



easier

*intelligent Automatic
Sign language tRanslation*

Automatic Sign Language Translation: EASIER project advancements

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WWW.PROJECT-EASIER.EU




A brief intro (my own path)



COST ACTION

 **LEAD-ME** **Leading Platform for European Citizens, Industries, Academia and Policymakers in Media Accessibility**

H2020-ICT19-2017

2017-2021

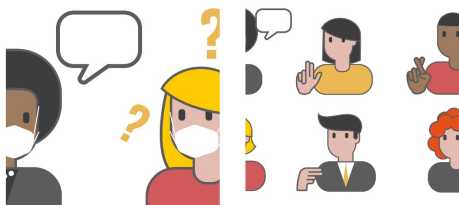
H2020-ICT57-2020



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2021-2023

#DidYouKnowThat? #DeafCommunity



End of COVID-19 Pandemic: Unmasking the Deaf Experience

May 8, 2023

On May 5, 2023, the World Health Organization declared that Covid-19 no longer represents a public health emergency of international...

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There is no Universal Sign Language

September 22, 2022

Some people mistakenly assume that there is a common worldwide sign language, but just like there is no universal spoken...

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sign language

Sign Language

sign language or Sign Language?

January 13, 2022

Those of you who have been following our #DidYouKnowThat campaign already know that we frequently stress the importance of using...

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Books and films that raise deaf awareness

November 30, 2021

RAISING DEAF AWARENESS: BEST BOOKS AND FILMS FOR THOSE WHO ARE KEEN TO LEARN MORE. Looking for a winter read...

[Read More](#)



Name signs

October 29, 2021

Name signs, also known as sign names, are an important component of Deaf culture. The research about them was pioneered...

[Read More](#)

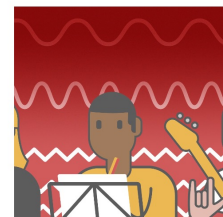


Deaf myths debunked: Part III

October 4, 2021

What are some of the most common myths about deafness that d/Deaf people encounter on a daily basis? Today, we...

[Read More](#)



Deaf myths debunked: Part II

September 13, 2021

What are some of the most common myths about deafness that d/Deaf people encounter on a daily basis? In today's...

[Read More](#)



Deaf myths debunked: Part I

September 1, 2021

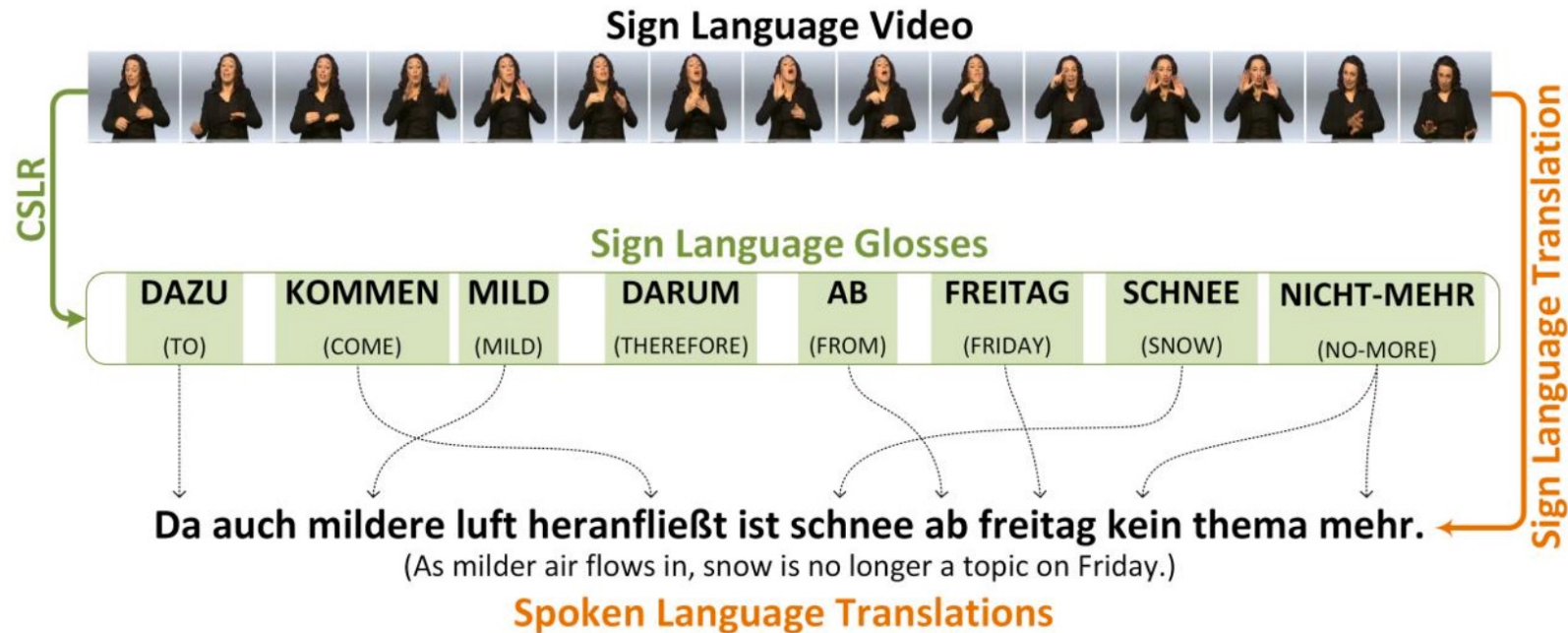
What are some of the most common myths and misconceptions about deafness that d/Deaf people encounter on a daily basis?...

[Read More](#)

A few important things to know before starting:

1. There is no universal sign language!
2. Sign languages are living languages, just like spoken languages. Each Deaf community has their own language, e.g., BSL ≠ ASL ≠ English and DGS ≠ DSGS ≠ German.
3. Sign languages are not only about gestures. They involve all body, facial expressions, and mouthing.
4. Spoken languages are foreign languages to native sign language signers.

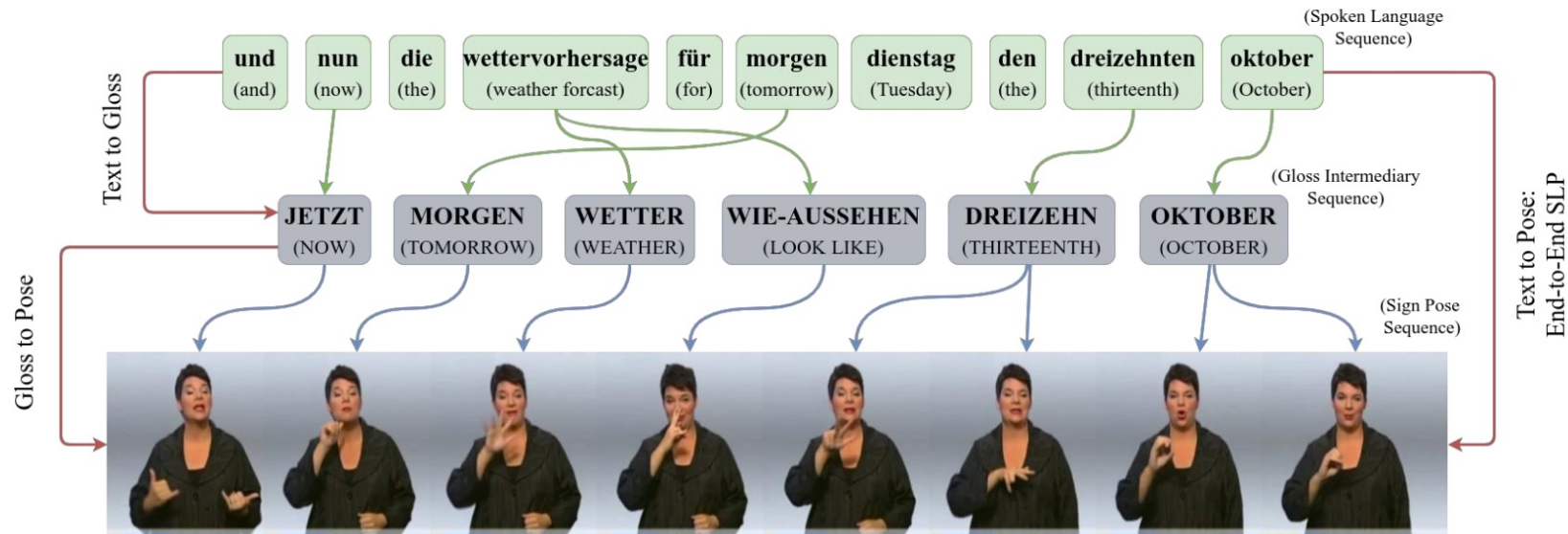
What is sign language translation 1/2



- CSLR: **C**ontinuous **S**ign **L**anguage **R**ecognition
- We use “Recognition” to refer to identifying specific signs within a continuous video sequence.

- Recognizing the sign is similar to “glossing” the data, which is what a linguist would do to annotate a sign language video.
- However, **translation means converting the underlying message into the equivalent spoken language sentence** (sign->spoken).

What is sign language translation 2/2



We can also go in the **opposite direction** (spoken -> sign).
Translation is not a simple sign to word mapping.

To **learn this relationship** we need either:

- **Rules** that allow us to convert from sign to spoken or vice versa,
- **Data** so that the machine can learn these rules itself.

However, the data normally needs **curation**.

- Careful **alignment** and expensive annotation.
- We have many orders of magnitude **less data than we need**.

Gloss or recognition is therefore important to:

- automate the annotation process,
- provide alignment and tools to curate data automatically,
- condition the translation models.

- Translation between **sign languages** and **spoken languages** (speech or writing)
- **Multiple languages** (e.g., *DGS, DSCGS, LSF, LIS, BSL, GSL, NGT*)
- **Automatic** (near realtime) and **semi-automatic** (human post-editing)
- **Mobile app** demonstrating the automated route
- Goals shared with the SignOn project (also funded within EU ICT-57)

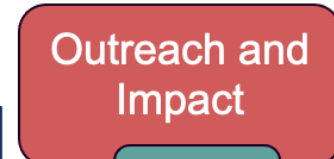
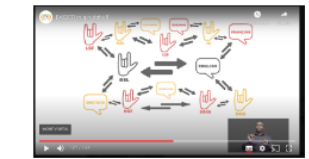
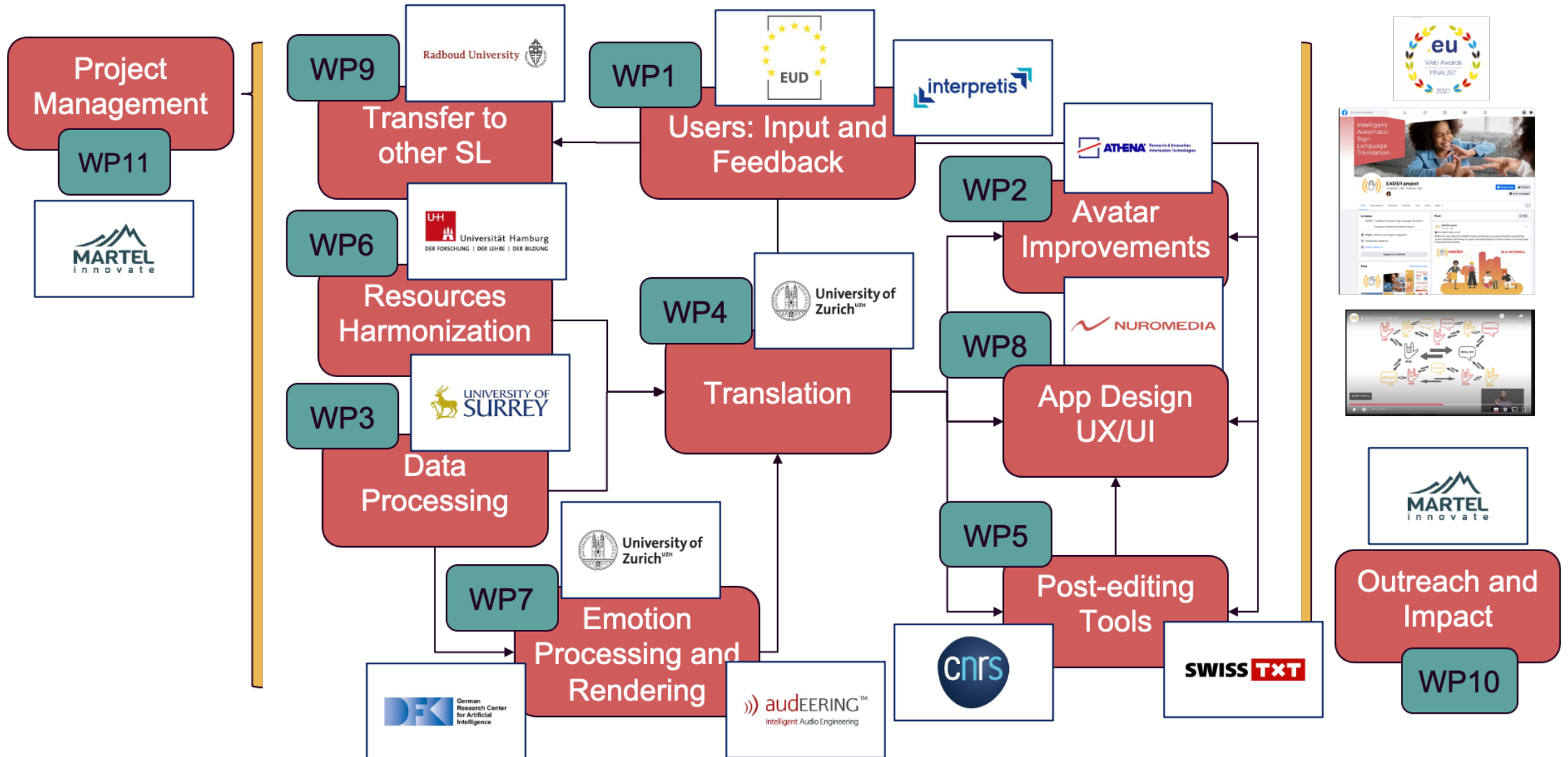
- Producing comprehensible and easy-to-read signing is a must
- Producing a signed utterance sign after sign is simply not enough.
- **Communication is more than content-passing.**
- **Co-design with the final beneficiaries** of the innovation.

The project structure reflects the main goals



WP1	Users: Input and Feedback	(EUD)
WP3	Data Processing	(UHH)
WP4	Translation	(UZH)
WP6	Resources Harmonization	(UHH)
WP8	Backend, App Design, UX/UI	(NURO)
WP2	Avatar Improvements	(ATHENA)
WP7	Emotion Processing / Rendering	(UZH)
WP5	Post-editing Tools	(CNRS)
WP9	Transfer to other SL	(RU)
WP10	Outreach and Impact	(MARTEL)
WP11	Project Management	(MARTEL)

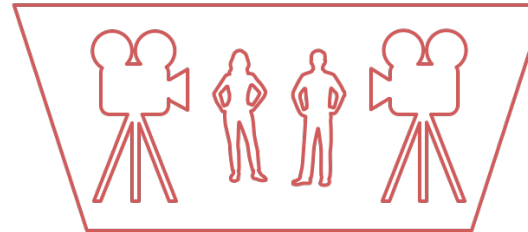
Graphical relationship among the WPs



- No direct mapping between spoken languages and sign languages e.g., grammar, syntax, sequentiality vs signing space
- Multidimensionality and multimodality of sign languages
 - Annotation
 - Data processing
- Data scarcity
 - Combination of datasets (broadcast & linguistic)
 - Combination of language pairs
 - Combination of approaches for translation (statistical vs lexical vs neural)
- Presentation of automatic translation results
 - Mobile interface
 - Avatar/virtual human
- User acceptance and quality of translation
 - Post-editing
 - End users always in the loop
 - Continuous evaluation

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Linguistic corpora



High quality

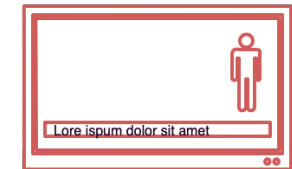
Variety of elicitation tasks

Source: Sign Language

Semi-spontaneous language production

Rich linguistic annotation + translations

Broadcasting data



Large quantity

News domain

Source: spoken language

Interpreting under time pressure

Subtitles/Captions

Challenge 1: Orders of magnitude

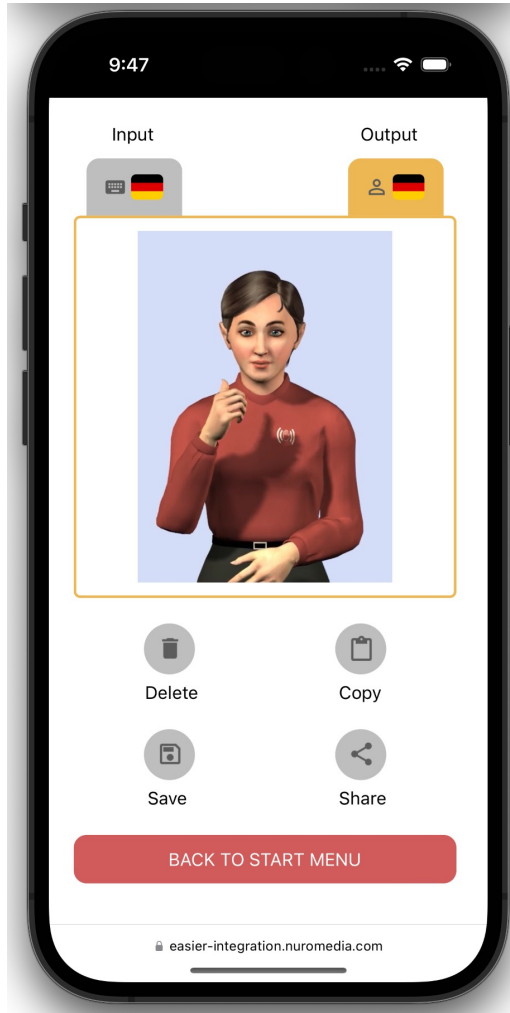


Language	Number of sentence pairs in corpus*	Number of sentence pairs in broadcast data**
DGS	64 000	1 130 000
BSL	6 000	1 150 000
Std corpus for English-German	150 000 000	150 000 000

* Public DGS Corpus, BSL Corpus

** Broadcast data prepared for processing within EASIER

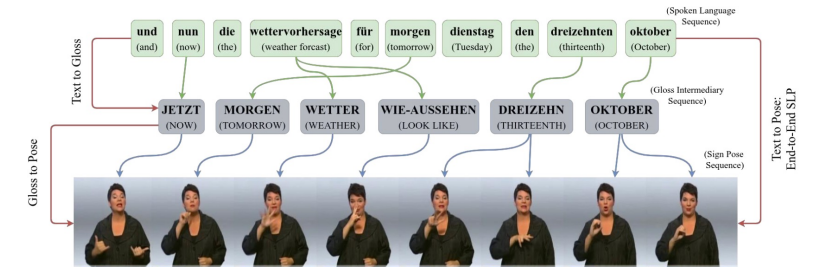
Challenge 2: Translation directions



- **Speech-to-text to sign**

 - State-of-the-art machine translation

 - Avatar presenting signed output



- **Sign to text (to speech)**

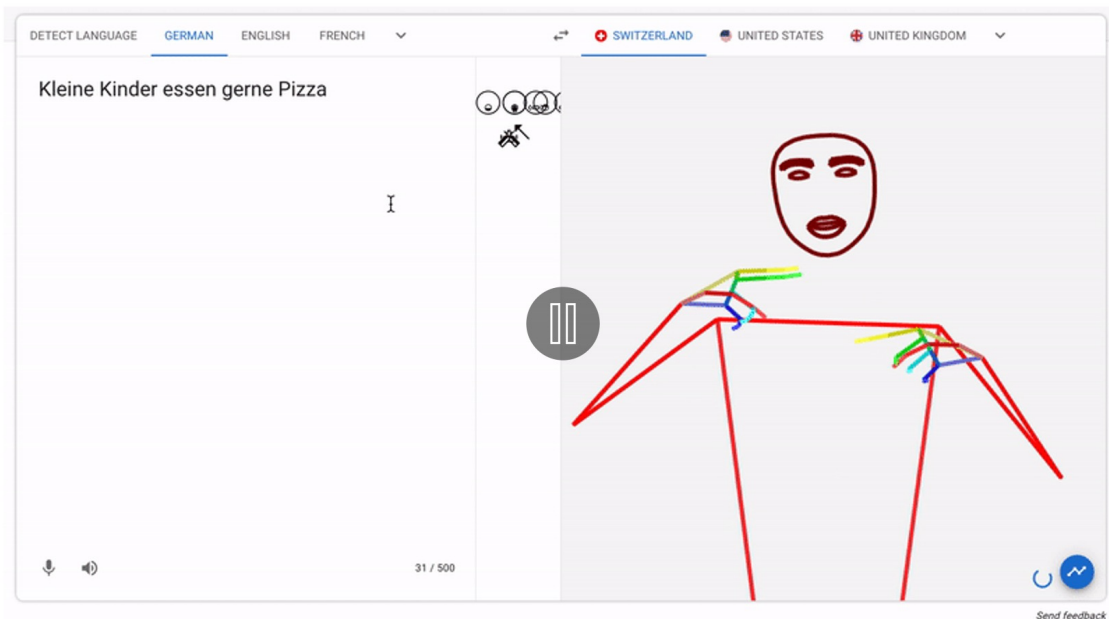
 - Robust data-driven video recognition

 - State-of-the-art machine translation

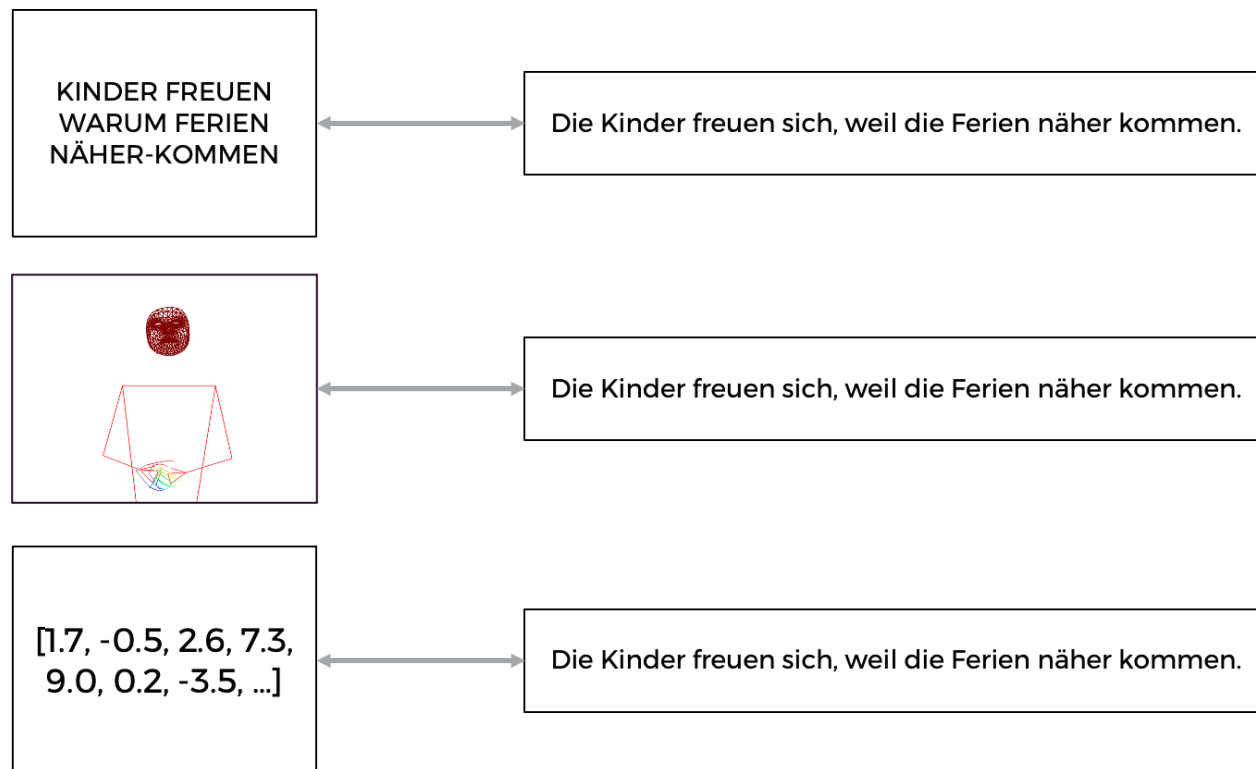
 - Output in text



Challenge 2: Translation representation



[sign.mt](https://www.sign.mt)



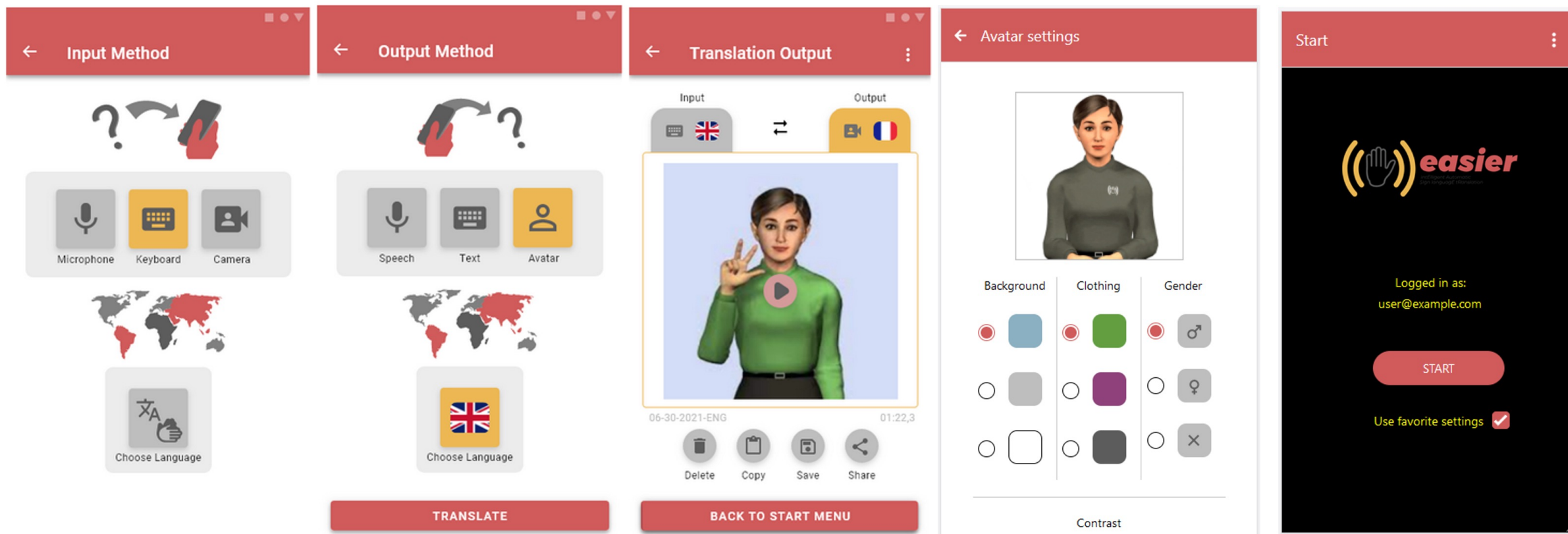
Challenge 3: Presentation (avatar)



Challenge 3: Presentation with affect



Challenge 4: Interaction



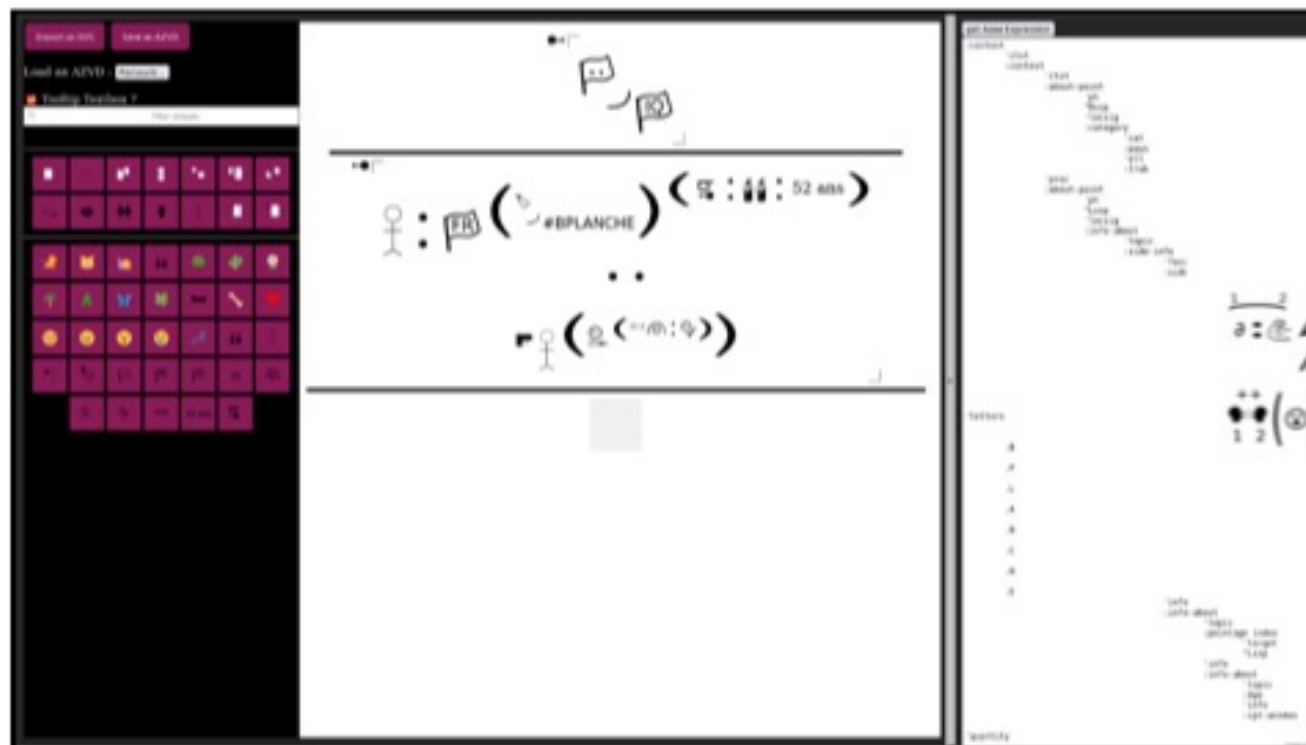
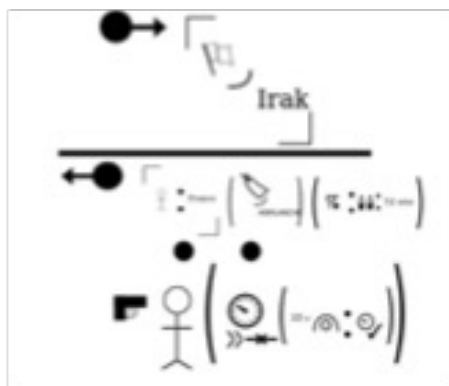
Challenge 5: Post-editing (NERstar)



The screenshot displays the NERstar application interface, which is used for post-editing transcripts and generating live subtitles. The interface is divided into several sections:

- Transcript Panel (Left):** Shows a list of transcript segments for the file "140716_srf_tagesschau_trans.srt". Each segment is a light blue box containing a line of German text. The text includes phrases like "Nein, man weiss es im Moment noch überhaupt nicht.", "Es sind schlicht noch viel zu viele Namen, die da hergereicht werden.", "Viel zu viele Regeln, die alle irgendwie befolgt werden müssen,", "Sie haben ein paar angesprochen: Mann, Frau, Nord, Süd und so weiter.", "Vielleicht erinnern Sie sich noch an dieses Spielzeug aus den 80er Jahren.", "Den Zauberwürfel oder Rubik's Cube, diesen farbigen Würfel, an dem man herumdrehen musste, in alle Richtungen, bis hoffentlich vielleicht am Schluss, jede Seite jeweils nur noch eine Farbe zeigt."
- NER Edit Panel (Center):** A control panel for the Neural Network-based Error Recognition (NER) tool. It includes:
 - Show Video:** A checked checkbox.
 - NER Edit Optimize:** A section with "Start" (12:160) and "End" (15:279) time markers, and options for "space" (selected) and "no space".
 - Error Type:** Radio buttons for "Correct" (selected), "Edition Error", and "Recognition Error".
 - Error Grade:** Radio buttons for "0.0", "1", "0.25", "0.5", "3", "1.0", and "4".
 - Error Class:** Radio buttons for "Substitution", "Deletion", and "Insertion".
 - Comment:** A text input field.
 - Color coding:** A checked checkbox.
 - Alt skin:** A checked checkbox.
- Live subtitles Panel (Right):** Shows the "Live subtitles" panel for the file "140716_srf_tagesschau_livesubs.srt". It features a video player window displaying a 3D female avatar speaking. Below the video player, there are subtitle boxes with German text, including "Vielleicht erinnern Sie sich noch an dieses Spielzeug aus den 80er Jahren.", "Geht es denn nur um Personalien heute Abend? Oder gibts noch andere Themen am Sondergipfel?", and "Es gibt andere Themen, zum Beispiel der Ukraine-Konflikt."

Challenge 5: Post-editing (Azee)



Challenge 6: Sign neologisms

A YouTube video thumbnail for a workshop. The left side of the thumbnail has a dark red background with the EASIER logo at the top, followed by the text "SIGN NEOLOGISMS" in large white letters, "A workshop organised by the EASIER Project" in smaller white letters, "Athens, Greece, 10 February 2023" in white, and the website "WWW.PROJECT-EASIER.EU" at the bottom. The right side of the thumbnail shows a woman with a large afro hairstyle, looking thoughtful with her hand to her chin. Three thought bubbles are floating around her, containing the words "Donetsk", "nitrogen deposit", and "flygskam". A red play button icon is overlaid on the woman's face. In the top right corner of the video player area, there are icons for "Watch Later" and "Share".

Sign Neologisms: a workshop organised by the EASIER Project

Watch Later Share

... Donetsk ...

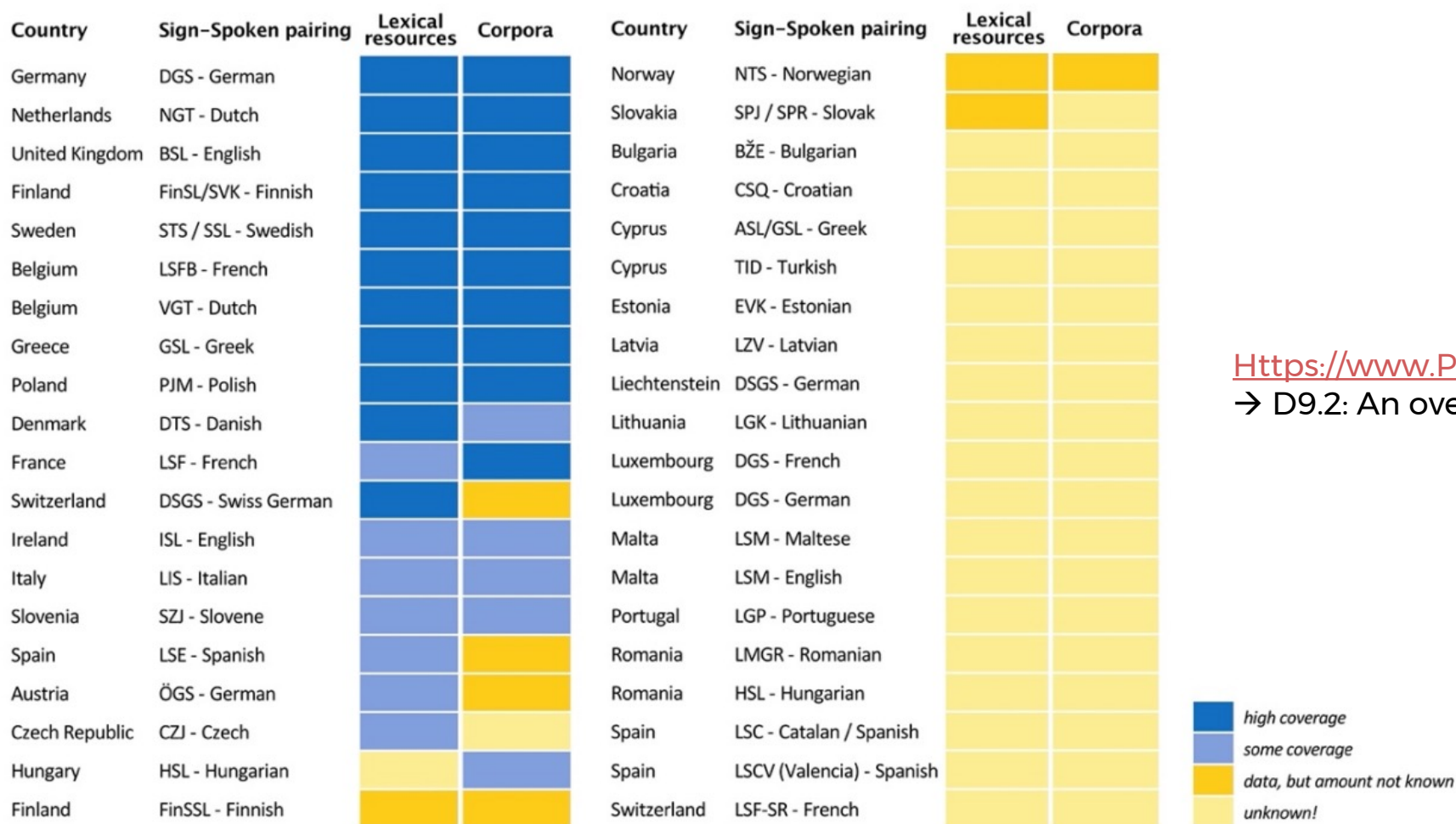
... nitrogen deposit ...

... flygskam ...

WWW.PROJECT-EASIER.EU

Watch on YouTube

Challenge 7: Under-resourced languages



<https://www.Project-easier.eu/deliverables/>
 → D9.2: An overview of resources in the making

FIGURE 1: : COVERAGE OF LANGUAGE RESOURCES (LEXICAL, CORPUS) IN LANGUAGES OF THE EUROPEAN UNION, LISTED BY LANGUAGE PAIRING (SIGN LANGUAGE - SPOKEN LANGUAGE PAIR)

Challenge 8: Raising awareness



Meet the EASIER consortium



Thanks



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THANKS



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