Proceedings of Machine Translation Summit XVIII

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1st International Workshop on Automatic Translation for Signed and Spoken Languages

Organizer: Dimitar Shterionov

Proceedings of the 1^{st} International Workshop on Automatic Translation for Sign and Spoken Languages

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1 Aim of the Workshop

According to the World Federation of the Deaf (WFD) over 70 million people are deaf and communicate primarily via a sign language (SL). Contrary to popular belief, SLs differ from spoken languages; they are not merely mappings of words in a spoken language into hand gestures. SLs are independent natural languages expressed in the visual-gestural modality with their own words and grammar that are separate from their regional spoken counterpart (Camgoz et al., 2018; Stokoe Jr, 2005). With more than 150 different sign languages[1] and more than 7000 spoken languages[2] crossing the signed-spoken language barrier in current times of increased globalisation and information flow is a challenging task, but one that is crucial for fair access of information.

Currently, human interpreters are the main medium for signed-to-spoken, spoken-to-signed and signed-to-signed language translation. The availability and cost of these professionals is often a limiting factor in communication between signers and non-signers. Machine translation (MT) is a core technique for reducing language barriers [for spoken languages]. Although MT has come a long way since its inception in the 1950s, it still has a long way to go to successfully cater to all communication needs and users. When it comes to the deaf community, MT is in its infancy.

The rapid technological and methodological advances in deep learning (DL), and in AI in general, that we have seen in the last decade, have not only improved MT, the recognition of image, video and audio signals, as well as the understanding of language, and the synthesis of life-like 3D avatars, etc., but have also led to the fusion of interdisciplinary research innovations that lays the foundation of automated translation services between signed and spoken languages. However, these recent advances have not yet improved the translation between signed and spoken, and between signed and signed languages to the extent of spoken-to-spoken MT where reaching human-level translation quality has been claimed more than once in the last 5 years (Junczys-Dowmunt et al., 2016; Wu et al., 2016; Hassan et al., 2018). Furthermore, lessons learned from research and development in the field of Natural Language Processing (NLP) (related to spoken language) have not yet been taken into account in the work of signed language researchers (Yin et al., 2021).

[1] The Ethnologue website (`https://www.ethnologue.com/subgroups/sign-language`) lists 150 sign languages; WFD reports more than 200 sign languages; other sources report up to 300 sign languages (e.g. `https://www.k-international.com/blog/different-types-of-sign-language-around-the-world/`).

[2] See `https://www.ethnologue.com/guides/how-many-languages` for an overview.

The goal of the first edition of the workshop on Automatic Translation for Signed and Spoken Languages (AT4SSL) is to reduce the aforementioned gaps in research and development of tool, techniques and methodologies for the automatic translation between signed and spoken languages. It provides a venue where researchers, practitioners, interpreters and innovators who focus on sign language linguistics, MT, NLP, interpreting of signed and spoken languages, image and video recognition (for the purpose of sign language recognition), 3D avatar and virtual signers synthesis, and other related fields can present complete or ongoing research and discuss problems, challenges and opportunities for the automated translation of signed-to-spoken, spoken-to-signed and signed-to-signed communication. The AT4SSL workshop encapsulates: (i) 8 long papers, presenting complete work; (ii) 3 short papers, presenting ongoing research; (iii) a key-note presentation and (iv) a panel discussion.

The work presented in this and other workshops[3] along with the increased financial support for large-scale projects working on signed and spoken language translation such as SignON (`https://signon-project.eu/`) and EASIER (`https://www.project-easier.eu/`) are indicative for the realisation that such a complex task needs to be addressed from different sides and through a multidisciplinary collaboration. As a workshop within the Machine Translation Summit 2021 (MTSummit 2021), the AT4SSL workshop also aims to bring closer the wider MT and the signed language research and development communities.

2 Paper Overview

The first edition of the AT4SSL workshop received 15 submissions (including long and short papers). Eight long papers, presenting completed work, and three short papers, presenting ongoing work were accepted to be presented at the workshop.

Three long papers present work on translation of sign language (gloss or video) into text, exploiting existing and proposing new techniques based on low-resource MT approaches. These papers are:[4]

- "Frozen Pretrained Transformers for Neural Sign Language Translation" (long paper) by Mathieu De Coster, Karel D'Oosterlinck, Marija Pizurica, Paloma Rabaey, Severine Verlinden, Mieke Van Herreweghe and Joni Dambre
- "Data Augmentation for Sign Language Gloss Translation" (long paper) by Amit Moryossef, Kayo Yin, Graham Neubig and Yoav Goldberg
- "Approaching Sign Language Gloss Translation as a Low-Resource Machine Translation Task" (long paper) by Xuan Zhang and Kevin Duh.

Two position papers discuss specific pitfalls, challenges and ethical considerations in the development of sign language technologies with a more in-depth focus on 3D avatars. These are:

- "The Myth of Signing Avatars" (long paper) by Rosalee Wolfe, John C. McDonald, Eleni Efthimiou, Evita Fontinea, Frankie Picron, Davy Van Landuyt, Tina Sioen, Annelies Braffort, Michael Filhol, Sarah Ebling, Thomas Hanke and Verena Krausneker
- "Is "good enough" good enough? Ethical and responsible development of sign language technologies" (long paper) by Maartje De Meulder

[3]For example, the workshop on Sign Language Translation and Avatar Technologies (SLTAT) `http://sltat.cs.depaul.edu/` and the workshop on Sign Language Recognition, Translation and Production (SLRTP) `https://slrtp.com/`.

[4]Following alphabetic order based on the author's surname.

One long paper and one short paper present work on synthesis of sign language, i.e. text-to-sign and 3D avatar synthesis on AR glasses:

- "AVASAG: A German Sign Language Translation System for Public Services" (short paper) by Fabrizio Nunnari, Judith Bauerdiek, Lucas Bernhard, Cristina España-Bonet, Corinna Jäger, Amelie Unger, Kristoffer Waldow, Sonja Wecker, Elisabeth André, Stephan Busemann, Christian Dold, Arnulph Fuhrmann, Patrick Gebhard, Yasser Hamidullah, Marcel Hauck, Yvonne Kossel, Martin Misiak, Dieter Wallach and Alexander Stricker

- "Automatic generation of a 3D sign language avatar on AR glasses given 2D videos of human signers" (long paper) by Lan Thao Nguyen, Florian Schicktanz, Aeneas Stankowski and Eleftherios Avramidis

Two long and two short papers address other miscellaneous topics:

- "Sign and Search: Sign Search Functionality for Sign Language Lexica" (long paper) by Manolis Fragkiadakis and Peter van der Putten – which presents different methods for search and retrieval of signs from sign language lexica using OpenPose keypoints.

- "Using Computer Vision to Analyze Non-manual Marking of Questions in KRSL" (long paper) by Anna Kuznetsova, Alfarabi Imashev, Medet Mukushev, Anara Sandygulova and Vadim Kimmelman – which a manual and an automatic analysis of non-manual markings in Kazakh-Russian Sign Language (KRSL) as presented in yes/no and wh- questions. The automated analysis uses an approach based on OpenPose.

- "Online Evaluation of Text-to-sign Translation by Deaf End Users: Some Methodological Recommendations" (short paper) by Floris Roelofsen, Lyke Esselink, Shani Mende-Gillings, Maartje de Meulder, Nienke Sijm and Anika Smeijers

- "Defining meaningful units. Challenges in sign segmentation and segment-meaning mapping" (short paper) by Mirella De Sisto, Dimitar Shterionov, Irene Murtagh, Myriam Vermeerbergen and Lorraine Leeson – the only linguistically oriented paper which discusses challenges related to mapping signs into meaning units that can allow the processing of sign language with established NLP and MT tools and techniques.

3 Invited Speakers

This first edition of the AT4SSL hosts one invited talk and a panel discussion. The key-note speaker is:

Prof Lorraine Leeson (key-note) (female) holds a Dip. Deaf Studies (interpreting), M.Phil Linguistics, PhD. Linguistics. Cert. Gender Studies. She is Professor in Deaf Studies at the Centre for Deaf Studies, School of Linguistics, Speech and Communication Sciences and Associate Dean of Research (Research Integrity) for Trinity College Dublin (2018-present). Prof Leeson has worked with Deaf communities in a range of capacities since 1990. She served as inaugural Director of the Centre for Deaf Studies at Trinity College Dublin from 2001-17. Her research work is multidisciplinary in nature. Her doctoral work was the first to examine aspects of the morphosyntax of Irish Sign Language, and subsequent to this, she has published widely on aspects of the grammar of Irish Sign Language, as well as on applied linguistics topics, including a significant body of work on sign language interpreting (16 books, 58 papers, 13 edited volumes (journals/monographs) and 100+ peer-reviewed conference papers). She was named a European Commission European Language Ambassador for her work on sign languages in 2008. Lorraine was a member of the first cohort of professionally trained Irish Sign Language/English interpreters in Ireland, and she continues to interpret. She has engaged in

pan-European research work with academic institutions, Deaf communities and interpreting organisations since 1990, serving as Chair of the European Forum of Sign Language Interpreters Committee of Experts (2013-2019). She is a member of the Royal Irish Academy's Committee on Languages, Literatures and Cultures (LLC) (2018-present).

The panel will feature seven prominent experts in the fields of machine translation, machine learning, engineering, sign language linguistics and computational linguistics, data collection and processing (for the purposes of sign language research) and avatar and 3D technologies. The panel members are:

- **Mr Mark Wheatley**, Executive Director of the European Union of the Deaf (EUD), Belgium
- **Prof Gorka Labaka**, Assistant professor at the Engineering School of the University of the Basque Country (UPV/EHU), Spain
- **Prof Christian Rathmann**, Professor in Deaf Studies Interpreting at Humboldt University, Germany.
- **Dr Sarah Ebling**, Lecturer and research associate at the University of Zurich and the University of Applied Sciences of Special Needs Education Zurich (HfH), Switzerland.
- **Prof Myriam Vermeerbergen**, Associate Professor at KU Leuven, Belgium
- **Mr Thomas Hanke**, Research Associate at the University of Hamburg, Germany.
- **Prof Richard Bowden**, Professor of Computer Vision and Machine Learning at the University of Surrey, the UK.

4 Committees

4.1 Organisation committee

- Dimitar Shterionov (workshop chair), Tilburg University
- Carmel Grehan, Trinity College Dublin
- Mathieu De Coster, Ghent University
- Aoife Brady, The ADAPT Centre, Dublin City University
- Davy Van Landuyt, European Union of the Deaf
- Jorn Rijckaert, Vlaams GebarentaalCentrum,
- Catia Cucchiarini, Dutch Language Union (Nederlandse Taalunie)
- Mirella De Sisto, Tilburg University
- Vincent Vandeghinste, KULeuven / Instituut voor de Nederlandse Taal

4.2 Program committee

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- Iacer Calixto, University of Amsterdam
- Ineke Schuurman, KU Leuven
- Ioannis Tsochantaridis, Google
- Kayo Yin, Carnegie Mellon University
- Maartje De Meulder, University of Applied Sciences Utrecht
- Rosalee J. Wolfe, ILSP / Athena RC
- Tsourakis Nikos, University of Geneva

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