Digital tools for sign language research: towards recognition and comparison of lexical signs
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English summary

The focus of this dissertation lies in the comprehensive exploration of sign languages, highlighting their unique linguistic and cultural attributes. Contrary to the common misconception that sign language is universal, this research affirms the individuality and diversity of sign languages, illuminating their separate origins from spoken languages and even amongst themselves.

Historically, sign languages have often been sidelined by spoken languages and inadequately served by existing linguistic technologies and tools. This has resulted in a significant gap and an unfortunate marginalization within the field of language technology. The research in this dissertation addresses this void by employing cutting-edge methodologies drawn from machine and deep learning. It develops digital strategies to improve sign language processing and recognition, effectively bridging this technological gap.

The major contributions of this dissertation revolve around the development and deployment of various technological methodologies aimed at enhancing the understanding and utilization of sign languages. Grounded in datacentric approaches and digital humanities, the research has led to several innovative solutions for sign language recognition and comparison.

Firstly, the research contributes to the automatic prediction and annotation of sign and gestural sequences from video material. This process allows researchers to retrain models for specific video and sign language material and helps to determine crucial sign language features like one-handed or two-handed signs. The detection of various handshapes in a video, however, is not fully automated but serves as a

semi-automated step towards comprehensive handshape recognition.

Secondly, this work has introduced an innovative approach to search sign language dictionaries. Users can now sign a query in front of a webcam and receive a list of matching signs. This system also investigates how varying degrees of sign language proficiency may affect the recognition process.

Thirdly, the dissertation has extended the dictionary search method by experimenting with different joint configurations detected by an advanced pose estimation framework and multiple machine and deep learning techniques. This development aims to establish an effective sign suggestion ranking system.

Lastly, a novel tool has been presented to measure and visualize the variation in the dominant hand's wrist trajectories between two sign languages. This advancement is particularly useful for comparative studies between sign languages and has the potential to help identify true-friends (i.e. mutually understood signs) across languages.

In conclusion, this dissertation offers considerable contributions towards advancing sign language recognition and processing technology. Through the development of a suite of innovative methodologies, it seeks to create a more inclusive landscape for communication, fostering a stronger connection between technology and the deaf community.