praised for accessibility (colors, fonts)• Accurate AI predictions• Minor font and gesture issues.	<ul style="list-style-type: none">• UI design praised for accessibility (colors, fonts)• Accurate AI predictions• Much needed application for the community

Accessible color combinations

Please don't use these color combinations; they do not meet a color contrast ratio of 4.5:1, so they do not conform with the standards of Section 508 for body text. This means that some people would have difficulty reading the text. Employing accessibility best practices improves the user experience for all users.

	White text #FFFFFF Aa	Light Green text #E0F2F1 Aa	Teal text #2ECC71 Aa	Dark Teal text #2ECC71 Aa	Deep Pink text #E74C3C Aa	Black text #000000 Aa
Black background #000000	Aa	Aa				
Deep Pink background #E74C3C		Aa				
Dark Teal background #2ECC71			Aa			
Teal background #2ECC71				Aa		
Light Green background #E0F2F1						Aa
White background #FFFFFF						Aa



Ensuring Accessibility in our Design

Our design strives to conform to the **Level AAA** of the WCAG accessibility standard - highest level of accessibility compliance!

- **Accessible Color Palette** - Selected with care to ensure usability and aesthetic appeal.
- **Color Blind Checker** - Implemented to ensure they're perceivable by users with color blindness
- **Predictions on Hand Video** - Enhanced visibility of predictions in hand gesture videos, making sure they're easily seen by all users.

Why we did this?

To enhance user experience and foster a more inclusive digital ecosystem within our application





Final Design

The screenshot shows the 'Resources' section of the VisuSpeak website. At the top, there's a navigation bar with the VisuSpeak logo, language selection ('English'), and links for 'Admin', 'Resources' (which is highlighted in green), and 'About Us'. Below the navigation, the title 'Resources' is displayed in bold. There are two main sections: 'ASL Dictionary' and 'Learn ASL Professionally'.
ASL Dictionary: This section features a photo of a woman with curly hair and glasses, smiling and holding up a sign. A detailed description follows: 'Our ASL Dictionary offers a curated selection of words supported by our application, available through an easy-to-use dropdown menu. Each entry is paired with a clear demonstration video, providing a visual guide to master the signs. This feature is designed to help users quickly learn and accurately replicate ASL signs, enhancing their ability to communicate effectively with the ASL community.' A blue 'View Dictionary' button is at the bottom.
Learn ASL Professionally: This section features a photo of a man and a child sitting on a couch, looking at a book together. A descriptive paragraph follows: 'Elevate your American Sign Language skills with Saskatchewan Deaf and Hard of Hearing Services. Designed for immersive learning, these classes provide structured instruction from experienced sign language educators. Engage in interactive lessons that cover everything from fundamental signs to advanced communication techniques, all aimed at building your proficiency and confidence in ASL.'
A small '...' icon is located at the bottom right of the 'Learn ASL Professionally' section.

This screenshot shows the sign language recognition interface. At the top, it says '10 s' and has a 'Words' toggle switch followed by a 'Fingerspelling' toggle switch. The main area shows a video feed of a person wearing a green hoodie with 'ENGINEERING' written on it. Yellow dots track the movement of the person's hands. A black box with the word 'Hello' is overlaid on the video. At the bottom left, there's a text input field with 'E Hand' and a microphone icon. To the right of the video feed are control buttons for 'Go', '5s', '10s', and '15s'. A status bar at the bottom indicates 'Current Word: Hello'.



Feedback on Final Design

Final Feedback

Rob

- Appreciated ASL dictionary and resources section.
- **Suggestion:** Ensure UI consistency, improve chat page responsiveness.

Patti

- Praised app innovation and usability.
- **Suggestion:** Enhance countdown visibility, add profile picture feature.

Jasmine

- Praised app innovation and usability.
- **Suggestion:** Enhance countdown visibility, add profile picture feature.

Tech Stack

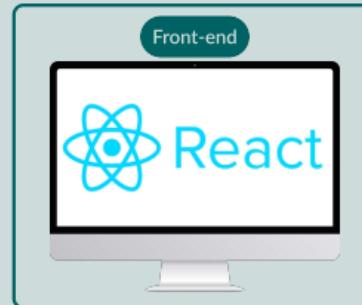




Tecnology Stack

Front-end

- **React hosted on Nginx** - allows for a dynamic user interface



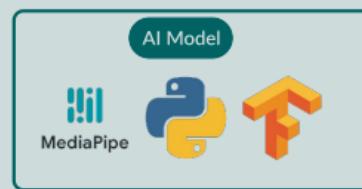
Back-end

- **Firebase** - facilitates real-time updating of messages for users in the chat feature



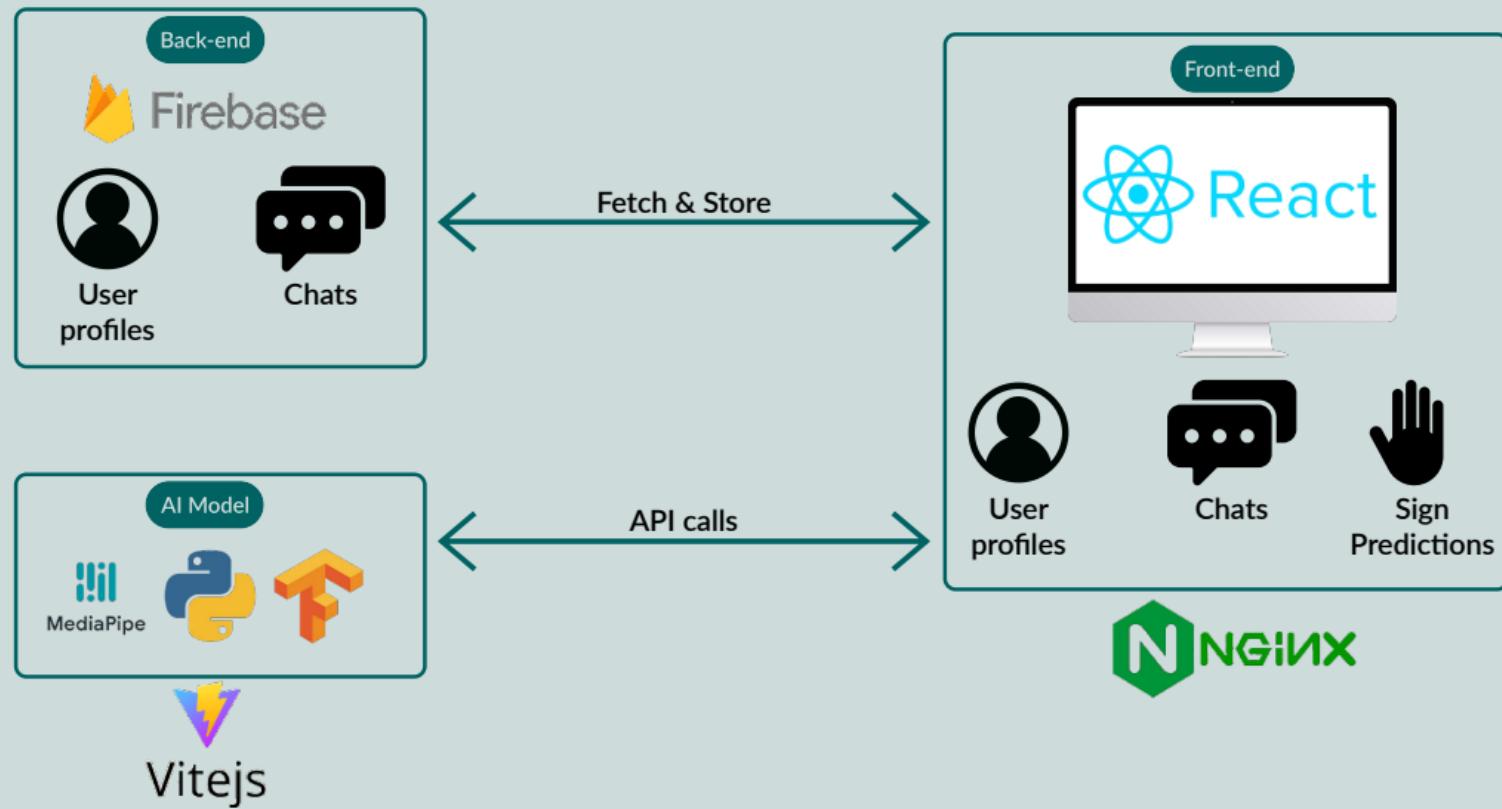
AI Model

- **Python and MediaPipe** - used to create and train our model to recognize hand gestures and classify them as the appropriate ASL letters or words
- **Tensorflow** - used to convert our model to lighter version in javascript and deployed using Vite

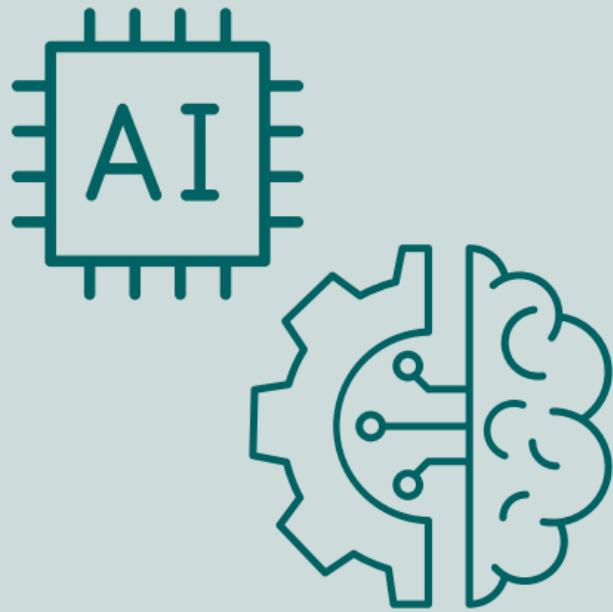




Architecture



AI Development



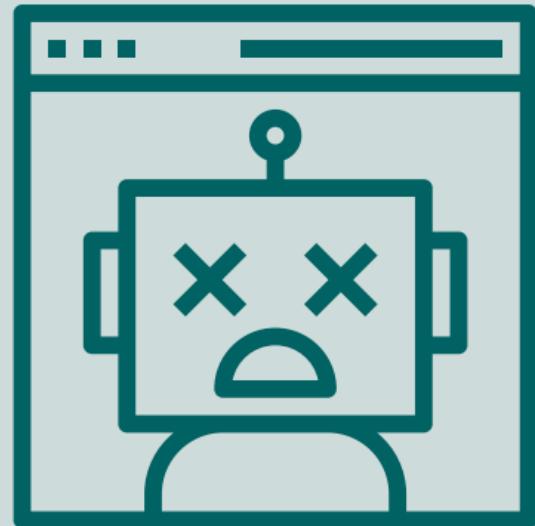


Initial Trial and Error

Previous Dataset used

- **WLASL:** Largest dataset for ASL, contains a collection of ASL signs represented as video files
- **Massey Dataset:** ASL alphabets using transfer learning and custom classification from Massey University

	WLASL	Massey Dataset
Accuracy	NONE	53%
Result	NONE	SEMI-DESIRED

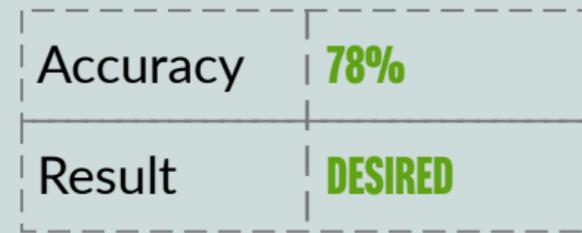




Artificial Intelligence dataset

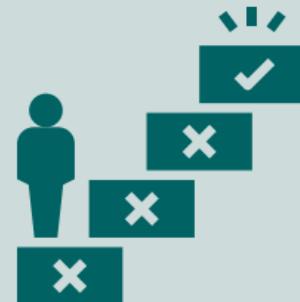
Current Model

- Utilized MediaPipe for hand gesture recognition to translate ASL to English.
- Trained on a custom dataset for predicting ASL letters and some words.
- Custom dataset created with assistance from Patti Spicer, an ASL speaker and vocational worker with SDHHS.

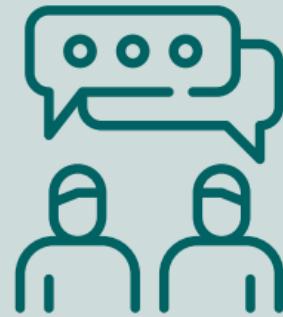


Pros

- Precision and accuracy of gesture recognition
- Robust and efficient processing on Web Applications

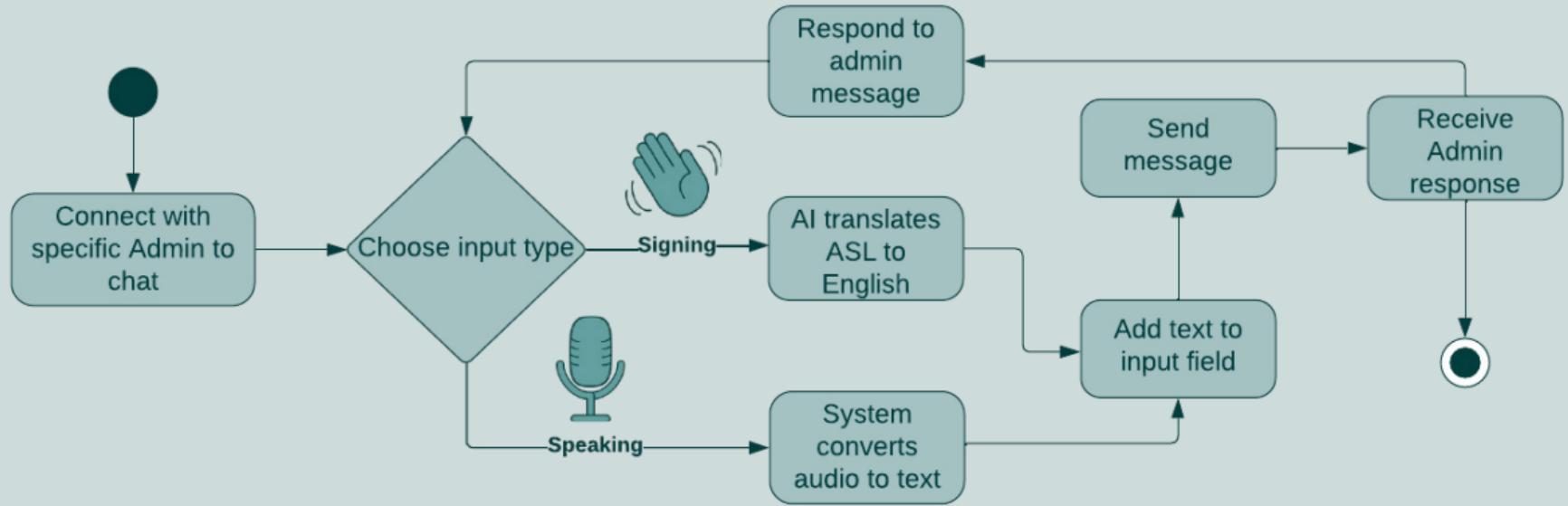


Chat Interactions





Conversation Flow



Terms and Conditions



Terms and Conditions

These terms and conditions ("Terms") govern your use of VisuSpeak provided by VisuSpeak ("we," "us," or "our"). By accessing or using the Application, you agree to be bound by these Terms. If you do not agree to these Terms, you may not access or use the Application.

1. Use of the Application

1.1 You agree to use the Application only for lawful purposes and in accordance with these Terms.

1.2 You are responsible for ensuring the accuracy and legality of any content you submit or upload to the Application.

2. Intellectual Property Rights

2.1 The Application and its original content, features, and functionality are owned by VisuSpeak and are protected by international copyright, trademark, patent, trade secret, and other intellectual property or proprietary rights laws.

2.2 You may not modify, reproduce, distribute, transmit, display, perform, or create derivative works from any content available through the Application without the prior written consent of VisuSpeak.

3. Disclaimer of Warranties

3.1 The Application is provided on an "as-is" and "as-available" basis. We make no representations or warranties of any kind, express or implied, regarding the accuracy, reliability, or availability of the Application.

3.2 We disclaim all warranties, express or implied, including but not limited to implied warranties of merchantability, fitness for a particular purpose, and non-infringement.

3.3 The predicted words provided by the AI model are generated based on a trained dataset. While we strive for accuracy, we cannot guarantee the precise interpretation of signed words. Users should exercise discretion when relying on the predicted words and understand that the accuracy may vary. We do not assume responsibility for any inaccuracies in the predictions.

4. Use of Webcam

4.1 By accessing webcam features within the Application, you consent to its use. We do not store any webcam video or images. Your consent is required for accessing certain features. You are solely responsible for content captured. Misuse may result in termination of access.

5. Limitation of Liability

5.1 In no event shall VisuSpeak, nor its directors, employees, partners, agents, suppliers, or affiliates, be liable for any indirect, incidental, special, consequential, or punitive damages, including without limitation, loss of profits, data, use, goodwill, or other intangible losses, resulting from (i) your access to or use of or inability to access or use the Application; (ii) any conduct or content of any third party on the Application.

6. Governing Law

6.1 These Terms shall be governed by and construed in accordance with the laws of Canada, without regard to its conflict of law provisions.

6.2 Users from international jurisdictions are responsible for compliance with local laws regarding the use of the Application.

7. Changes to Terms

7.1 We reserve the right, at our sole discretion, to modify or replace these Terms at any time. If a revision is material, we will provide at least 30 days' notice prior to any new terms taking effect.

Close

Accept





CONCLUSION



Conclusion

-  Empower individuals with special accessibility needs.
-  Facilitate easy communication and access to essential services for native ASL speakers
-  Reduce communication barriers and promoting inclusion
-  Enable seamless communication for non-verbal individuals and people with hearing loss in customer service settings





Many Thanks to Those who Helped Along the Way!

Project Support

- Dr. Timothy Maciag - Capstone Facilitator
- Dr. Kin-Choong Yow - Project Mentor

Industry Experts

- Rob Anderson, P. Eng - Manager, Mobility and Innovative Solutions (SaskPower)
- Jasmine Owens - Accessibility Officer (U of R Accessibility Centre)
- Patti Spicer - Vocational Worker, Early Childhood & Family Services (Saskatchewan Deaf and Hard of Hearing Services)



And to the family, friends and classmates who provided support and feedback throughout this journey!



Want to learn more?

We've used github as our project management tool,
but what can be found here?

- Documentation highlighting our journey from start to finish
- Diagrams and prototypes displaying our vision for this app
- All the code that brings VisuSpeak to life

Take a look for yourself!



[GitHub](#)



[Website](#)





Thank, you!

Any Questions?



GitHub



Website