

D9.7 STATISTICAL DATA FROM VIDEO PROCESSING OTHER EUROPEAN SIGN LANGUAGE DATASETS

Revision: v1.0

| | |
|-----------------------------|---|
| Work Package | WP9 |
| Task | T9.4 |
| Due date | 31/12/2023 |
| Submission date | 31/01/2024 |
| Deliverable lead | Universität Hamburg (UHH) |
| Version | 1.0 |
| DOI (latest version) | 10.25592/uhhfdm.13996 |
| Authors | Thomas Hanke, Marc Schulder |
| Reviewers | Giacomo Inches (MARTEL), Sarah Ebling (UZH) |

| | |
|-----------------|---|
| Abstract | EASIER has established a pipeline for processing datasets from European sign languages beyond those covered by the consortium, with the aim of providing pose analysis as an important entry point for data science on sign language resources. While discussions with third parties on using this service took place and are still ongoing, no data processing happened before the end of the project. Accordingly, there are no statistical data to report. Instead, the report analyses why no such uses have taken place. |
| Keywords | sign language pose, high performance cluster, service |



Grant Agreement No.: 101016982
Call: H2020-ICT-2020-2
Topic: ICT-57-2020
Type of action: RIA

Document Revision History

| Version | Date | Description of change | List of contributors |
|---------|------------|---|--|
| V0.1 | 27/12/2023 | First draft | Thomas Hanke, Marc Schulder |
| V0.2 | 18/01/2024 | Internal Review | Giacomo Inches (MARTEL), Sarah Ebling (UZH) |
| V1.0 | 31/01/2024 | Camera-ready submission DOI: 10.25592/uhhfdm.13997 | Thomas Hanke, Marc Schulder |

DISCLAIMER

The information, documentation and figures available in this deliverable are written by the “Intelligent Automatic Sign Language Translation” (EASIER) project’s consortium under EC grant agreement 101016982 and do not necessarily reflect the views of the European Commission.

The European Commission is not liable for any use that may be made of the information contained herein.

COPYRIGHT NOTICE

© 2023 EASIER Consortium

| Project co-funded by the European Commission in the H2020 Programme | | |
|---|---|-----|
| Nature of the deliverable | | DEC |
| Dissemination Level | | |
| PU | Public, fully open, e. g., web | ✓ |
| CL | Classified, information as referred to in Commission Decision 2001/844/EC | |
| CO | Confidential to EASIER project and Commission Services | |

R: Document, report (excluding the periodic and final reports)

DEM: Demonstrator, pilot, prototype, plan designs

* DEC: Websites, patents filing, press & media actions, videos, etc.

OTHER: Software, technical diagram, etc

EXECUTIVE SUMMARY

Within WP9, EASIER has established a pipeline for processing datasets from European sign languages beyond those covered by the consortium, with the aim of providing pose analysis as an important entry point for data science on sign language resources.

While discussions with third parties on using this service took place and are still ongoing, no data processing happened before the end of the project. Accordingly, there are no statistical data to report. Instead, the report analyses why no such uses have taken place.

CONTENTS

| | |
|---|-----------|
| Executive Summary | 3 |
| Abbreviations | 5 |
| 1 Introduction | 6 |
| 2 Structure of the service and alternatives | 7 |
| 3 Problems in making use of the service provided | 8 |
| 4 Discussion | 9 |
| 5 Conclusion | 10 |
| References | 11 |



ABBREVIATIONS

GDPR General Data Protection Regulation
HPC high performance cluster

Sign Languages

BSL British Sign Language
DGS German Sign Language / Deutsche Gebärdensprache
DSGS Swiss German Sign Language / Deutschschweizer Gebärdensprache
GSL Greek Sign Language / Ελληνική νοηματική γλώσσα (Elleniké Noematiké Glossa)
LSF French Sign Language / Langue des Signes Française
NGT Sign Language of the Netherlands / Nederlandse Gebarentaal
PJM Polish Sign Language / Polski Język Migowy
STS Swedish Sign Language / Svenskt Teckenspråk

1 INTRODUCTION

The goal of WP9 was to pave the road for applying sign language technologies to European sign languages beyond the core sign languages of the consortium members. While D6.1 (Kopf et al., 2021) identified sign language resources already available for European sign languages, tasks T9.1 and T9.2 were meant to identify developments for such resources to become available in the future. Task T9.3 had the goal to generate expertise for European sign languages where no such developments could be identified. Task T9.4 was to complement this approach by providing processing services for resource creators to use emerging sign language technologies, at the same time supporting resource creation and giving the project early access to statistics on the sign language resources in the making.

While the tasks T9.1 to T9.3 had been massively impacted by the Covid-19 pandemic, requiring adjustments in the methodology and causing delays with respect to the original timeframe of WP9, the Neologisms Workshop in Athens in February 2023 (D9.4: Morgan and Crasborn, 2023) and the Autumn School in Hamburg in September 2023 (D9.5: Kopf et al., 2023) were very successful in bringing stakeholders from both academia and deaf organisations together and promoting the goals of EASIER, allowing the project to reach all the objectives originally set up for T9.1 and T9.3.

In fact, the discussions initiated at these events led to the inclusion of two more sign languages in the multi-sign language wordnet (D6.5: Bigeard et al., 2024), i.e. Swedish Sign Language (STS) and Polish Sign Language (PJM), in addition to those sign languages already addressed in the project: German Sign Language (DGS), Greek Sign Language (GSL), British Sign Language (BSL), Sign Language of the Netherlands (NGT), French Sign Language (LSF), and Swiss German Sign Language (DSGS).

While the events also raised some interest in having data processed with the infrastructure set up as D9.6 (Hanke, 2022), no case resulted in actual data processing initiated by the data holders, so there are no statistical data to report. While, as outlined above, this did not impact the success of WP9 as a whole, potential reasons for this not happening are worth being investigated, cf. Chapter 3.

As one of the potential reasons identified for the service not being used so far is the time it takes to prepare the use of such a service legally and technically, UHH is happy to maintain the offer to process data beyond the end of the EASIER project.¹ As the core of the data pipeline will continue to be used for data created at or accessible to UHH, this commitment does not involve major resources in maintenance, but might also turn out helpful for those projects on European sign languages that were delayed due to the Covid-19 pandemic.

¹Cf. <https://www.sign-lang.uni-hamburg.de/easier>.

2 STRUCTURE OF THE SERVICE AND ALTERNATIVES

At the time of writing the proposal, OpenPose (Cao et al., 2019; Simon et al., 2017) was the only pose analysis approach applicable to sign language data. As it required massive computing resources to be run on a larger set of sign language video data, T9.4 was designed around the idea of using a high performance cluster (HPC) for this purpose. This meant that the video data needed to be transferred to the processing unit, processed on the HPC, and the results—still large amounts of data in the case of bigger corpora, despite being a magnitude smaller than the original video data—needed to be transferred back to the data holder and stored there.

Over time, alternative approaches, especially MediaPipe (Lugaresi et al., 2019), improved substantially without requiring such a massive computational effort. A strong evidence how far this has gone is the fact that many of the tools developed in EASIER now use MediaPipe instead of OpenPose. For data holders this means they can process their data on-site without major quality implications instead of sending them to the processing service which would involve data transfer overhead as well as the storage of results.

3 PROBLEMS IN MAKING USE OF THE SERVICE PROVIDED

With two of the parties having expressed their interest in using the service at the Autumn School (cf. Section 1), discussion continued afterwards (and still continues), but did not lead to actual data processing within the time frame of the project. Without identifying the parties in this public report, we can sketch the situations as follows:

- **Legal issues**

Party A, an academic institution, was interested in all their corpus data being processed. Having read D9.6, including information on General Data Protection Regulation (GDPR) issues that have to be addressed when making sign language video data available to third parties, they correctly saw the need to consult with their legal department. Unfortunately, the lawyers contacted did not feel competent to give an OK or design a contract right away, but wanted to consult with others. Checking with them regularly during the past three months did not reveal any progress. This experience is in line with discussions that all EASIER consortium members have been involved in: GDPR issues for sign language video data are new territory for many legal departments involved and it takes substantial time to reach the state of formal agreements.

- **Data logistics**

After an initial test case was transferred, processed, and sent back, party B saw no roadblocks in the data processing itself. They have applied for resources to store the results of the data analysis on their site and expect storage space to become available in early 2024.

4 DISCUSSION

From the discussions held at the Autumn School, it seems useful to group potential users as follows:

- **Academic research groups with language technology staff or cooperating with data scientists, with access to HPC resources**

These parties are more interested in EASIER's achievements from the data processing viewpoint and can easily run corresponding services at their own sites, avoiding the overheads involved in having it processed elsewhere.

- **Academic research groups with language technology staff or cooperating with data scientists, without access to HPC resources**

These parties have arranged with the resources available locally, i.e. they mostly work with MediaPipe (cf. Section 2).

- **Academic research groups without language technology staff nor cooperations with data scientists**

These parties are those who might profit most from support through the EASIER services, although we have learned that even for them getting ready to actually provide the data to be processed takes several months at minimum. The Autumn School also was an opportunity to meet data scientists outside of EASIER to form collaborations with, turning these parties into one of the other group types listed above.

- **Non-academic data holders, esp. deaf organisations**

Obviously, non-academic institutions are rather heterogeneous. While some have well-defined projects comparable to academic projects (with the same challenges of finding funding at the right times to retain personnel), others work mostly with volunteers, making an aggregation of knowledge about language technology very challenging. Some participants reported that funding opportunities on language projects in their countries that are open to them come with such irregularity that it does not even make sense for them to develop strategies.

This also highlights the ethical responsibilities of any EU project as well as any academic institution when offering such a processing service to data holders from other EU member states. Collecting data in exchange for short-term technical support when the other party has no other options and no perspective for long-term expertise bears the risk of culturally appropriating that data. Instead, projects and institutions would have to develop long-term strategies for how to support such start-up research.

5 CONCLUSION

The service provided is only of interest to one of the four groups of potential users identified, research groups without language technology staff or partners, and even there setting the service up (in a non-technical sense) takes much longer than expected, for various reasons. While two of the other groups can help themselves, thanks to the technological progress within the last three years, support for organisations only starting their interest in sign language technology needs to be defined in a much broader and long-term fashion than was possible within EASIER during and right after the pandemic.

As was pointed out, the intended effect of the support in video processing, getting researchers outside the consortium interested in EASIER technologies, was instead achieved through the workshops within WP9.

REFERENCES

- Bigeard, Sam, Marc Schulder, Maria Kopf, Thomas Hanke, Kiriaki Vasilaki, Anna Vacalopoulou, Theodor Goulas, Athanasia-Lida Dimou, Stavroula-Evita Fotinea, Eleni Efthimiou, Neil Fox, Onno Crasborn, Lianne Westenberg, Sarah Ebling, Laure Wawrinka, Johanna Mesch, Thomas Björkstrand, Anna Kuder, and Joanna Wójcicka (2024). *Extended interlingual index for the project's core sign languages and languages covered in WP9*. Project Note D6.5. Version 1.1. Hamburg, Germany: EASIER Consortium. DOI: [10.25592/uhhfdm.13847](https://doi.org/10.25592/uhhfdm.13847).
- Cao, Zhe, Ginés Hidalgo Martinez, Tomas Simon, Shih-En Wei, and Yaser A. Sheikh (2019). "OpenPose: Realtime Multi-Person 2D Pose Estimation using Part Affinity Fields". In: *IEEE Transactions on Pattern Analysis and Machine Intelligence* 43.1, pp. 172–186. ISSN: 1939-3539. DOI: [10.1109/TPAMI.2019.2929257](https://doi.org/10.1109/TPAMI.2019.2929257).
- Hanke, Thomas (2022). *Establishment of the infrastructure to automatically analyse other datasets*. Project Note D9.6. Hamburg, Germany: EASIER Consortium. DOI: [10.25592/uhhfdm.10264](https://doi.org/10.25592/uhhfdm.10264).
- Kopf, Maria, Thomas Hanke, Marc Schulder, Sam Bigeard, Giacomo Inches, and Eleni Pechlivanidou (2023). *Workshop and training for experts in under-resourced languages – Session 2*. Project Note D9.5. Hamburg, Germany: EASIER Consortium. DOI: [10.25592/uhhfdm.13867](https://doi.org/10.25592/uhhfdm.13867).
- Kopf, Maria, Marc Schulder, and Thomas Hanke (2021). *Overview of Datasets for the Sign Languages of Europe*. Project Note D6.1. Hamburg, Germany: EASIER Consortium. DOI: [10.25592/uhhfdm.9561](https://doi.org/10.25592/uhhfdm.9561).
- Lugaresi, Camillo, Jiuqiang Tang, Hadon Nash, Chris McClanahan, Esha Uboweja, Michael Hays, Fan Zhang, Chuo-Ling Chang, Ming Yong, Juhyun Lee, Wan-Teh Chang, Wei Hua, Manfred Georg, and Matthias Grundmann (2019). "MediaPipe: A Framework for Perceiving and Processing Reality". In: *Third Workshop on Computer Vision for AR/VR at IEEE Computer Vision and Pattern Recognition (CVPR) 2019*. URL: https://mixedreality.cs.cornell.edu/s/NewTitle_May1_MediaPipe_CVPR_CV4ARVR_Workshop_2019.pdf.
- Morgan, Hope E. and Onno Crasborn (2023). *Workshop and training for experts in under-resourced languages – Session 1: Sign Neologisms workshop*. Project Note D9.4. Hamburg, Germany: EASIER Consortium. URL: https://www.project-easier.eu/wp-content/uploads/sites/67/2023/03/EASIER_deliverable-D9.4_v.1.0.pdf.
- Simon, Tomas, Hanbyul Joo, Iain Matthews, and Yaser Sheikh (2017). "Hand Keypoint Detection in Single Images Using Multiview Bootstrapping". In: *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*. Honolulu, Hawaii, USA, pp. 4645–4653. DOI: [10/ggd43g](https://doi.org/10/ggd43g).