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A Dataset for recognition of Norwegian Sign Language

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ABSTRACT: Machine learning is a powerful tool in developing sign language recognition models, significantly enhancing communication accessibility for the deaf and hard-of-hearing community. However, such models' creation relies on the availability of comprehensive datasets, which are currently scarce for specific sign languages, particularly for Norwegian Sign Language (NSL). This paper introduces a unique dataset created to address this gap. The dataset, comprising 24,300 images of 27 NSL letters, was captured under varying conditions to represent each sign comprehensively. A man and a woman performed the signs. The goal of creating this dataset was to provide a robust foundation for further research in NSL recognition.

The dataset is hosted by the Department of Applied Data Science at Noroff University College, Norway, and is freely accessible [1] at https://data.mendeley.com/datasets/3cfrj4vd4m/1.

Keywords: Dataset; Sign Language; Norwegian Sign Language.

1. Value of the data

The dataset represents a significant contribution to the field of Norwegian Sign Language (NSL) recognition. As the first collection of its kind, it serves as a valuable resource for researchers and developers working on assistive technologies for the hearing-impaired community in Norway. The dataset includes images of the NSL letters performed by two individuals, a man, and a woman, under varying conditions of lighting, backgrounds, angles, and rotations. This diversity not only accounts for potential variations in sign performance between different individuals but also enhances the dataset's generalizability. As such, it provides a robust tool for training and testing various machine learning models, paving the way for advancements in NSL recognition.

The focus of the dataset on static fingerspelling signs, which form the building blocks of sign language, ensures that it can serve as a baseline for more complex NSL recognition tasks in the future. This focus on the fundamentals of NSL not only encourages the development of basic NSL recognition models but also lays the groundwork for future research into more complex aspects of NSL.

The traditional method of sign language recognition relies heavily on human interpreters, which can be time-consuming and ineffective, especially in real-time communication scenarios. This dataset aims to serve as a foundation for the development of automated NSL recognition systems. These systems have the potential to minimize human effort, enhance communication efficiency, and significantly improve the quality of life for the deaf and hard-of-hearing community in Norway.

2. Objective

the objective of this study was to develop a comprehensive and diverse dataset for Norwegian Sign Language (NSL) recognition. Given the lack of publicly available NSL datasets, our aim was to create a resource that could not only serve as the basis for our own model development but also act as a valuable tool for other researchers in this field.

3. Dataset Description

Our dataset consists of 24,300 images of 27 NSL letters, excluding the letters Å and H which cannot be statically displayed. The signs are mostly presented one-handed but J, P, Q, U, X, Z, and Ø are represented as two-handed as these signs cannot be performed statically one-handed. The information about the NSL alphabet and the drawn images in figure 1 was gathered from the Norwegian Sign Language Dictionary, developed by Statped on behalf of the Norwegian Directorate for Education and Training [2].

Images in the dataset were captured using a Lenovo Performance FHD Webcam with a resolution of 1920 x 1080. To focus on the hand signs, a technique called Range of Interest (ROI) was implemented to restrict the area of interest to 256x256 pixels. This approach ensured the high-definition quality of the images while minimizing the noise and background, optimizing the dataset for accuracy and efficiency in machine learning model training.

The dataset includes 600 images captured indoors with natural and artificial lighting on a white background, evenly split between the male and female performers. An additional 300 images were captured with a complex background to help the model better handle real-world scenarios. The distribution of the dataset is shown in table 1. These images were taken by the male participant indoors with various objects in the background shown in figure 2.

In addition to the diversity of lighting conditions and backgrounds, the dataset also includes images of signs performed at different angles and rotations shown in figure 3 and 4. This was done to account for the variations in hand orientations when sign language gestures are performed, like how people pronounce words differently with their voice.

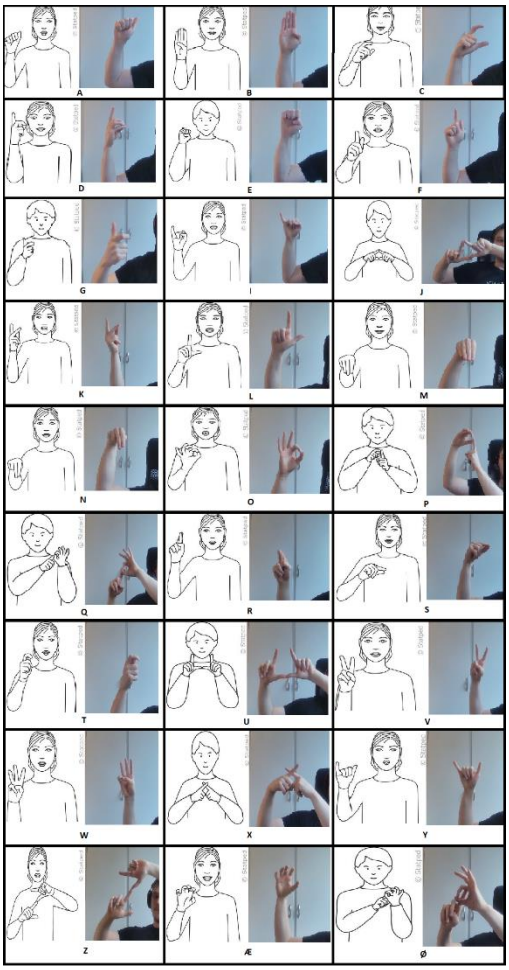

Figure 1: Drawn images and captured images of each sign in the Norwegian alphabet (excluding H and Å).

Figure 2: From left to right: Male hand with artificial and natural lighting on white background, Female hand with artificial and natural lighting on white background, Male hand on complex Background.

Figure 3: Image shows different angles of the sign N

Figure 4: Image shows different rotations of the sign U

Table 1: Distribution of the NSL dataset

Alphabets	Male Complex Background	Male Artificial and Natural lighting, White background	Female Artificial and Natural lighting, White background	Total
A-Ø (Å and H excluded)	300	300	300	900*27 = 24,300

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