Eye Blink Detection in Sign Language Data Using CNNs and rule-based methods

Margaux Susman & Vadim Kimmelman
University of Bergen
(Margaux.Susman@uib.no, Vadim.Kimmelman@uib.no)

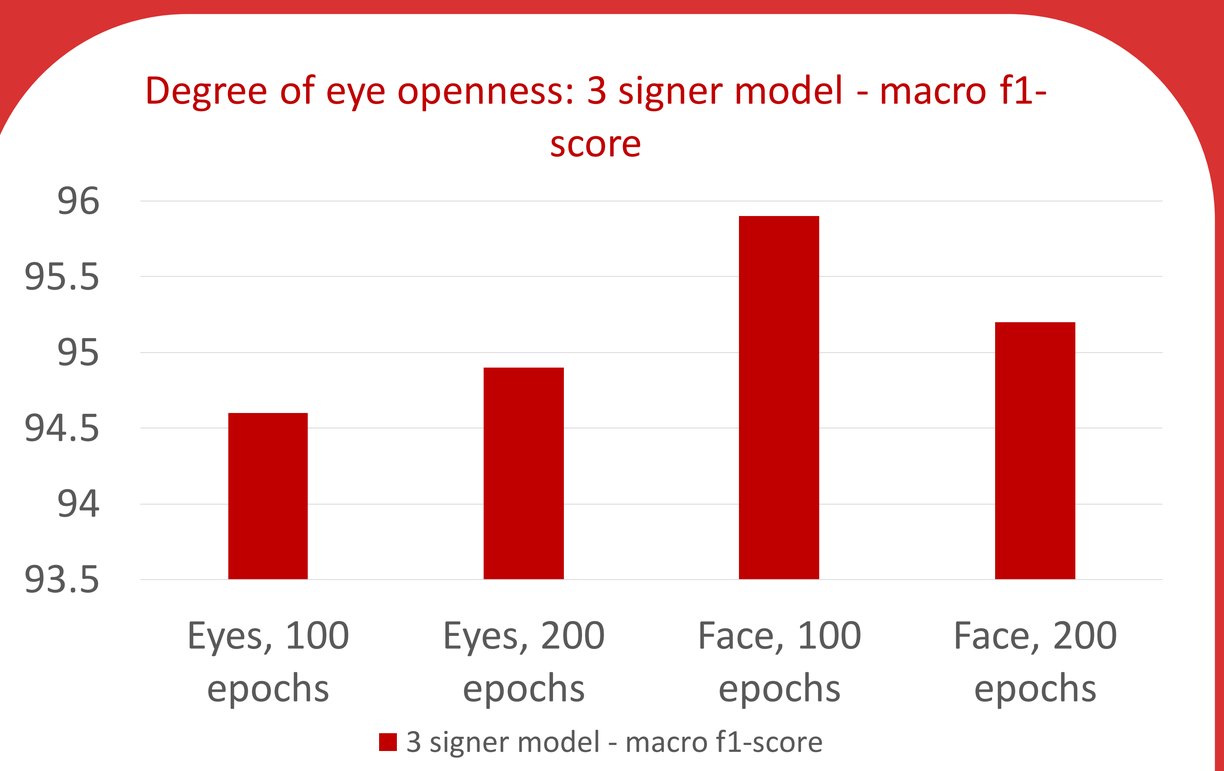
Funded by the European Union
European Research Council
Established by the European Commission

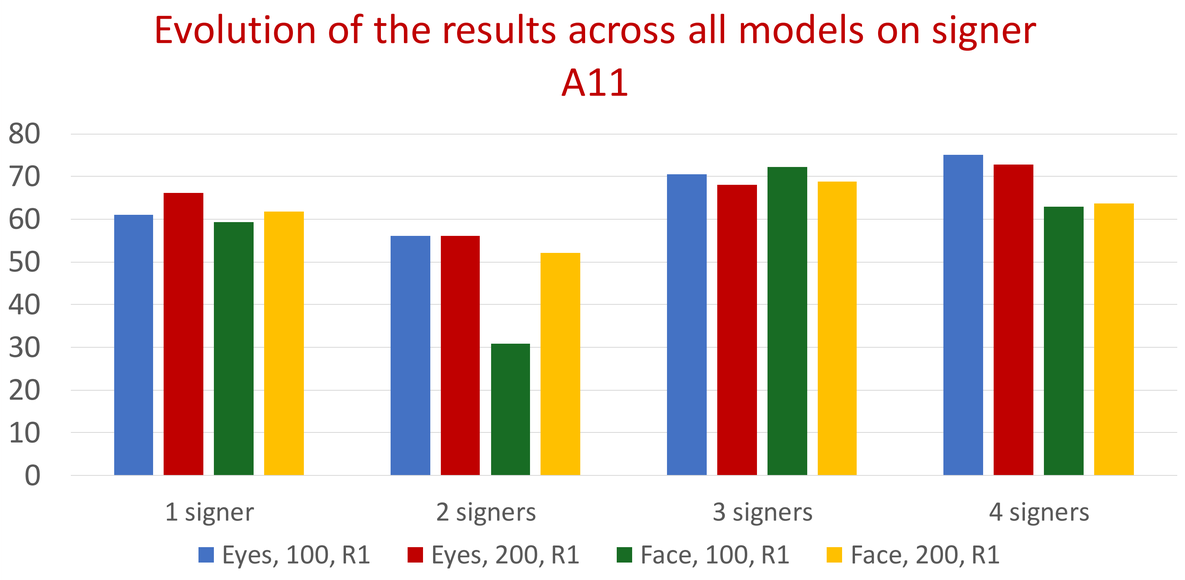
- Eye blinks have been shown to serve as **boundary markers** in sign languages
- No large-scale quantitative research on eye blinks in sign language exists.
- Need for a reliable method to detect blinks automatically.

Data

- DictaSign-LSF
- 5 participants
- 9 videos
- 60:36.000
- 1565 blinks
- 26 blinks/min

- Two methods with two steps:
  - **Degree of eye openness**: a CNN model or the eye aspect ratio (EAR) calculation
  - **Blink or not**: rule-based blink identification method with two rules:
    - The high-low-value-difference rule
    - The curve rule





Results of the hybrid, 4-signer model (CNN trained on 4 signers + rules)

Signer	Eyes	Eyes	Face	Face
	100, R1	200, R1	100, R2	200, R2
B15	0.964 [0.5]	**0.969 [0.6]**	0.953 [0.5]	0.953 [0.6]
B5	0.874 [0.5]	**0.917 [0.5]**	0.874 [0.5]	**0.917 [0.5]**
B14	**0.758 [0.9]**	0.724 [0.9]	0.743 [0.7]	0.728 [0.9]
A9	0.87 [0.8]	0.822 [0.8]	**0.888 [0.7]**	0.863 [0.8]
A11	**0.751 [0.8]**	0.727 [0.8]	0.629 [0.5]	0.636 [0.8]

Results of the EAR + rules

Signer	EAR + R1	EAR + R2	CNN best
B15	0.943	0.877	**0.97 (3, E, 200, R1)**
B5	**0.944**	0.884	0.917 (4, E, 200, R1)
B14	0.638	0.65	**0.758 (4, E, 100, R1)**
A9	0.874	0.806	**0.888 (4, F, 100, R1)**
A11	0.723	0.65	**0.751 (4, E, 100, R1)**

Funded by the European Union (ERC, NONMANUAL, project number 101039378). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Council. Neither the European Union nor the granting authority can be held responsible for them.