

# Icelandic Sign Language Video Platform

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This report presents the development of a video crowdsourcing platform for Icelandic Sign Language (ISL), addressing the critical need for accessible digital resources within the deaf and hard of hearing community in Iceland, félag heyrnarlausra. The platform serves a single main purpose: creating a comprehensive dataset for advancing sign language translation technologies. By integrating user-friendly video recording capabilities, community engagement features, and a robust backend for data collection, the project aims to overcome the limitations of existing resources. The platform's design emphasizes inclusivity, fostering collaboration between the ISL community and AI researchers. This initiative not only has the potential to contribute to the preservation and promotion of ISL but also lays the groundwork for developing advanced AI-driven sign language translation tools.

# 1 INTRODUCTION

Sign language is vital for communication within the deaf community. In Iceland, the development of a dedicated video platform for ISL represents a significant step towards greater inclusivity. While Iceland has an existing platform called SignWiki, its user experience limitations have resulted in minimal user-generated content, with only one video per gloss<sup>1</sup>. The ISL Video Platform project addresses these limitations by creating an accessible and user-friendly website for collecting ISL video samples. This data is crucial for developing AI solutions for sign language translation, which could greatly improve web accessibility for deaf individuals. Previous research has shown the positive impact of integrating sign language in digital platforms:

- The Sign Language Interpreter Module (SLIM) demonstrated improved comprehension for deaf users by integrating sign language videos on web pages (Debevc et al., 2009).
- A study on social app accessibility highlighted the importance of video-based content for deaf users who primarily communicate through sign language (Mack et al., 2020).
- Research on e-learning accessibility found that incorporating sign language videos in educational materials led to higher satisfaction and ease of use among deaf users (Debevc et al., 2010).

Our project aims to create a comprehensive digital resource for ISL that will:

1. Collect a wide range of ISL video samples
2. Serve as a foundation for developing sign language translation models
3. Provide an accessible and user-friendly platform for the ISL community
4. Encourage collaboration between the data science community and individuals who are hard of hearing

The long-term vision for this platform includes:

1. Becoming a central hub for sharing and engaging with ISL educational content
2. Serving as a digital archive for ISL videos
3. Accumulating sufficient data to train a sign language translation model

# 2 MAIN FEATURES

The ISL video platform is designed with a focus on being intuitive and accessible for the user. Our goal is to create a welcoming digital space where the Icelandic Sign Language community can easily contribute, learn, and be engaged.

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<sup>1</sup>A word in sign language

The platform offers a range of features that make it simple for users to record high-quality videos from home, with the end-goal of contributing to an interactive and comprehensive database of gloss translations.

To have the platform accessible to everyone we prioritized the internationalization of the website. This consisted of an initial integration of English and Icelandic languages in the website. The open-source nature of the codebase facilitates the addition of new languages with minimal programming expertise, thereby enabling a diverse range of contributors to enhance the platform's language offerings.

The key features of community service the users can benefit from are:

- **Video recording** after given a gloss
- **Rating existing videos** for quality check
- **Accessing the data** for all experts to try and make a good use of it

The ultimate goal is for the members of the Icelandic deaf community to contribute to a valuable dataset that will inspire curious AI experts, creating a win-win scenario where the AI community gains a rich resource to work with, and the deaf community benefits from life-changing solutions tailored to their needs.

### 3 COMMUNITY ENGAGEMENT VISION

#### 3.1 IMPORTANCE OF COMMUNITY INVOLVEMENT

The Icelandic deaf community has faced historical inequality, leading to wariness of external involvement (Orfanidou et al., 2014). Our project prioritizes meaningful community engagement by:

- Creating an inclusive and empowering digital space through crowdsourcing.
- Bridging the gap between the ISL community and broader society by raising awareness of the importance of this underserved group in the context of AI and accessibility.

#### 3.2 IMPORTANCE OF AI COMMUNITY INVOLVEMENT

The involvement of the AI community is a key goal of our project. We are confident that a rich, high-quality dataset will attract the AI community, that is thirsty for challenging data, to develop innovative solutions for the deaf community.

By creating this platform we aim to obtain video recordings of glosses, and eventually:

- Explore the possibilities of applying modern AI technology to ISL.
- Provide a benchmark for testing the capabilities of frontier multimodal models such as the Gemini models that can handle video input (Team et al., 2024).

## 4 CHALLENGES AND SOLUTIONS

**CHALLENGES:** Throughout the project, from initial planning to deployment, we faced several challenges. One of the first was selecting the right development tools. Another challenge was the language barrier, as not all developers were comfortable working in Icelandic, despite the website being designed for the Icelandic community. To address this, we ensured from the start that the site was fully internationalized, allowing for easy integration of additional languages in the future. The most significant and rewarding challenge, however, was navigating unfamiliar technologies that we needed to integrate to finish the project. This journey broadened our technical expertise and strengthened our problem-solving skills.

Some challenges have not yet been solved and we hope that future collaboration will help us finish the project. The project is open-sourced and available on Github and the readme file lists things that can be done to take the project further.

**SOLUTIONS:** To overcome the challenge we list here some of the tools we chose to use, despite having limited experience with them:

- **Docker** ensures cross-platform consistency during development and facilitated scalability. Despite a steep initial learning curve, its benefits proved invaluable to our workflow.
- **YouTube** serves as our free video hosting platform, enabling integration of media content into the website. Auto upload videos was a much harder task than expected.
- **Heroku** Chosen as our deployment platform, modifying the development code to work in a production environment, while keeping development possible, was not easy but we learned and deployed it successfully.

## 5 FUTURE WORK

### 5.1 IMPROVEMENTS FOR FUTURE DEVELOPMENT

The website is functional, but due to the short duration of the project and grand ambitions, there are features we would have liked to implement and test properly. Below are some of the improvements, prioritized from most important:

- **Smart Recording:** Signers currently receive random glosses to record, but with thousands of glosses in Icelandic Sign Language and few contributors, a smarter system is needed. It should prioritize frequently used glosses and consider the number of recorded videos per gloss, as AI models typically require multiple examples per instance.
- **Settings Page:** As with most websites, users should be able to update profile information, change login credentials, delete their account, and recover a forgotten password.
- **Gamification Elements:** To encourage users to engage with the platform by making the experience more enjoyable. The hope for future AI models isn't enough of an immediate reward for users.

- **User Feedback:** Users should be able to see anonymous ratings and feedback on their videos to help them improve, for example, comments about lighting issues in the recording.
- **Error Handling:** Currently, not all errors are captured, which may lead to unintended behavior or display unhelpful error messages that make sense to developers but not to general users.
- **Improved Video Navigation:** Rating videos should have a better user experience, which could be done through improved navigation features.
- **Mobile App:** Developing a mobile app to provide easy, on-the-go access to all current and future features would significantly enhance accessibility and engagement.

## 5.2 POTENTIAL USE CASES

This project has no significant impact by its own, it is meant to facilitate future projects. In our vision we see multiple paths of growth for this project:

- **Sign Translation:** The implementation of real-time sign language interpretation using AI models trained on the collected data. This could include both sign-to-text and text-to-sign models, which could be combined with other technologies to create solutions like sign-to-speech. Additionally, generative AI could create sign language videos featuring various characters, allowing children, for example, to watch Mickey Mouse signing for them.
- **SignWiki Integration:** Combining SignWiki with our project to create a platform for both data collection and education. This could include a competition page presenting the best AI models trained on the dataset.
- **Social:** Expanding community features to connect ISL speakers and learners.
- **Education:** Offering interactive lessons and quizzes to support language acquisition, including AI-powered feedback for learners on the correctness of their signs.
- **Fun Learning:** Integrating virtual reality or augmented reality technologies to provide immersive learning experiences.
- **Internationalization:** Collaborating with sign language communities abroad to develop a multi-language platform.

We are sure that the developing community and the deaf community won't only implement these ideas but will also come up with new and interesting ideas that we have not thought of.

## 6 RESULTS

Deployment of the website, which was the main goal of the project, is successful, but due to operational costs we do not have it running at the moment, but all code is available on Github. In this section you can see the main features of the interface.

The sign-up and log-in pages are crucial components of the platform (see Figure 6.1), as they ensure that we can monitor who contributes each video. This is essential for training AI models, as it allows us to isolate individual signers in a test set. By doing so, we can evaluate how well the model performs when tested with a completely new user, ensuring robust and accurate assessments. The private information won't be used, nor will be exported to the open source dataset. A random userID is assigned instead.

The figure displays two web interfaces side-by-side. The left interface, labeled (a), is the 'Register' page. It features a title 'Register' at the top. Below it are four input fields: 'Email Address' with an envelope icon, 'Username' with a person icon, 'Password' with a lock icon, and 'Confirm Password' with a lock icon. Each field has a placeholder text: 'Enter email', 'Choose a username', 'Enter password', and 'Confirm your password' respectively. At the bottom is a green button with a person icon and the text 'Register'. The right interface, labeled (b), is the 'Login' page. It features a title 'Login' at the top. Below it are two input fields: 'Email Address' with an envelope icon and 'Password' with a lock icon. Each field has a placeholder text: 'Enter email' and 'Enter password' respectively. At the bottom is a blue button with a right-pointing arrow icon and the text 'Login'.

(a) Sign up page

(b) Login page

Figure 6.1: Sign Up and Login Interfaces

The Home page in Figure 6.2 was created with the goal of being simple, easy to browse and that it could lead to the main features of the platform in one click. In the center of the home page, it was decided to highlight the essential features to obtain data in an informed way. It is intended that the user's attention is initially drawn to the center of the page where the following features can be found:

- Contribute Data
- Access contributed data by other users
- Learn about the mission of the website
- Sign up

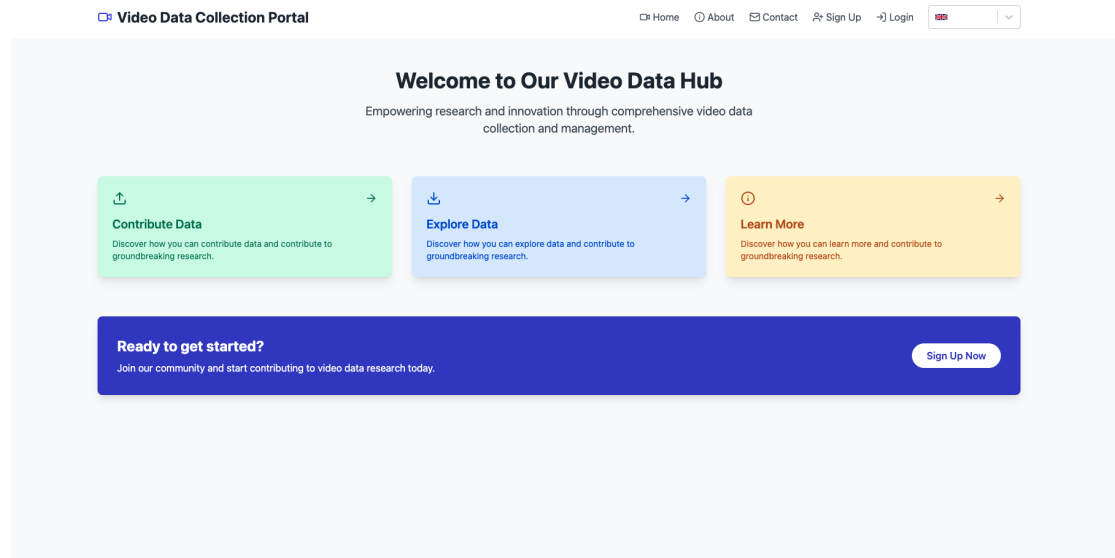


Figure 6.2: Home Page

Users who are logged in will see in the header the "Record" and "Rate Videos" page as shown in Figure 6.3.



Figure 6.3: Header interface hafter the user has logged in.

## 6.1 EXPLORE DATA INTERFACE

This feature allows the users to look at the list of all glosses availabale in the database. As shown in figure 6.4 the user can also view the number of recordings per gloss (if more than 0 it shows with the color green) and can replay the videos recorded.

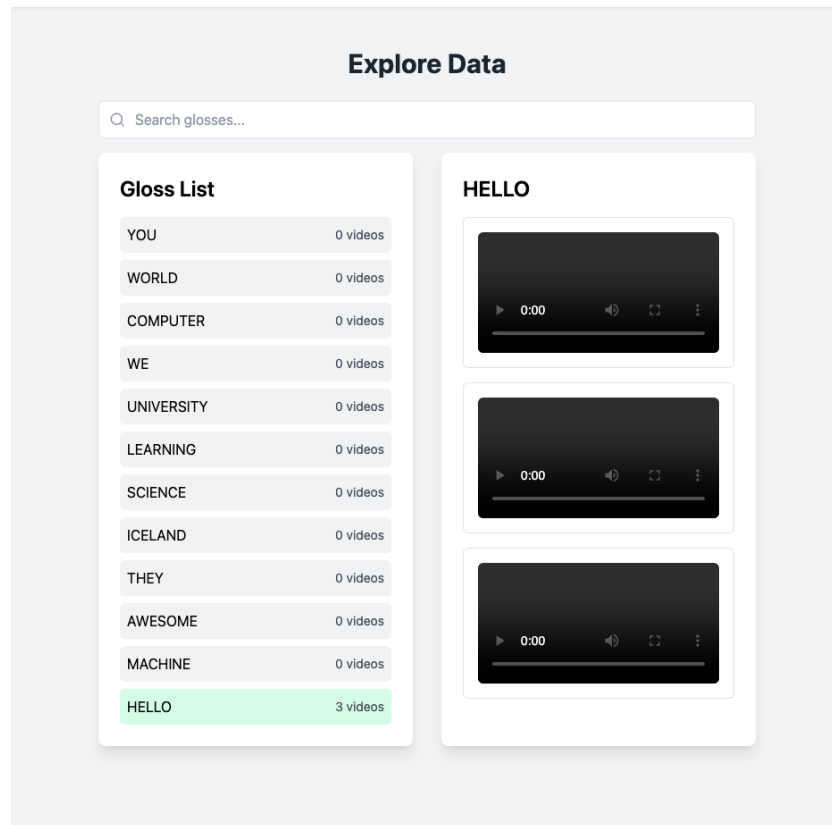


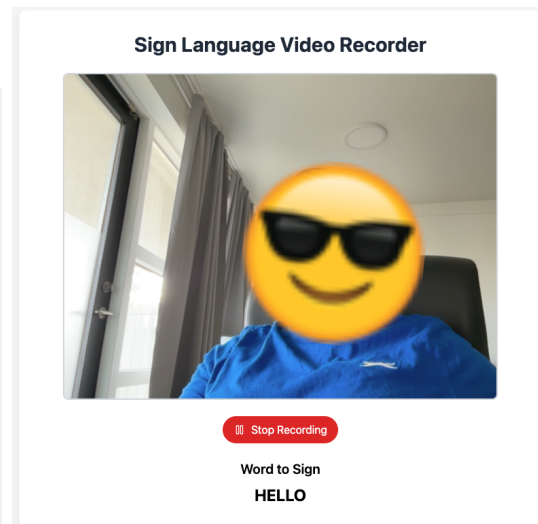
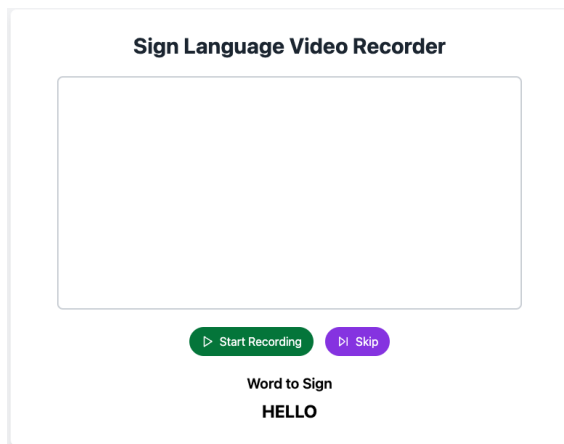
Figure 6.4: Explore Data Interface. The user can go over a comprehensive list of all the glosses in the database and view the videos recorded for each gloss. The glosses shown in the figure are glosses in English used for testing the interface.

## 6.2 RECORDING INTERFACE

The recording interface should be very straightforward for the user to interact with as well as allowing full control of the camera and video submission. The different steps of a recording can be seen in 6.5. The recording is done by the following steps:

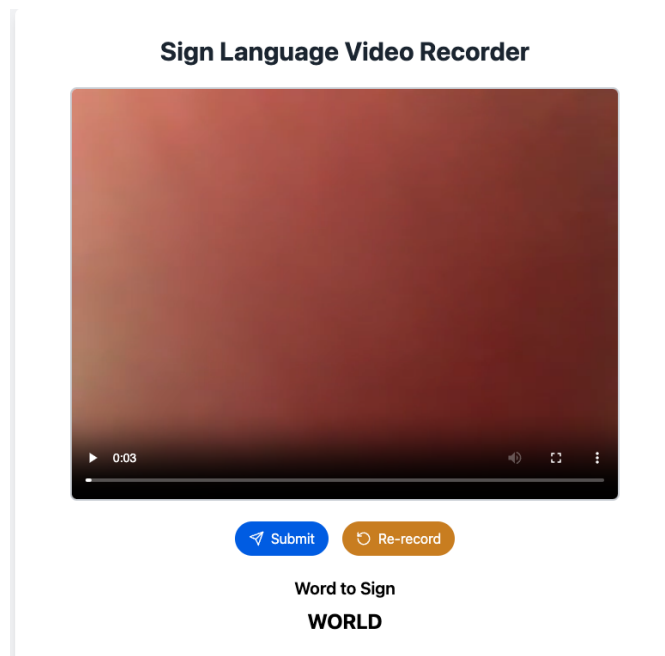
1. The user enters the recording interface. Get a gloss and can choose either to record a video or skip to the next gloss, as illustrated in 6.5a.
2. The user starts a recording (after giving the browser camera access permission) and then clicks the "Stop Recording" button. The recording interface is shown in 6.5b.
3. Once the recording is done, it is automatically replayed, the user decides whether to submit it or re-record as shown in 6.5c.
4. Start over again with a new gloss.





(a) Recording interface: User is prompted to start recording or skip to the next word.

(b) Recording in progress: User is prompted to stop when finished.

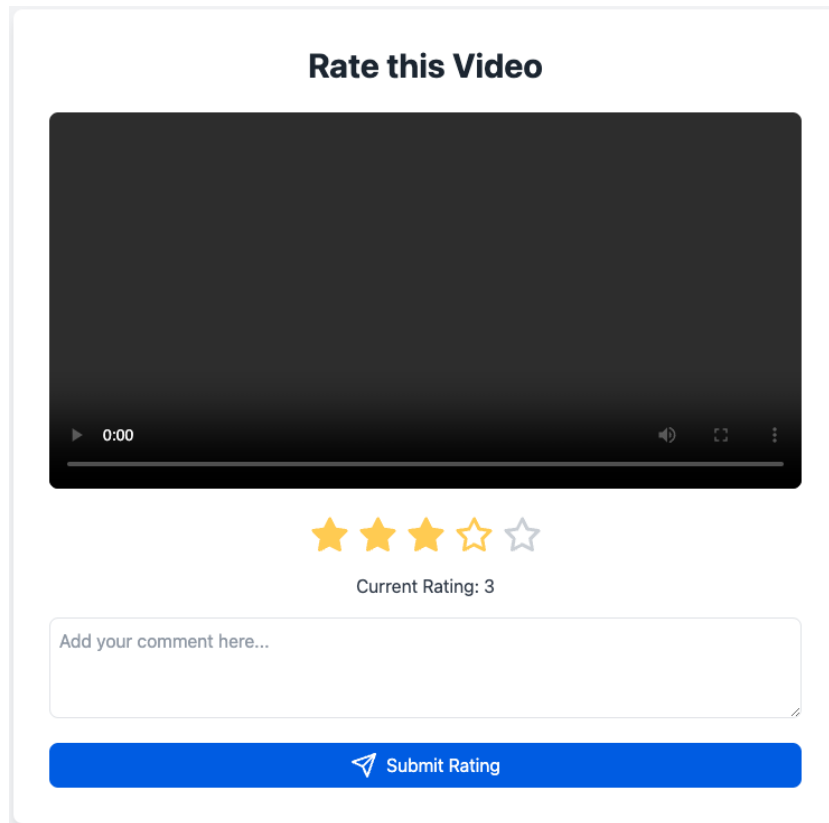


(c) Review interface: User can review the video and submit or re-record the video.

Figure 6.5: Recording steps

### 6.3 RATING INTERFACE

The rating feature seen in figure 6.6 allows the user to view with the recorded videos get it comprehensive feedback either through a comment, a star rating (from 1 to 5) or both. The retrieved feedback is then stored for future use.

The image shows a web interface for rating a video. At the top, the text "Rate this Video" is centered. Below it is a video player with a black frame and a white progress bar at the bottom showing "0:00". Under the video player are five star icons; the first three are yellow and the last two are grey. Below the stars, the text "Current Rating: 3" is displayed. Underneath is a text input field with the placeholder "Add your comment here...". At the bottom is a blue button with a white paper plane icon and the text "Submit Rating".

Rate this Video

0:00

★ ★ ★ ☆ ☆

Current Rating: 3

Add your comment here...

Submit Rating

Figure 6.6: Video Rating Interface. The user can provide feedback for the recorded videos.

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