ⴰⵡⴰⵍ–ⵢⴰⵏ ⵓⵙⵏⵜⵉ ⵉⵖⵍⵉⵏ ⵙ ⵜⵣⵎⵔⵜ ⵏ ⵜⵎⵓⵏⵜ ⵉ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵉⵙⵓⴳⴰⵎⵏ ⵏ ⵉⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵉ ⵜⵎⴰⵣⵉⵖⵜ

ⴰⵍⴱ ⵓⴽⵜⵉⵎ (Alp Öktem)[1,2], ⴼⴰⵔⵉⴷⴰ ⴱⵓⴷⵉⵛⴰⵜ (Farida Boudichat)[2]

[1]ⴽⵓⵍ·ⵍⵢⴽⴼⵉⵜ (Col·lectivaT)
alp@collectivat.cat

[2]ⵜⴰⵔⴰⴱⴱⵓⵜ ⵏ ⵓⵙⵏⵜⵉ ⵏ ⴰⵡⴰⵍ
awal@collectivat.cat

ⵜⴰⴳⴹⵡⵉⵜ.

ⴰⵔⵣⵣⵓ ⴰⴷ ⴰⵔ ⵉⵙⵎⵉⵍⵉ ⴰⵡⴰⵍ, ⵢⴰⵏ ⵓⵙⵏⵜⵉ ⵉⵖⵍⵉⵏ ⵙ ⵜⵣⵎⵔⵜ ⵏ ⵜⵎⵓⵏⵜ ⵉ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵉⵙⵓⴳⴰⵎⵏ ⵏ ⵉⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵉ ⵜⵎⴰⵣⵉⵖⵜ. ⴳ ⴰⵔⵣⵣⵓ ⴰⴷ, ⵔⴰ ⵏⵙⵔⵙ ⵢⴰⵏ ⵓⵣⵣⵔⴰⵢ ⴰⵅⴰⵜⴰⵔ ⵏ ⵓⴷⵖⴰⵔ ⵏ ⵓⵙⵎⴽⵍ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⴳⴰⵎⴰⵏⵜ (NLP) ⵉ ⵜⵎⴰⵣⵉⵖⵜ, ⴷ ⵔⴰ ⵏⵖⵙ ⵜⴰⵍⴰⵢⵉⵏ ⵜⵉⵎⴰⵢⵏⵓⵜⵉⵏ ⴳ ⵢⵉⴳⵔ ⵏ ⵉⵙⵓⴳⴰⵎⵏ ⵏ ⵉⵎⵙⵙⵓⴷⵙⴰⵏⵏ (computational resources), ⴷ ⵡⵉⵏ ⵓⵙⵏⴼⵍ ⵏ ⵜⵖⴰⵔⴰⵙⵉⵏ ⵉⴱⴷⴷⴰⵏ ⵖⴼ ⵜⴳⵔⴰⵡⵜ ⵢⴰⴽ ⴰⴷ ⵏⵙⵎⵍ ⵜⴰⴷⵔⵙⵉ ⵏ ⵓⵎⵍⴰⵏ ⵉⵜⵜⴰⴷⵔⴰⵏ. ⵉⵜⵜⵓⵙⵏⵎⴰⵍⴰ ⵓⵙⵏⵜⵉ ⵏ awaldigital.org ⴳ ⵓⵙⴳⴳⵯⴰⵙ ⵏ 2024. ⵉⵙⵔⵙ ⵓⵙⵏⵜⵉ ⴰⴷ ⵜⵉⵟⵟ ⵏⵏⵙ ⵖⴼ ⵜⴷⵔⵙⵉ ⵏ ⵜⵉⵍⵉⵜ ⵏ ⵜⵢⵜⵍⴰⵢⵜ ⵜⵎⴰⵣⵉⵖⵜ ⴳ ⵓⵎⴰⴹⴰⵍ ⴰⵎⵓⵟⵟⵓⵏ.

ⵏⴽⵙⵔ ⵢⴰⵜ ⵜⴷⴰⴱⵓⵜ ⵜⴰⵎⴰⵡⴰⵙⵜ ⴷⴰ ⵢⵓⵊⵊⴰⵏ ⵉⵎⵙⴰⵡⴰⵍⵏ ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⴰⴷ ⵙⵙⴽⵛⵎⵏ ⴰⵙⵓⵖⵍⵏ ⴷ ⵉⵎⵙⵍⵉ ⵏⵏⵙⵏ. ⴰⵔ ⵏⵙⵙⴼⵙⴰⵢ 18 ⵏ ⵡⴰⵢⵢⵓⵔⵏ ⵏ ⵜⴷⵔⴰⵡⵜ ⵜⴰⵎⴳⵔⴰⵡⵜ. ⵜⴰⴷⵔⴰⵡⵜ ⴰⴷ ⵜⴰⵡⵙ ⴰⵖ ⴰⴷⴷ ⵏⵙⵙⵓⴼⵖ ⵉⵔⴼⵜⵉⵍⵏ ⵉⵅⴰⵜⴰⵔⵏ ⴷⴰ ⵉⵜⵜⴱⴷⴷⴰⵏ ⵎⵍⵉⴷ ⵜⴳⵔⴰⵡⵜ.

ⵙⴳ ⵉⵔⴼⵜⵉⵍⵏ ⴰⴷ ⵜⴷⵔⵙⵉ ⵏ ⵜⵉⵔⵔⴰ ⵙ ⵜⵎⴰⵣⵉⵖⵜ ⴷ ⵜⵣⵎⵎⴰⵔ ⵏ ⵓⵙⵏⴰⵡⴰⵢⴰ ⵏ ⵜⵓⵜⵍⴰⵢⵜ. ⵡⴰⵅⵅⴰ ⴰⵙⵏⵜⵉ ⴰⴷ ⵉⵏⵏⵓⵍ ⵢⴰⵏ ⵓⵙⵏⵓⴱⴳ ⵓⵎⵏⵉⵅⵏ, ⵜⴰⴷⵔⴰⵡⵜ ⵜⴰⵎⴳⵔⴰⵡⵜ ⵡⴰⵙⴰ ⵜⵍⵍⴰ ⵜⴷⵔⵓⵙ ⴰⵃⴰ ⵜⴷⴷⴰ ⴷ ⵖⴰⵙ ⵙⴳ ⴷⴰⵔ ⵉⵎⵙⵏⵉⵍⵙⵏ ⴷ ⵉⵎⵖⵏⴰⵙⵏ. ⵡⴰⵅⵅⴰ ⵜⴷⵔⵓⵙ, ⵜⴰⴷⵔⴰⵡⵜ ⵜⴰⵎⴳⵔⴰⵡⵜ - ⴷⴰ ⵉⵙⵎⵓⵏ ⴽⵔⴰ ⵏ
6,421 ⵏ ⵉⴽⵏⵉⵡⵏ ⵏ ⵓⵙⵓⵖⵍ ⴷ 3 ⵜⵙⵔⴰⴳⵉⵏ ⵏ ⵉⵎⵙⵍⵉ - ⵜⵙⵎⵍⴰ ⴷ ⵉⵔⴼⵜⵉⵍⵏ ⴷⴰ ⵉⴱⴷⴷⴰⵏ ⵎⵉⵍⴷ ⵏ ⵓⵙⵔⵙ ⵏ ⵜⵉⵎⵢⴰⴷⴰⵙⵉⵏ ⵜⵉⵏⴰⵡⴰⵢⵏ ⵖⴼ ⵜⵖⵔⵉ ⵏ ⵜⵡⵉⵙⵉ ⵏ ⵓⵜⵍⴰⵢⵉⵏ ⴷⴰⵔ ⵎⵉ ⵍⵍⴰⵏⵜ ⵉⵎⵏⴰⴹⵏ ⵉⵙⵏⵎⵓⵏⵉⵍⵙⵜⵏ ⵎⵢⴰⵏⴰⵡⵏ. ⵖⴼ ⴰⴽⴽⵯ ⵓⵢⴰ, ⴰⵔ

ⵢⵙⵡⵓⵔⵉ ⵖⴼ ⵓⵙⴼⵓⵍⴽⵉ ⵏ ⵉⵣⵓⵔⴰⵜ ⵏ ⵜⵙⵓⵖⵍⵜ ⵜⵉⵎⵉⵙⵜ ⵉⵜⵜⵢⴰⵏⴰⴼⵏ ⵉ ⵓⴳⴷⵓⴷ ⵙ ⵜⵎⴰⵡⴰⵙⵜ ⵏ ⵓⵎⵍⴰⵏ ⵉⵜⵜⴰⵙⵎⵓⵏⵏ.

1. ⵜⴰⵣⵡⴰⵔⵜ

ⴰⵙⵎⴷⵢⴰ ⴰⵎⵓⵟⵟⵓⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵏ ⵓⵎⴰⴹⴰⵍ ⵉⵙⵓⵍ ⵓⵔ ⵜⴰ ⵉⵎⵙⴰⵙⴰ ⴷⴳ ⴷⵅ ⵏⵜⵜⴰⴼⴰ ⵖⴰⵙ ⵛⴰ ⵏ ⵜⵔⵓⴱⴱⴰ ⵉⴷⵔⵓⵙⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵍⵍⵉ ⵙⴰⵡⵡⴰⵍⵏ ⵎⵉⴷⴷⵏ ⴰⵟⵟⴰⵙ ⴰⴷ ⵉⵜⵜⴼⵍⴰⵣⵏ ⵙⴳ ⵉⵙⴱⵓⵖⵍⵓⵜⵏ ⵉⵜⵉⴽⵏⵓⵍⵓⴳⵏⵏ. ⵎⴰⵛⴰ ⴰⵃⵟⵟⴰⵟ ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵢⴰⴹⵏⵉⵏ ⴳⵯⵔⴰⵏⵜ ⴳ ⵜⴷⴰⴱⵓⵜⵉⵏ ⵜⵉⵎⵓⵟⵟⵓⵏⵉⵏ. ⴰⵏⴱⴹⴰⵢ ⴰⵎⵓⵟⵟⵓⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ ⴰⴷ ⵢⵓⴽⵏ ⴰⵟⵟⴰⵙ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵜⵉⴼⵔⵉⵅⵉⵏ. ⵡⴰⴳⴳⴰ ⵍⵍⴰⵏⵜ ⵓⴳⴳⵓⵔ ⵏ 2,000 ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ ⴷⴰ ⵙⵔⵙⵏⵜ ⵙⴰⵡⴰⵍⵏ ⵓⴳⴳⵓⵔ ⵏ ⵢⴰⵏ ⵎⵍⵢⴰⵔ ⵏ ⵓⴼⴳⴰⵏ, ⵉⵙⵓⴳⴰⵎ ⵉⵎⵙⵙⵓⴷⵙⴰⵏⵏ ⴷ ⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵙⵓⵍⵏ ⴷⵔⵓⵙⵏⵜ (Nekoto et al., 2020; Kreutzer et al., 2022). ⵏⴳⵔ ⵜⵓⵜⵍⴰⵢⵉⵏ ⴰⴷ ⵓⵔ ⵉⵜⵜⵡⴰⵙⵎⴷⵢⴰⵏ, ⵜⴳⴰ ⵜⵎⴰⵣⵉⵖⵜ ⵢⴰⵜ ⵜⵖⵓⵔⵉ ⵏ ⵡⴰⴷⴷⴰⴷ ⴰⴳⴰⵜⴰⵔ ⵖⴼ ⵉⵎⵓⴽⵔⵉⵙⵏ ⴷ ⵜⵥⵉⴹⴰⵇ ⵏ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵜⴰⵜⵉⴽⵏⵓⵍⵓⵊⵜ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵙ ⵜⵡⵉⵙⵉ ⵏ ⵓⴳⴷⵓⴷ.

ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⵎⴰⵣⵉⵖⵜ, ⴷⴰ ⵙ ⵙⴰⵡⵡⴰⵍⵏ ⵓⴳⴳⵓⵔ ⵏ 40 ⵏ ⵎⵍⵢⵓⵏ ⵏ ⵓⴼⴳⴰⵏ ⴳ ⵜⴼⵔⵉⵅⵜ ⵏ ⵓⴳⴰⴼⴰ ⴷ ⵜⵎⵉⵣⴰⵔ ⵏ ⵓⵣⵡⴰⴳ ⴳ ⵓⵎⴰⴹⴰⵍ, ⵜⵣⵔⵉ ⵢⴰⵏ ⵓⴱⵔⵉⴷ ⵉⵖⵣⵣⵉⴼⵏ ⵙⴳ ⵓⵡⵏⵓⵍ ⴰⵔ ⵜⵓⵙⵙⵏⵜ ⵜⴰⵎⴰⴷⴷⵓⴷⵜ ⴳ ⵎⵏⵏⴰⵡⵜ ⵏ ⵜⵎⵉⵣⴰⵔ ⵙⴳ ⵓⵙⴳⴳⵯⴰⵙ ⵏ 2011. ⵎⴰⵛⴰ, ⵜⵓⵙⵙⵏⵜ ⴰⴷ ⵜⴰⵙⵔⵜⴰⵏⵜ ⵓⵔ ⵜⵓⵜⵜⵓⵙⵓⵖⵉⵍ ⵏⵉⵛⴰⵏ ⵙ ⵢⴰⵜ ⵜⵉⵍⵉⵜ ⵜⴰⵎⵓⵟⵟⵓⵏⵜ ⵉⴷⵓⵙⵏ ⵏⵖ ⴷ ⵛⴰ ⵏ ⵉⵙⵓⴳⴰⵎ ⵉⵎⵙⵙⵓⴷⵙⵓⵏⵏ. ⵡⴰⴳⴳⴰ ⵏⵙⵙⵏ ⵢⴰⵜ ⵜⵙⴰⵜⵜⵓⵢⵜ — ⴰⵎ ⵓⵙⵓⴼⵖ ⵏ ⵡⵉⴽⵉⴱⵉⴷⵢⴰ ⵙ ⵜⵎⴰⵣⵉⵖⵜ ⴳ 2023, ⴷ ⵓⵙⴽⵛⵎ ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⴳ ⵓⵙⵓⵖⵍ ⵏ ⴳⵓⴳⵍ, ⴷ ⵜⵉⵍⵉⵜ ⵏ ⵢⵉⵎⴰⵙⵙⵏ ⵉⵎⵓⵟⵟⵓⵏⵏ ⴷⴰ ⵉⵙⴽⵔ ⵓⵙⵉⵏⴰⴳ ⴰⴳⵍⴷⴰⵏ ⵏ ⵜⵓⵙⵙⵏⴰ ⵜⴰⵎⴰⵣⵉⵖⵜ (IRCAM) ⴷ ⵡⵉⵏ ⵢⵉⵎⵙⵏⵉⵍⵙⵏ ⴷ ⵉⵎⵙⵖⵉⵡⵙⵏ ⵢⴰⴹⵏⵉⵏ — ⵜⵓⵜⵍⴰⵢⵜ ⵜⵙⵓⵍ ⵜⴷⵔⵓⵙ

ⴰⵍⴱ ⵓⴽⵜⵉⵎ (ALP

ⵜⵉⵍⵉⵜ ⵏⵏⵙ ⴳ ⵡⴰⵏⵜⵉⵔⵏⵉⵜ ⴰⴼⴰⴷ ⴰⴷ ⵜⵙⵙⴷⵓ ⵜⵉⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵉⴱⴷⴷⵏ ⵖⴼ ⵜⵉⵖⵉⵙⵜ ⵜⴰⵙⵎⴳⵓⵔⵜ (AI), ⴰⴱⵓⵀⵓⵎ ⴰⴽⴽⵯ ⵉⵣⵓⵔⴰⵜ ⵉⵎⵇⵔⴰⵏⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ (LLMs). ⴳ ⵡⴰⴽⵓⴷ ⴷⴳ ⵜⵜⵓⵙⵙⵉⴷⵏⵜ ⵜⵉⵙⵏⵜⴰⵢⵉⵏ ⵜⵉⵜⵔⴰⵔⵉⵏ ⵖⴼ ⵓⵙⵎⵢⵉⵡⵏ ⴷ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵜⵣⵎⵎⴰⵔ ⵏ ⵜⵉⵔⵔⴰ, ⵉⵇⵇⴰⵏ ⴷ ⴰⴷ ⵉⵍⵉⵏⵜ ⵜⵎⴰⴳⵍⴰⵢⵜ ⵜⵉⴳⵎⴰⵜⵉⵏ ⵉ ⵓⵙⵏⵓⵍⴼⵓ ⵏ ⵡⴰⵙⵙⴰⵢ ⴰⵎⵓⵟⵟⵓⵏ ⵉⵍⴰⵏ ⵢⴰⵜ ⵜⵖⴰⵔⴰ ⵢⴰⵜⵜⵓⵢⵏ ⴷ ⵉⵙⴼⴽⴰ ⵉⵎⵙⵙⵓⴷⵙⵏ ⵉⵣⴹⴰⵔⵏ ⴰⴷ ⵙⵙⵍⵎⴷⵏ ⵉⵏⴳⵔⴰⵡⵏ ⵏ ⵜⵖⵉⵙⵜ ⵜⴰⵙⵎⴳⵓⵔⵜ (AI) ⵉⴷⵓⵙⵏ.

ⴰⵔⵣⵣⵓⴰ ⴰⴷ ⴰⵔ ⵉⵙⵎⵏⵉⴷ ⴰⵙⵏⵜⵉ ⵏ "ⴰⵡⴰⵍ" (Awal), ⴷⴰ ⵉⴳⴰⵏ ⵢⴰⵜ ⵜⴰⵙⵏⵜⴰⵢⵜ ⵜⴰⵏⴰⵎⵓⵏⵜ ⵉⵜⵜⵓⵙⴽⴰⵔⵏ ⴳ 2024 ⵙ ⵓⴼⵓⵙ ⵏ ⴽⵕⴰⴹⵜ ⵜⵎⴰⴷⴷⴰⵙⵉⵏ ⴳ ⴽⴰⵟⴰⵍⵓⵏⵢⴰ, ⵢⴰⴽ ⴰⴷ ⵜⵙⴱⵓⵖⵍⵓ ⵜⵉⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵜⵉⵏⵓⵜⵍⴰⵢⵉⵏ ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⵙ ⵓⴳⴳⵯⴰⵎ ⴰⵎⴳⴳⴰⵢ ⵏ ⵉⵙⴼⴽⴰ. ⴰⵔ ⵉⵙⵎⵓⵜⵜⵓⵔ ⴰⵡⴰⵍ ⵜⵉⵢⵓⴳⵉⵡⵉⵏ ⵏ ⵓⵙⵓⵖⵍ ⴷ ⵉⵙⴼⴽⴰ ⵏ ⵡⴰⵡⴰⵍ ⵉⵜⵜⵓⵙⵓⵍⴼⵏ ⵉⵣⴹⴰⵔⵏ ⴰⴷ ⵜⵜⵓⵙⵎⵔⵔⵙⵏ ⵙ ⵓⵙⵔⵔⵉⴷ ⵉ ⵓⵙⵍⵍⵎⴷ ⵏ ⵉⵏⵎⴰⵍⵍⵓⵜⵏ ⵏ ⵜⵖⵉⵙⵜ ⵜⴰⵙⵎⴳⵓⵔⵜ (AI), ⴰⵎ ⵓⴽⵣ ⴰⵡⵜⵓⵎⴰⵜ ⵏ ⵡⴰⵡⴰⵍ (ASR), ⴷ ⵜⵙⵓⵖⵍⵜ ⵜⴰⵡⵜⵓⵎⴰⵜⵜ (MT), ⴷ ⵉⵣⵓⵔⴰⵜ ⵉⵎⵇⵔⴰⵏⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ (LLMs). ⴰⵔ ⵜⵙⵙⴱⵖⴰⵙ ⵜⵙⴰⵢⵔⴰⵔⵜ ⴷⴰ ⵉⵙⴽⵔ ⵡⴰⵡⴰⵍ ⴰⴷⵔⴰⵡ ⴰⵏⴰⵎⵓⵏ ⵙ ⵉⴼⵔⴷⵉⵙⵏ ⵏ ⵓⵙⵓⵔⴰⵔ, ⴰⴽⴷ ⵓⵛⵟⵟⵓ ⵏ ⵜⵖⴰⵔⴰ ⵙ ⵉⵎⴰⴽⴰⵏ ⵏ ⵓⵙⴷⴷⵉⴷ ⵙ ⵉⵏⴳⴳⵯⴰ.

ⴰⵔⵣⵣⵓ ⴰⴷ ⵉⵜⵜⵓⵄⴽⴰ ⴰⵎ ⵎⴽ ⴰⴷ. ⴷⴳ ⵜⵙⵓⴼⵖⵜ ⵜⵉⵙ 2, ⴷⴰ ⵏⵙⴽⴰⵏ ⵢⴰⵏ ⵓⵣⵣⵔⴰⵢ ⴰⵏⵎⴷⵓ ⵖⴼ ⵓⵙⵎⴽⵍ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⴳⴰⵎⴰⵏⵜ (NLP) ⵉ ⵜⵎⴰⵣⵉⵖⵜ, ⵙ ⵜⵖⵓⵔⵉ ⵏ ⵡⵓⴷⵎ ⵏⵏⵙ ⴰⵏⵎⵙⵍⴰⵢ ⴷ ⵡⴰⴷⴷⴰⴷ ⵏⵏⵙ ⴰⵏⴰⵎⵓⵏⵙⵔⵜⴰⵏ (ⵜⴰⵙⵓⴼⵖⵜ 2.1), ⴷ ⵓⵏⴳⴳⵉⵥ ⴷ ⵓⵙⴱⵓⵖⵍⵓ ⴳ ⵜⴰⵍⵢⴰ ⵏ ⵓⵙⵎⴽⵍ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⴳⴰⵎⴰⵏⵜ (NLP) ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⵎⴰⵣⵉⵖⵜ (ⵜⴰⵙⵓⴼⵖⵜ 2.2), ⴷ ⵜⵖⴰⵔⴰⵙⵉⵏ ⵜⵉⵏⴰⵎⵓⵏⵉⵏ (ⵜⴰⵙⵓⴼⵖⵜ 2.3). ⵜⴰⵙⵓⴼⵖⵜ ⵜⵉⵙ 3 ⵜⵙⴼⵔⵓ ⵙ ⵜⴼⵔⴰⵢⵜ ⴰⵙⵏⵜⵉ ⵏ "ⴰⵡⴰⵍ", ⵜⴱⴷⵔ ⵜⵓⵄⴽⴰ ⵏⵏⵙ ⴷ ⵉⵡⵜⵜⴰⵙⵏ ⵏⵏⵙ (ⵜⴰⵙⵓⴼⵖⵜ 3.1), ⴷ ⵜⴱⴰⴷⵓⵜ ⵏ awaldigital.org (ⵜⴰⵙⵓⴼⵖⵜ 3.2), ⴷ ⵡⴰⵍⴳⴰⵢ ⵏ ⵉⵙⴼⴽⴰ ⵉⵎⵙⴰⵡⴰⵍⵏ ⵙ ⵓⴱⵔⵉⴷ ⵏ "Common Voice" (ⵜⴰⵙⵓⴼⵖⵜ 3.3), ⴷ ⵡⴰⵜⴰⵡ ⵏ ⵡⴰⵎⵓⵏ ⴷ ⵜⵎⵓⵙⵙⵓⵢⵏ ⵏ ⵓⵙⵏⵖⵎⵙ (ⵜⴰⵙⵓⴼⵖⵜ 3.4), ⴷ ⵉⵙⵏⵎⴽⵜⴰⵜⵏ ⵏ ⴷⵖⵉⵇ ⴷ ⵓⵙⴰⴷⴼ ⵙ ⵉⵙⴼⴽⴰ (ⵜⴰⵙⵓⴼⵖⵜ 3.5), ⴷ ⵉⵡⵜⵜⴰ, ⴷ ⵓⵏⴳⴳⵉⵥ ⴷ ⵡⴰⴷⴷⴰⴷ ⵏ ⵉⵎⴰⵍ (ⵜⴰⵙⵓⴼⵖⵜ 3.6). ⵏⵙⵎⴷⴰⵢ ⴳ ⵉⵙⵜⴳⴳⵯⵔ ⴳ ⵜⵙⵓⴼⵖⵜ ⵜⵉⵙ 4.

2. ⵜⵉⴳⵏⵉ ⵏ ⵓⵙⵎⴽⵍ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⴳⴰⵎⴰⵏⵜ (NLP) ⵉ ⵜⵎⴰⵣⵉⵖⵜ

ⵜⴰⵙⵓⴼⵖⵜ ⴰⴷ ⴰⵔ ⵜⵣⵔⵔⵓ ⴰⴷⴷⴰⴷ ⴰⵎⵉⵔⴰⵏ ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⴳ ⵜⴰⵖⵓⵍⵜ ⵜⴰⵎⵓⵟⵟⵓⵏⵜ. ⴳ ⵉⵙⵜⵣⵡⵔ, ⵏⴼⴽⴰ ⵢⴰⵜ ⵜⵙⵎⴰⵇⵇⴰⵍⵜ ⵖⴼ ⵓⵎⵣⴰⵔⴰⵢ ⴰⵏⵎⵙⵍⴰⵢ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⴷ ⵜⵣⵣⵉⴳⵉⵣⵜ ⵏⵏⵙ ⵜⴰⵏⴰⵎⵓⵏⵜⵙⵔⵜⴰⵏⵜ, ⴷ ⵓⵣⵣⵔⴰⵢ ⵢⵍⵍⴰⵏ ⵏ ⵜⵡⵓⵔⵉⵡⵉⵏ ⵜⵎⵙⵙⵓⴷⵙⴰⵏⵏ ⴷ ⵉⵖⴱⵓⵍⴰ ⵉⵍⵍⴰⵏ, ⵓⵔⵜⴰ ⵏⵎⵙⴰⵡⴰⵍ ⵖⴼ ⵉⵍⵍⵡⵉ ⵏ ⵜⵖⴰⵔⴰⵙⵉⵏ ⵜⵉⵡⴰⵎⵓⵏⵉⵏ.

2.1. ⵓⴷⵎ ⴰⵏⵎⵙⵍⴰⵢ ⴷ ⵡⴰⴷⴷⴰⴷ ⴰⵏⴰⵎⵓⵙⵔⵜⴰⵏ ⵏ ⵜⵎⴰⵣⵉⵖⵜ

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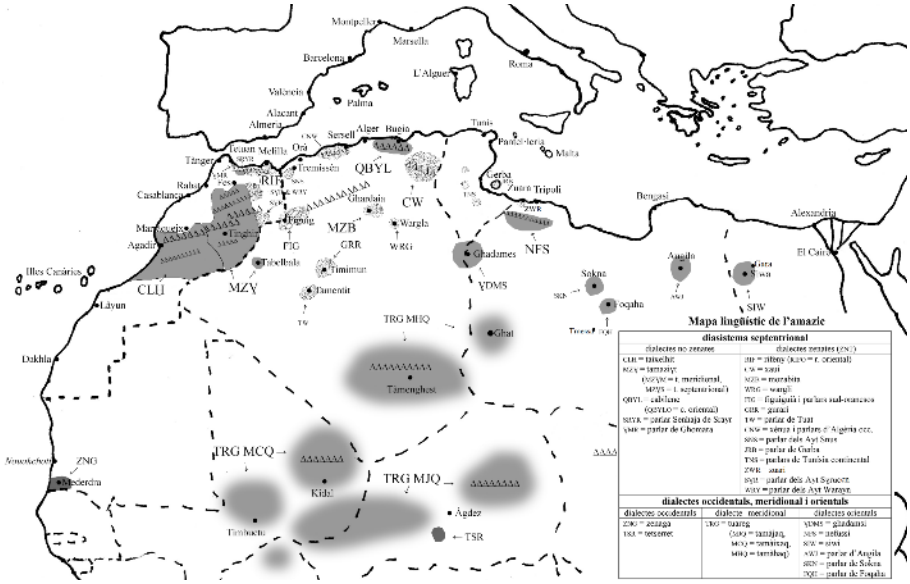
ⵜⴰⵎⴰⵣⵉⵖⵜ ⵜⵄⴼⴰⵕ ⵉ ⵜⵡⵊⴰ ⵏ ⵜⴻⵜⵍⴰⵢⵉⵏ ⵜⵉⴼⵕⵡⴰⵣⵉⵏ, ⵙ ⴻⴳⴳⴰⵔ ⵏ 40 ⵏ ⴻⵎⵍⵢⴻⵏ ⵏ ⴻⵎⴷⴰⵏ ⴳ ⵢⴰⵜ ⵜⵎⵏⴰⵄⵜ ⵜⴰⵎⵇⵇⵔⴰⵏⵜ ⴳ ⵜⴼⵔⵉⵇⵜ ⵏ ⴻⴳⴰⴼⴰ, ⴳ ⵡⴰⵎⴻⵔⴰⴽⴻⵛ, ⴷⵣⴰⵢⵔ, ⵜⴻⵏⵙⵜ, ⵍⵉⴱⵢⴰ, ⴷ ⵜⵎⴻⵔⴰ ⵏ ⵚⴱⴰⵏⵢⴰ, ⵛⵏⴳⵉⴹ, ⵏⵏⵉⵊⵉⵔ, ⵎⴰⵍⵉ, ⴷ ⵎⵉⵚⵕⴰ, ⴷ ⴻⵍⴰ ⴳ ⴻⵎⵣⵡⴰⴳ. ⵜⴰⵡⵍⴰⴼⵜ 1 ⴰⵔ ⵜⵙⵎⵉⵍⵉ ⴰⴱⴹⴹⴻ ⴰⵊⴻⵖⵔⴰⴼ ⵏ ⵜⵏⵜⴰⵍⴰⵢⵉⵏ ⵜⵉⵎⴰⵣⵉⵖⵉⵏ ⴳ ⵜⴼⵔⵉⵇⵜ ⵏ ⴻⴳⴰⴼⴰ. ⵜⴰⵎⴰⵣⵉⵖⵜ ⵜⴳⴰ ⵜⴻⵜⵍⴰⵢⵜ ⵜⴰⵎⴷⴷⴻⴷⵜ ⴳ ⵡⴰⵎⴻⵔⴰⴽⴻⵛ ⵙⴳ 2011, ⴷ ⴳ ⴷⵣⴰⵢⵔ

ⴰⵍⴱ ⵓⴽⵜⵉⵎ (Alp

ⵙⴳ 2016, ⴷ ⴳ ⴽⵔⴰ ⵏ ⵜⵎⵏⴰⴹⵉⵏ ⵏ ⵍⵉⴱⵢⴰ ⵙⴳ 2017, ⴷ ⴳ ⵎⴰⵍⵉ ⵙⴳ 2023. ⵜⵓⵜⵍⴰⵢⵜ ⵜⵙⵎⵓⵏ ⵢⴰⵏ ⵓⵏⴳⵔⴰⵡ ⵏ ⵜⵏⵜⴰⵍⵢⵉⵏ ⵉⵎⵇⵇⵓⵔⵏ, ⴷⵉⴳⵙ ⵜⵉⵏⵜⴰⵍⵢⵉⵏ ⵜⵉⵎⵇⵇⵔⴰⵏⵉⵏ ⴰⵎ ⵜⴰⵙⵓⵙⵉⵜ (shi), ⴷⴰ ⵙⴰⵡⴰⵍⵏ ⵙⵔⵙ ⴳ ⵢⵉⴼⴼⵓⵙ ⴰⵜⴰⵔⴰⵎ ⴷ ⵡⴰⵟⵍⴰⵙ ⴰⵎⵇⵇⵔⴰⵏ ⴷ ⵙⵓⵙ, ⴷ ⵜⴰⵔⵉⴼⵉⵜ (rif) ⴳ ⵜⵎⵏⴰⴹⵜ ⵏ ⵓⵔⵔⵉⴼ ⴳ ⵡⴰⵎⵓⵔⴰⴽⵓⵛ, ⴷ ⵜⴰⵎⴰⵣⵉⵖⵜ ⵏ ⵡⴰⵟⵍⴰⵙ ⴰⵏⴰⵎⵎⴰⵙ (tzm) ⴳ ⵡⴰⵎⵎⴰⵙ ⴷ ⵢⵉⴼⴼⵓⵙ ⴰⴳⵎⵎⵓⴹ ⵏ ⵡⴰⵎⵓⵔⴰⴽⵓⵛ, ⴷ ⵜⵇⴱⴰⵢⵍⵉⵜ (kab) ⴳ ⴷⵣⴰⵢⵔ, ⴷ ⵜⵛⴰⵡⵉⵜ (shy) ⵓⵍⴰ ⵏⵜⵜⴰⵜ ⴳ ⴷⵣⴰⵢⵔ, ⴷ ⵜⴰⵎⴰⵀⵇ (thv) ⵏ ⵉⵎⵓⵀⴰⵇ ⴳ ⵜⵎⵏⴰⴹⵉⵏ ⵏ ⵢⵉⴼⴼⵓⵙ ⵏ ⴷⵣⴰⵢⵔ, ⵏⵏⵉⵊⵉⵔ, ⴷ ⵎⴰⵍⵉ, ⴷ ⵜⵎⴰⵛⵇ (taq) ⴳ ⵎⴰⵍⵉ ⴷ ⵏⵏⵉⵊⵉⵔ (ⵍⴰⴼⵇⵉⵡⵉ, 2018).



ⵓⵏⵓⵖ 1: ⴰⴱⵟⵟⵓ ⴰⵊⵓⵖⵔⴰⴼ ⵏ ⵜⵏⵜⴰⵍⵢⵉⵏ ⵜⵉⵎⴰⵣⵉⵖⵉⵏ ⴳ ⵜⴼⵔⵉⵇⵜ ⵏ ⵓⴳⴰⴼⴰ (ⵎⵓⵔⵙⵢⴰ, 2017).

ⵜⴰⵎⴰⵣⵉⵖⵜ ⵜⵣⵣⵔⵉ ⴰⵙⵙⵎⵥⵉ ⴷⴷⴰⵡ ⵜⵉⴹⴰⴼ ⵏ ⵓⵙⴷⵓⵔⵔⵉ ⴷ ⵓⵙⵃⵄⵄⴱ, ⴰⵢⵏⵏⴰ ⵢⵓⵡⵉⵏ ⵙ ⵜⴹⵓⵔⵉ ⵏ ⵡⴰⴷⴷⴰⴷ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⴷ ⵓⵙⵎⵔⵙ ⵏⵏⵙ. ⵜⵉⵙⵙⵓⵎⵙⴰ ⵜⴰⵎⴰⵣⵉⵖⵜ, ⵙⵍⴰⵡⴰⵏ ⴰⴽⴽⵯ ⴳ ⵜⴼⵙⵓⵜ ⵏ ⵉⵎⴰⵣⵉⵖⵏ, ⵜⵉⵔⴰⵔ ⵢⴰⵜ ⵜⵉⵍⴰⵍⵜ ⵜⴰⴳⴰⵜⴰⵔⵜ ⴳ ⵓⵙⵓⵖⴼ ⵏ ⵜⵖⵇⵡⵙⵉⵡⵉⵏ ⴰⴷ ⴷ ⵓⵎⵣⴰⵖ ⵖⴼ ⵉⵣⵔⴼⴰⵏ ⵉⵙⵏⵉⵍⵙⴰⵏⵏ ⴷ ⵉⴷⵍⵙⴰⵏⵏ (ⵄⵓⴽ, 2009; ⵙⵢⵉⵎⴰⵏ ⴷ ⵜⴰⴷⴷⴰⵔⵜ ⵜⴰⵎⴰⵣⵉⵖⵜ ⴳ ⴽⴰⵟⴰⵍⵓⵏⵢⴰ, 2019). ⵜⵉⵙⵙⵓⵎⵙⴰ ⴰⴷ ⵜⵉⵡⵉⵢ ⴷ ⵜⴰⵣⵣⵉⴳⵣⵜ ⵜⴰⴳⴰⵜⴰⵔⵜ ⴳ ⵡⵎⵓⵔⴰⴽⵓⵛ, ⵜⵙⵙⵏⵜⵉ ⵙ ⵓⵙⴱⴷⴷⵉ ⵏ ⵓⵙⵉⵏⴰⴳ ⴰⴳⵍⴷⴰⵏ ⵏ ⵜⵓⵙⵙⵏⴰ ⵜⴰⵎⴰⵣⵉⵖⵜ (IRCAM) ⴳ ⵓⵙⴳⴳⵯⴰⵙ ⵏ 2001, ⴷⴰ ⵉⴳⴰⵏ ⵜⴰⵣⵡⴰⵔⵜ ⵏ ⵓⵙⵎⵔⵙⵍ ⵏ ⵜⵎⴰⵣⵉⵖⵜ. ⵉⵙⴱⵓⵖⵍⴰ ⵉⵔⴽⴰⵎ ⵜⴰⵍⵖⴰ ⵜⴰⵏⴰⵡⴰⵢⵜ ⵜⴰⵎⴰⵣⵉⵖⵜ ⵜⴰⵏⴰⵡⴰⵢⵜ ⵜⴰⵎⵄⵄⵓⴽⵜ (ⵉⵏⵉⴳⵍ ISO-639: zgh), ⵜⵙⵎⵓⵏ ⵜⵉⵎⵥⵍⴰⵢ ⵏ ⴽⵄⴰⴹⵜ ⵜⴰⵏⵜⴰⵍⴰⵢⵉⵏ ⵜⵉⴳⵊⴷⴰⵏⵉⵏ: ⵜⵉⵏ ⵢⵉⴼⴼⵓⵙ, ⵜⵉⵏ ⵡⴰⵎⵎⴰⵙ ⴷ ⵜⵉⵏ

ⴰⵡⴰⵍ–ⵢⴰⵏ ⵓⵙⵏⵜⵉ ⵉⵖⵍⵉⵏ ⵙ ⵜⵣⵎⵔⵜ ⵏ ⵜⵎⵓⵏⵜ ⵉ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵉⵙⵓⴳⴰⵎⵏⵏ

ⵇⴳⴰⵃⴰ (ⴱⵓⴽⵓⵙ, 2014), ⴷ ⵓⵍⴰ ⵜⵉⵎⵣⴰⵔⴰⵢⵉⵏ ⵢⴰⴹⵏⵉⵏ ⴰⵎ ⵜⴰⵎⴰⵟⵄ. ⴳ ⵓⵙⴰⵜⵉ ⵏ ⵜⵣⵎⵎⴰⵔ ⵏ ⵓⵙⵏⴰⵡⴰⵢ, ⴰⴳⵎⵎⴰⵢ ⵏ ⵜⵃⵉⵏⴰⵖ ⵜⴰⵜⵔⴰⵔⵜ, ⴷⴰ ⵉⵙⴱⵓⵖⵍⴰ ⵓⵙⵉⵏⴰⴳ ⴰⴳⵍⴷⴰⵏ ⵏ ⵜⵓⵙⵙⵏⴰ ⵜⴰⵎⴰⵣⵉⵖⵜ (IRCAM)

ⴰⵍⴱ ⵓⴽⵜⵉⵎ (Alp

ⴷⴰ ⵉⴱⵉⴷⴷⵏ ⵖⴼ ⵜⴼⵉⵏⴰⵖ ⵜⴰⵣⴰⵢⴽⵓⵜ, ⴰⵀⴰ ⵉⵜⵜⵓⵙⵜⴰⵢ ⴰⴷ ⵉⴳ ⴰⴳⵎⵎⴰⵢ ⴰⵎⴰⴷⴷⵓⴷ ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⴳ 2003. ⴰⵏⴳⵔⴰⵡ ⴰⴳⵎⵎⴰⵏ ⴰⵜⵔⴰⵔ ⴰⴷ, ⵉⵜⵜⵡⴰⵙⵙⵏⵏ ⵙ ⵜⴼⵉⵏⴰⵖ-ⵉⵔⴽⴰⵎ, ⵉⵜⵜⵢⵓⴼⴰ ⵖⴼ ⵉⴳⵎⵎⴰⵢⵏ ⴰⵍⴰⵜⵉⵏⵉ ⴷ ⵡⴰⵄⵇⴰⴱ ⴷⴰ ⵜⵜⵓⵙⵎⵔⴰⵙⵏⵉⵏ ⴳ ⵓⵎⵣⵔⵓⵢ, ⴰⵛⴽⵓ ⵉⴼⴽⴰ ⵢⴰⵏ ⵓⵏⴳⵔⴰⵡ ⵏ ⵜⵉⵔⵔⴰ ⴰⵏⴰⵡⴰⵢ ⴷ ⵓⵎⵖⵓⴷ ⵙⴳ ⵓⵙⵡⵉⵔ ⴰⵙⵏⵎⵙⵍⵉⵜ ⵉ ⵜⵏⵜⴰⵍⵢⵉⵏ ⵜⵉⵎⴰⵣⵉⵖⵉⵏ ⵜⵉⵎⵇⵇⵓⴽⵉⵏ ⵉⵎⵣⴰⵔⴰⵢⵏ (ⵙⵓⵍⵉⵎⴰⵏⵉ, 2016; ⵄⴰⵟⴰⵍⵍⴰⵀ ⴷ ⴱⵓⵍⵥⵏⴰⴷⵍ, 2012).

2.2. ***ⴰⵏⴳⴳⵉⵅ ⴷ ⵜⵣⵣⵉⴳⵣⵜ ⴳ ⵓⵙⵎⴽⵍ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⴳⴰⵎⴰⵏⵜ (NLP) ⵏ ⵜⵎⴰⵣⵉⵖⵜ***

ⵜⵓⴷⴷⵙⴰ ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⴳ ⵓⵙⵎⴽⵍ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⴳⴰⵎⴰⵏⵜ (NLP) ⵜⴽⴽⴰ ⴷ ⵙⴳ ⵜⵉⵔⵔⴰ ⵏⵏⵙ, ⵜⴰⵙⵏⴰⵍⵖⴰ ⵏⵏⵙ, ⴷ ⵜⵎⵣⴰⵔⴰⵢⵉⵏ ⵜⵉⵏⵜⴰⵍⴰⵏⵉⵏ ⵉⴳⴳⵓⴷⵉⵏ. ⵜⵉⵍⵉⵜ ⵏ ⵉⴳⵎⵎⴰⵢⵏ ⵉⵎⵣⴰⵔⴰⵢⵏ, ⴳⵉⵙⵏ ⵜⴼⵉⵏⴰⵖ, ⴰⵍⴰⵜⵉⵏⵉ, ⴷ ⵡⴰⵄⵇⴰⴱ, ⴰⵔ ⵜⴽⵔⵔⵙ ⴰⵙⵏⴰⵡⴰⵢ ⴷ ⵓⵙⵎⴽⵍ ⴰⵎⵙⵙⵓⴷⵙⴰⵏ. ⵓⴳⴳⵓⵔ ⵏ ⵓⵢⴰ, ⵜⴰⵙⵏⴰⵍⵖⴰ ⵜⴰⵏⴱⵖⵓⵔⵜ ⵏ ⵜⵓⵜⵍⴰⵢⵜ, ⴷⴰ ⵉⵙⵎⵓⵏⵏ ⵜⵉⵣⵉⴳⵣⵉⵏ ⵏ ⵜⵓⵏⴼⵉⵍⵉⵏ ⴷ ⵜⵉⵡⴼⵖⴰⵏⵏ, ⵓⵍⴰ ⵉⵎⵣⴰⵔⴰⵢⵏ ⵉⵏⵜⴰⵍⴰⵏⵏ ⵎⵥⵥⵓⵔⵏⵉⵏ, ⴰⵔ ⵙⵙⴽⴰⵔⵏ ⵉⵡⵜⵜⴰ ⵉ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵜⵙⵏⵙⵉⵡⵉⵏ ⵜⵓⵖⴷⵉⵎⵉⵏ ⵏ ⵓⵙⵎⴽⵍ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⴳⴰⵎⴰⵏⵜ. ⵉⴼⵔⴷⵉⵙⵏ ⴰⴷ ⴷⴰ ⵙⴽⴰⵔⵏ ⵜⵉⵡⵓⵔⵉⵡⵉⵏ ⵜⵉⵏⵎⵎⵓⵔⴰ ⴰⵎ ⵓⵙⵔⵓ ⵏ ⵜⵉⴳⴳⴰⵢⵉⵏ ⵏ ⵡⴰⵡⴰⵍ, ⴰⵙⴽⵏⵍ ⴰⵙⴰⴷⴷⴰⵙ, ⴷ ⵓⵙⵓⵖⵍ ⴰⵡⵓⵔⵎⴰⵏ (ⵄⴰⵟⴰⵍⵍⴰⵀ ⴷ ⴱⵓⵍⵥⵏⴰⴷⵍ, 2012).

ⵡⴰⴳⴳⴰ ⴰⵙⵏⴰⵡⴰⵢ ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⴷ ⵓⴽⵛⴰⵎ ⵏⵏⵙ ⵙ ⵢⵉⴳⵔ ⴰⵎⵓⵟⵟⵓⵏ ⴳⴰⵏ ⴰⵎⴰⵢⵏⵓ, ⴷⴰ ⵉⵣⵡⴰⵔⵏ ⵙ ⵓⵙⵏⵜⵉ ⵏ ⵡⵉⴽⵉⴱⵉⴷⵢⴰ ⵜⴰⵎⴰⵣⵉⵖⵜ ⴳ 2023, ⵉⵙⵓⵍ ⵓⵙⵎⴽⵍ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⴳⴰⵎⴰⵏⵜ (NLP) ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⵉⵙⵙⵏ ⴷ ⵢⴰⵜ ⵜⵣⵣⵉⴳⵉⵣⵜ ⵜⴰⴳⴰⵜⴰⵔⵜ ⴳ ⵉⵙⴳⴳⵯⴰⵙⵏ ⴰⴷ ⵉⴳⴳⵯⵔⴰⵏ. ⵜⵉⵡⵓⵔⵉⵡⵉⵏ ⵜⵉⴳⴰⵜⴰⵔⵉⵏ ⴳⵉⵙⵏⵜ ⴰⵚⵚⴽⵓ ⵏ ⵓⵍⵓⴳⵏ ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⵜⴰⵏⴰⵡⴰⵢⵜ (ⵄⴰⵟⴰⵍⵍⴰⵀ ⴷ ⴱⵓⵍⵥⵏⴰⴷⵍ, 2013), ⴰⵙⴱⵓⵖⵍⵓ ⵏ ⵢⴰⵏ ⵡⵓⴳⵔⵉⵡ ⵉⵍⵖⴰⵙⵏⴰⵢⵏ (ⵄⵎⵔⵉ ⴷ ⴰⴽⴽⵯ., 2017), ⴷ ⵡⴰⵍⴰⵢ ⴳ ⵓⵙⵏⵜⵍ ⵏ ⵜⴳⵓⵔⵉⵡⵉⵏ ⵜⵉⵎⴰⵣⵉⵖⵉⵏ (ⴼⴰⵡⵣⵉ ⴷ ⴰⴽⴽⵯ., 2023). ⵙ ⵜⵎⵔⵏⵉⵡⵜ, ⵢⴰⵏ ⵢⵉⵎⵉⵙ ⵏ ⵓⵙⴼⵜⵉ ⵏ ⵓⵎⵢⴰⴳ ⴰⵎⴰⵣⵉⵖ ⵉⵙⴱⵓⵖⵍⴰ ⵜ ⵄⴰⵟⴰⵍⵍⴰⵀ ⴷ ⴱⵓⵍⵥⵏⴰⴷⵍ (2014), ⴰⵎⵙⴰⴷⴰⵖ ⴷ ⵢⵉⵎⵉⵙ ⵏ ⵓⵔⵣⵣⵓ ⵉⵎⵙⴰⵙⴰⵏ ⴷ ⵜⴼⵉⵏⴰⵖ ⵡⵉⵏ ⵄⴰⵟⴰⵍⵍⴰⵀ ⴷ ⴱⵓⵍⵥⵏⴰⴷⵍ (2012). ⴽⵔⴰ ⵙⴳ ⵉⵎⵉⵙⵙⵏ ⴷ ⵉⵙⵓⴳⴰⵎⵏ ⴰⴷ ⵍⵍⴰⵏ ⵉ ⵓⵙⵎⵔⵔⵙ ⴳ ⵜⴳⵓⵔⵜ ⵏ ⵉⵔⴽⴰⵎ[1].

ⵙⴳ ⵜⵡⵓⵔⵉⵡⵉⵏ ⵜⵉⴳⴰⵜⴰⵔⵉⵏ ⵏ ⵜⵙⵓⵖⵍⵜ ⵜⴰⵡⵓⵔⵎⴰⵏⵜ ⵙ ⵓⵖⴱⴰⵍⵓ ⵢⵓⵇⵅⵎⵏ ⴳⵉⵙⵏⵜ ⴰⵙⵏⵜⵉ NLLB, ⴷⴰ ⵉⵙⵎⵓⵏⵏ ⵜⴰⵎⴰⵣⵉⵖⵜ ⴳⵔ 200 ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ ⴷⴰ ⵉⵙⵏⴰⵍ (ⵜⴰⵔⴰⴱⴱⵓⵜ ⵏ NLLB ⴷ ⴰⴽⴽⵯ., 2022). ⵉⴱⴷⴷ ⵓⵙⵏⵜⵉ ⴰⴷ ⵖⴼ ⵜⵉⴳⴳⴰⵢⵉⵏ ⵏ ⵓⵙⵍⵓⵖⵎ ⴷ ⵓⵙⵉⵜⴳ ⵏ ⴼⵍⵓⵔⵉⵙ (FLORES), ⴷⴰ, ⵎⴽ ⵍⵍⵉ ⵉⵔⴰ ⵓⵙⵏⵜⵉ ⵏ "ⴰⵡⴰⵍ" (Awal) ⴰⴷ ⵜ ⵉⵙⴽⵔ ⵓⵍⴰ ⵏⵜⵜⴰ, ⵉⵙⵖⴰⵡⵙⴰ ⵓⵙⵏⵓⵎ ⵉ ⵓⵙⴱⵓⵖⵍⵓ ⵉⵏⵖⴷⵏ (ⴳⵓⵢⴰⵍ ⴷ ⴰⴽⴽⵯ., 2022). SIB-200, ⴷⴰ ⵉⴳⴰⵏ ⴰⵙⵖⵅⵉⴼ ⵏ ⴼⵍⵓⵔⵉⵙ (FLORES), ⴷⴰ ⵢⴰⴽⴽⴰ ⵢⴰⵜ ⵜⴰⵙⴰⵖⵓⵍⵜ ⵜⴰⵎⴰⵢⵏⵓⵜ ⵉ ⵜⵙⵏⴰⵡⴰⵢⵜ ⵉⵙⴳⵓⵎⴰⵏⵏ ⴳ 205 ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ, ⴳⵉⵙⵏⵜ ⵜⴰⵎⴰⵣⵉⵖⵜ (ⴰⴷⵉⵍⴰⵏⵉ ⴷ ⴰⴽⴽⵯ., 2024). ⴰⵙⵏⵜⵉ ⵏ MADLAD, ⵉⴳⴰ ⵢⴰⵏ ⵓⵙⴱⵓⵖⵍⵓ

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ⴰⵅⴰⵜⴰⵔ ⵢⴰⴹⵏ, ⴷⴰ ⵢⴰⴽⴽⴰⵏ ⵢⴰⵜ ⵜⴳⴳⴰⵢⵜ ⵏ ⵉⵙⴼⴽⴰ ⵜⴰⵅⴰⵜⴰⵔⵜ ⵜⴰⴳⵜⵓⵜⵍⴰⵢⴰⵏⵜ ⴷⴰ ⵉⵜⵜⴰⵣⵣⵔⴰⵢⵏ ⴳ ⵓⵙⵡⵉⵔ ⵏ ⵡⴰⵔⵔⴰⵜⵏ, ⵉⴱⴷⴷ ⵖⴼ CommonCrawl, ⴷⴰ ⵉⵙⵏⵔⵏⴰⵢⵏ ⵉⵙⵓⴳⴰⵎⵏ ⵢⵉⵍⵉⵏ ⵉ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵜⵉⴷⵔⵓⵙⵉⵏ ⴳ ⵉⵙⵓⴳⴰⵎⵏ ⴰⵎ ⵜⵎⴰⵣⵉⵖⵜ (ⴽⵓⴷⵓⴳⵓⵏⵜⴰ ⴷ ⴰⴽⴽⵯ., 2023). ⵓⴳⴳⵓⵔ ⵏ ⵓⵢⴰ, ⴰⵙⵏⵜⵉ ⵏ GlotCC ⴷⴰ ⵢⴰⴽⴽⴰ ⵢⴰⵜ ⵜⴳⴳⴰⵢⵜ ⵏ ⵉⵙⴼⴽⴰ ⵜⴰⵢⵏⵜⵍⴰⵢⴰⵏⵜ ⵏ ⵢⵉⴳⵔ ⴰⵎⴰⵜⵜⴰⵢ ⵉⵜⵜⵓⵙⵓⴷⴷⵎⵏ ⵙⴳ CommonCrawl (ⴽⴰⵔⴳⴰⵔⴰⵏ ⴷ ⴰⴽⴽⵯ., 2024), ⴷⴰ ⵉⵙⵎⵓⵏⵏ ⵓⴳⴳⵓⵔ

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1 https://tal.ircam.ma/talam/

ⴰⵍⴱ ⵓⴽⵜⵉⵎ (ALP

ⵏ 1000 ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ, ⴷ ⵉⵙⵎⵏⵉⴷ GlotLID, ⵢⴰⵏ ⵓⵣⵓⵔⵜ ⵏ ⵓⵙⴽⵣ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵙ ⵓⵖⴱⴰⵍⵓ ⵉⵕⵥⵎⵏ ⵢⵓⵙⵉⵏ ⵓⴳⴳⵓⵔ ⵏ 2000 ⵏ ⵜⵎⴰⵜⴰⵔⵉⵏ, ⵙⵎⵓⵏⵏ ⵙ ⵙⵉⵏ ⵜⴰⵎⴰⵣⵉⵖⵜ ⵜⴰⵏⴰⵡⴰⵢⵜ ⵏ ⵡⴰⵎⵓⵔⵇⴽⵓⵛ ⴷ ⵜⵏⵜⴰⵍⵢⵉⵏ ⵢⴰⵄⵏⵉⵏ ⵏ ⵜⵎⴰⵣⵉⵖⵜ (ⴽⴰⵔⴳⴰⵔⴰⵏ ⴷ ⴰⴽⴽⵯ., 2023).

2.3. ⵜⵉⵖⴰⵔⴰⵙⵉⵏ ⵜⵉⵏⴰⵎⵓⵏⵉⵏ

ⵜⴰⵏⵥⵕⵜ ⵜⴰⵅⴰⵜⴰⵔⵜ ⴷⴰ ⵉⵜⵜⵏⴰⵍⵏ ⵜⴰⵎⴰⵣⵉⵖⵜ ⴷ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵢⴰⵄⵏⵉⵏ ⵜⵉⴷⵔⵓⵙⵉⵏ ⴳ ⵓⵙⵎⴷⵢⴰ ⴳ ⵓⵣⵎⵣ ⴰⵎⵓⴹⴹⵓⵏ ⵜⵙⴼⴰⵡ: ⵡⴰⵔ ⵉⵙⴼⴽⴰ ⵉⴳⴰ ⵡⴰⵔ ⵜⵉⵖⵉⵙⵜ ⵜⴰⵙⵎⴳⵓⵔⵜ (AI). ⵉⵣⵓⵔⴰⵜ ⵉⵎⵇⵇⵔⴰⵏⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⴷ ⵜⵉⴽⵏⵓⵍⵓⵊⵉⵢⵉⵏ ⵢⴰⵄⵏⵉⵏ ⵏ ⵜⵖⵉⵙⵜ ⵜⴰⵙⵎⴳⵓⵔⵜ (AI) ⴷⴰ ⵜⵜⴱⴷⴰⴷⵏ ⵖⴼ ⵜⵙⵎⴽⵜⵉⵏ ⵜⵉⵎⵇⵇⵔⴰⵏⵉⵏ ⵏ ⵉⵙⴼⴽⴰ ⴰⴼⴰⴷ ⴰⴷ ⵙⵡⵓⵔⵉⵏ ⵙ ⵜⵖⴰⵔⴰⵙⵜ ⵉⵎⵓⵔⵙⵏ. ⵉ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵜⵉⴷⵔⵓⵙⵉⵏ ⴳ ⵓⵙⵎⴷⵢⴰ ⴰⵎ ⵜⵎⴰⵣⵉⵖⵜ, ⴰⴼⵙⵙⴰⵢ ⵉⵙⵖⴰⵡⵙⴰ ⴰⵙⵏⴼⵍⵓⵍ ⵏ ⵜⵓⵎⴰⵢⵜ ⵜⴰⴳⴰⵎⴰⵏⵜ—ⵉⴱⵍⵓⴳⵏ, ⵉⴼⵉⴷⵢⵓⵜⵏ, ⴷ ⵉⵙⵓⴳⴰⵎⵏ ⵏ ⵡⴰⵏⵜⵉⵔⵏⵉⵜ—ⵓⵍⴰ ⵉⵥⵎⵎⴰⵥⵥⵍⵏ ⵏ ⵓⵙⵎⵓⵏ ⵓⵙⵔⵉⴷ ⵏ ⵉⵙⴼⴽⴰ ⴷⴰ ⵉⵜⵜⵢⵓⵙⴽⴰⵔⵏ ⵙ ⵜⵥⵍⴰⵢⵜ ⵉ ⵓⵙⵍⵓⵖⵎ ⵏ ⵜⵖⵉⵙⵜ ⵜⴰⵙⵎⴳⵓⵔⵜ (AI).

ⵜⵉⵙⵏⵜⴰⵢⵉⵏ ⵜⵉⵏⴰⵎⵓⵏⵉⵏ ⴼⴼⵖⵏⵜ ⴷ ⴰⵎ ⵢⴰⵏ ⵜⵎⵔⴰⵔⵓⵜ ⵖⴼ ⵜⴷⵔⵙⵉ ⵏ ⵓⵙⵎⴷⵢⴰ ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ ⴳ ⵉⵙⴰⵢⵔⴰⵔⵏ ⵉⵎⵓⴹⴹⵓⵏⵏ. ⵎⴽⴰⵏⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ ⴰⴷ ⴷⵔⵓⵙⵏⵜ ⴳ ⵡⴰⵏⵜⵉⵔⵏⵉⵜ, ⴰⵔ ⴷ ⵜⵜⴼⴼⵖⵏⵜ ⵙ ⵜⴷⵔⵙⵉ ⴳ ⵜⵎⵀⴰⵍ ⵏ ⵓⵎⵔⵓⵔⴷ ⵜⵉⵎⵇⵇⵔⴰⵏⵉⵏ ⵏ ⵡⴰⵏⵜⵓⵔⵏⵉⵜ ⴷⴰ ⵉⴳⴰⵏ ⵜⵉⵔⵙⴰⵍ ⵏ ⵜⵓⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵜⵉⵜⵔⴰⵔⵉⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ. ⵜⴰⴷⵔⴰⵡⵜ ⵜⴰⵏⴰⵎⵓⵏⵜ ⴳ ⵓⵙⵎⵓⵏ ⵏ ⵉⵙⴼⴽⴰ, ⴰⵎ ⴰⵣⵓⵔⵜ ⴰⵎⵢⴰⵡⴰⵙ ⵏ ⵡⵉⴽⵉⴱⵉⴷⵢⴰ, ⴷⴰ ⵉⵎⵓⵔⵙⵏ ⴳ ⵓⵚⴽⴽⵓ ⵏ ⵉⵙⵓⴳⴰⵎⵏ ⵉⵙⵏⵉⵍⵙⵏⵏ ⵉⵅⴰⵜⴰⵔⵏ. ⵉⵎⴷⵢⴰⵜⵏ ⵉⵅⴰⵜⴰⵔⵏ ⵢⴰⵄⵏⵉⵏ ⴳⵉⵙⵏ Common Voice (ⴰⵔⴷⵉⵍⴰ ⴷ ⴰⴽⴽⵯ., 2020), ⵜⴰⵜⵓⴱⴰ (Tatoeba)[2], ⵉⵎⵙⵍⵉⵜⵏ ⵏ ⵏⴰⵢⵊⴰ (NaijaVoices) ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵏ ⵉⴳⴱⵓ (Igbo), ⵀⴰⵡⵙⴰ (Hausa), ⴷ ⵢⵓⵔⵓⴱⴰ (Yoruba) (ⵉⵎⵉⵣⵓ ⴷ ⴰⴽⴽⵯ., 2025), ⴷ ⵓⵙⵎⵓⵏ ⵏ ⵉⵙⴼⴽⴰ ⵏ ⴷⴷⴰⵔⵉⵊⴰ[3].

ⴰⵏⴰⵡⵏ ⵏ ⵜⵙⵏⵜⴰⵢⵉⵏ ⴰⴷ ⵙⵎⵍⴰⵏ ⴷ ⵉⵙ ⵓⵍⴰ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵉⴳⴳⵯⵔⴰⵏⵜ ⵥⵄⴰⵕⵏⵜ ⴰⴷ ⴰⵡⵄⵏⵜ ⵙ ⵓⵙⵎⴷⵢⴰ ⴳ ⵜⵏⴰⴼⵓⵜⵉⵏ ⵉⵎⵙⵖⵏⵣⵉⵜⵏ ⵉⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵓⵍⴰ ⵉⵣⵓⵔⴰⵜ ⵏ ⵓⵖⴱⴰⵍⵓ ⵉⵕⵥⵎⵏ ⴳ ⵡⴰⴽⵓⴷ ⵏⵏⴰ ⴷⵔⵓⵏⵜ ⵜⵎⵓⵏⵉⵏ ⵙ ⵜⵉⴷⵜ ⴳ ⵜⵣⵎⵎⴰⵔ ⵏ ⵓⵙⵎⵓⵏ ⵏ ⵉⵙⴼⴽⴰ (ⵉⵎⵉⵣⵓ ⴷ ⴰⴽⴽⵯ., 2025; ⴳⵓⵏⵣⴰⵍⵉⵣ-ⴰⵅⵉⵔⵔⵉ ⴷ ⴰⴽⴽⵯ., 2024). ⵎⴳⴰⵍ ⵏ ⵜⵖⴰⵔⴰⵙⵜ ⴰⴷ ⵜⴰⴷⵔⴰⵡⴰⵏⵜ, ⴰⵙⴱⵓⵖⵍⵓ ⵏ ⵜⵉⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵉ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵜⵉⴷⵔⵓⵙⵉⵏ ⴳ ⵓⵙⵎⴷⵢⴰ ⵙ ⵓⵎⴰⵜⴰ ⴰⵔ ⵉⵄⴼⴼⵓⵕ ⵢⴰⵜ ⵜⵖⴰⵔⴰⵙⵜ ⵏ ⵓⴼⵍⵍⴰ ⵙ ⵡⴰⴷⴷⴰ, ⴷⴰ ⵙⵙⵡⵓⴷⴷⵓⵢⵏⵜ ⵜⵎⵔⵙⴰⵍ ⵜⵉⴽⴰⴷⵉⵎⵉⵏ ⵏⵖ ⵜⵎⵙⵙⵓⵔⵉⵏ ⵏ ⵜⴰⵜⵉⴽⵏⵓⵍⵓⵊⵉⵜ ⵙ ⵢⴰⵜ ⵜⴷⵔⴰⵡⵜ ⵜⴰⵏⴰⵎⵓⵏⵜ ⵉⴷⵔⵓⵙⵏ (ⵎⵓⵛⴰⴳⵉⵏ ⴷ ⴰⴽⴽⵯ., 2024; ⴱⵉⵔⴷ, 2020; ⵛⴼⴰⵔⵜⵣ, 2022). ⵜⴰⵖⴰⵔⴰⵙⵜ ⴰⴷ ⵜⵍⴰ ⵢⴰⵏ ⵉⵎⵉⵣⵉ ⴰⵅⴰⵜⴰⵔ ⵉ ⵜⵓⵜⵍⴰⵢⵉⵏ ⴷ ⵜⵎⵓⵏⵉⵏ ⵙ ⵓⵙⵎⴷⵢⴰ ⵓⵔ ⵉⵖⵓⴷⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵙ ⵜⴰⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵉⵜⵜⵢⵓⵚⴽⴰⵏⵉⵏ ⵙ ⵡⴰⵔ ⵜⴰⴷⵔⴰⵡⵜ ⵉⵍⴰⵏ ⴰⵏⴰⵎⴽ ⵙⴳ ⵜⵎⵓⵏⵉⵏ ⵏ ⵉⵎⵙⵙⴰⵡⴰⵍ. ⵎⴽ ⴷⴰ ⵉⵙⴽⴰⵣ ⴱⵉⵔⴷ (2020), ⵙ ⵓⵙⵎⴽⵍ ⵏ ⵜⵓⵙⵙⵏⴰ ⵜⴰⵣⵖⵔⴰⵏⵜ ⴰⵎ ⵜⵖⴰⵡⵙⴰ ⵏ ⵓⵣⵣⵏⵣ, ⴷ ⵉⵎⵣⵣⴰⵍⴰⵍ ⵏ ⵜⴰⵜⵉⴽⵏⵓⵍⵓⵊⵉⵜ ⵏ ⵡⴰⵡⴰⵍ ⴷ ⵜⵓⵜⵍⴰⵢⵜ ⵄⵕⵏ ⴳ ⵢⵉⵎⵉⵣⵉ ⵏ "ⵜⵓⴽⴽⵙⴰ ⵏ ⵉⵣⵔⴼⴰⵏ ⵉ ⵉⴷⵓⴱⴰ ⵏ ⵜⵓⵙⵙⵏⴰ ⵜⴰⴷⵖⴰⵔⴰⵏⵜ, ⴷ ⵡⴰⵍⵙ ⵏ ⵓⵙⴽⴰⵔ ⵏ ⵜⵎⵉⵏⵜⴰⵍ ⵏ ⵜⵎⴷⴼⴼⵔⵜ ⵏ

ⴰⵡⴰⵍ–ⵢⴰⵏ ⴻⵙⵏⵜⵉ ⵉⵖⵍⵉⵏ ⵙ ⵜⵣⵎⵔⵜ ⵏ ⵜⵎⴻⵏⵜ ⵉ ⴻⵙⵟⴻⵖⵍⴻⵏ ⵉⵙⴻⴳⴰⵎⵏⵏ

ⵜⴻⵜⵍⴰⵢⵜ." ⵜⴰⵖⴰⵔⴰ ⵏ ⵉⵙⵊⴽⴰ ⵏ ⴻⵙⵍⴻⵖⵎ ⴷⴰ ⵜⵜⴳⴰⵜⴰⵔ ⵙ ⵜⵥⵍⴰⵢⵜ ⴻⵍⴰ ⵉ ⵜⴻⵜⵍⴰⵢⵉⵏ ⵉⴳⴳⵯⵔⴰⵏⵜ, ⵎⴰⵏⵉ ⴳ ⵜⵥⴹⴰⵇ ⵜⴻⵎⴰⵢⵜ ⴻⵔ ⵉⵖⴻⴷⵏ

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2 http://tatoeba.org
3 https://www.atlasia.ma/

ⴰⴷ ⵜⵙⵔⵔⴽⵙ ⵜⵉⵙⵎⴷⵢⴰⵢⵉⵏ ⵜⵉⵎⵓⵟⵟⵓⵏⵉⵏ ⴷ ⴰⴷ ⵜⵣⵣⵓⵣⵔ ⵜⵓⵛⵛⴹⵉⵡⵉⵏ ⴳ ⵉⵏⴳⵔⴰⵡⵏ ⵏ ⵜⵖⵉⵙⵜ ⵜⴰⵙⵎⴳⵓⵔⵜ (AI) (ⴽⵔⵓⵢⵜⵣⵔ ⴷ ⴰⴽⴽⵯ., 2022; ⵍⴰⵡ ⴷ ⴰⴽⴽⵯ., 2025).

ⵉ ⵜⵎⴰⵣⵉⵖⵜ ⵙ ⵜⵅⵍⴰⵢⵜ, ⵎⵏⵏⴰⵡ ⵏ ⵜⵙⵏⵜⴰⵢⵉⵏ ⵜⵉⵏⴰⵎⵓⵏⵉⵏ ⴼⴼⵖⵏⵜ ⴷ ⴰⴼⴰⴷ ⴰⴷ ⵙⵎⴷⵏⵜ ⵜⴰⴷⵔⵙⵉ ⴰⴷ. ⴰⵙⵉⴷⴼ ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⴳ Google Translate ⵉⴳⴰ ⵢⴰⵏ ⵓⵎⴰⵜⴰⵔ ⴰⴳⴰⵜⴰⵔ, ⵡⴰⴳⴳⴰ ⵜⴰⵖⴰⵔⴰ ⵏ ⵜⵙⵓⵖⵍⵜ ⴳ ⵉⵙⵜⵣⵡⵔ ⵜⴳⴳⵯⵣ. ⵎⴰⵛⴰ, ⵜⵉⵡⵉⵙⵉ ⴷ ⵜⴷⵔⴰⵡⵜ ⵜⴰⵏⴰⵎⵓⵏⵜ ⵙⴱⵓⵖⵍⴰⵏⵜ ⵜⵕⵡⵉ ⵏ ⵓⵏⴳⵔⴰⵡ ⵉⵎⵉⵇ ⵙ ⵉⵎⵉⵇ, ⵎⴰ ⴰⴷ ⵉⴼⴽⴰⵏ ⴰⵜⵉⴳ ⵏ ⵜⴷⵔⴰⵡⵜ ⵏ ⵉⵎⵙⵙⴰⵡⴰⵍ ⴳ ⵓⵙⵖⵓⴷ ⵏ ⵜⵉⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ.

ⵜⴰⵎⵓⵏⵜ ⵏ ⵓⵙⵎⴽⵍ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⴳⴰⵎⴰⵏⵜ (NLP) ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⴳ Hugging Face[4] ⵜⵎⵎⵍ ⴷ ⵢⴰⵜ ⵜⵣⵎⵔⵜ ⵜⴰⵏⴰⵎⵓⵏⵜ ⵢⴰⴹⵏⵉⵏ ⵢⴰⴽ ⴰⴷ ⵜⵙⴱⵓⵖⵍⵓ ⵜⵉⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ. ⴰⵡⵜⵜⴰⵙ ⵏ ⵜⵎⵓⵏⵜ ⴰⴷ, ⴷⴳ ⵍⵍⴰⵏ 40 ⵏ ⵉⴳⵎⴰⵎⵏ, ⵉⴳⴰ ⵜ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵉⵣⵓⵔⴰⵜ ⴷ ⵉⵎⴰⵙⵙⵏ ⵉ ⵜⵎⴰⵣⵉⵖⵜ ⴳ ⵓⵙⵎⴽⵍ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⴳⴰⵎⴰⵏⵜ (NLP) ⴷ ⵜⵉⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵏ ⵡⴰⵡⴰⵍ. ⴳ ⵜⵡⵏⵏⴰⴹⵜ ⵏ ⵡⵉⴽⵉⴱⵉⴷⵢⴰ, ⵜⵓⵜⵜⵓⵙⵏⵜⴰ ⵜⵎⴰⵣⵉⵖⵜ ⵜⴰⵏⴰⵡⴰⵢⵜ ⵏ ⵡⴰⵎⵓⵔⴰⴽⵓⵛ ⴳ ⵓⵙⴳⴳⵯⴰⵙ ⵏ 2024[5], ⴰⴼⴰⴷ ⴰⴷ ⵜⵎⵓⵏ ⴷ ⵜⵏⵜⴰⵍⵢⵉⵏ ⵜⵉⵎⴰⵣⵉⵖⵉⵏ ⵢⴰⴹⵏⵉⵏ ⴷⴰ ⵉⵍⵍⴰⵏ, ⴳⵉⵙⵏⵜ ⵜⴰⵇⴱⴰⵢⵍⵉⵜ (ⵉⵜⵜⵓⵙⵏⵜⴰⵏ ⴳ 2007) ⴷ ⵜⵛⵍⵃⵉⵢⵜ (ⵉⵜⵜⵓⵙⵏⵜⴰⵏ ⴳ 2021), ⵉⵍⵉⵏⵜ ⵜⵏⵜⴰⵍⵢⵉⵏ ⵜⵉⵎⴰⵣⵉⵖⵉⵏ ⵢⴰⴹⵏⵉⵏ ⴳ ⵜⴼⵔⴽⵜ ⵏ ⵓⵙⴷⵍ.

ⴰⵔⵎⵎⵓⵙ ⵏ ⵓⵎⵓⵙⵙⵓ ⴰⴷ ⵉⵙⵙⴼⴰⵡ ⴰⵙⵉⵍⵖ ⵏ ⵓⵙⵏⵜⵉ ⵏ "ⴰⵡⴰⵍ" (Awal), ⴷⴰ ⵉⵔⴰⵏ ⴰⴷ ⵉⵙⴱⴷⴷ ⵜⵎⵙⵉⵔⵉⵏ ⵉⵜⵜⵡⴰⵍⵎⴰⴷⵏ ⵙⴳ ⵜⵣⵎⵎⴰⵔ ⵜⵉⵏⴰⵎⵓⵏⵉⵏ ⴷⴰ ⵢⴰⴷ ⵉⵍⵍⴰⵏ, ⵙ ⵓⵙⵎⴽⵍ ⵏ ⴽⵔⴰ ⵙⴳ ⵉⵡⵜⵜⴰ ⵏⵏⵙⵏⵜ.

3. ⴰⵙⵏⵜⵉ ⵏ ⵡⴰⵡⴰⵍ

ⴰⵙⵏⵜⵉ ⵏ Awal ("ⴰⵡⴰⵍ" ⵏⵖ "ⵉⵏⴰⵡ" ⵙ ⵜⵎⴰⵣⵉⵖⵜ) ⵉⴳⴰ ⵢⴰⵜ ⵜⵙⵏⵜⴰⵢⵜ ⵜⴰⵏⴰⵎⵓⵏⵜ ⵉⵅⵍⵉⵏ ⵙ ⵓⵃⵟⵟⵓ ⴷ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⴳ ⵓⵙⴰⵢⵔⴰⵔ ⴰⵎⵓⵟⵟⵓⵏ. ⵉⵜⵜⵓⵙⵏⵜⴰ ⴳ ⵓⵙⴳⴳⵯⴰⵙ ⵏ 2024 ⵙ ⵓⵎⵢⴰⵡⴰⵙ ⴳⵔ ⵜⵎⵔⵙⴰⵍ ⵜⵉⴽⴰⵟⴰⵍⴰⵏⵉⵏ ⵡⴰⵔ ⴰⴱⵖⵓⵔ ⴷⴰ ⵉⵙⴱⵓⵖⵍⵓⵏ ⵜⴰⵎⴰⵣⵉⵖⵜ ⴷ ⵜⴰⵜⵉⴽⵏⵓⵍⵓⵊⵜ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵢⵓⵕⵣⵎⵏ[6], ⵉⵔⴰ ⵓⵙⵏⵜⵉ ⴰⴷ ⵉⵙⴷⵓⵙ ⵜⵉⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵙ ⵜⵎⴰⵣⵉⵖⵜ ⵙ ⵓⵙⵉⴷⴷ ⵖⴼ ⵓⵙⵎⵓⵏ ⴰⵎⴳⵔⴰⵡ ⵏ ⵉⵙⴼⴽⴰ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵙⴳ ⵉⵎⵙⵙⴰⵡⴰⵍ ⵉⵣⵖⵔⴰⵏⵏ.

ⵉⵎⵉⵔ ⴰⴷ ⴰⵔ ⵉⵙⵎⵍⴰ ⵜⴰⴱⵔⵉⴷⵜ ⵏ ⵓⵙⵏⵜⵉ ⵏ "ⴰⵡⴰⵍ" (Awal), ⵜⴰⵎⵚⴽⴰⵡⵜ ⵏ ⵜⴱⴰⴷⵓⵜ, ⵉⵎⵓⵔⵔⵙⵏ ⵡⴰⵙⴰ ⴷ ⵉⵡⵜⵜⴰ ⵏⵏⵙ. ⴰⵔ ⵏⵣⵔⵔⴰⵡ ⴰⵏⴳⵔⴰⵡ ⵏ ⵓⵙⵎⵓⵏ ⵏ ⵉⵙⴼⴽⴰ ⵏ ⵜⵙⵓⵖⵍⵜ ⴷⴰ ⵉⵜⵜⵓⵙⵏⵙⵏ ⴳ awaldigital.org, ⵓⵍⴰ ⵜⵉⵣⵎⵎⴰⵔ ⵏ ⵓⵙⵎⵓⵏ ⵏ ⵉⵙⴼⴽⴰ ⵙ Common Voice, ⵏⵙⴽⵔ ⵜⴰⵙⵍⵟ ⵉ ⵜⵎⵙⵙⵉⵙⵡⵜ ⵏⵏⵙⵏ ⴳ ⵓⵚⴽⴽⵓ ⵏ ⵉⵙⵓⴳⴰⵎⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵉ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵓⵙⵎⴽⵍ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⴳⴰⵎⴰⵏⵜ (NLP) ⵏ ⵜⵎⴰⵣⵉⵖⵜ.

3.1. ***ⵜⵉⵣⵡⵉⵔⴰ ⴷ ⵉⵡⵜⵜⴰⵙⵏ ⵏ ⵓⵙⵏⵜⵉ***

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4 https://huggingface.co/Tamazight-NLP
5 https://zgh.wikipedia.org/
6 ⵙⵢⵉⵎⴰⵏ, ⵜⴰⴷⴷⴰⵔⵜ ⵜⴰⵎⴰⵥⵉⵖⵜ ⵅ ⴽⴰⵟⴰⵍⵓⵏⵢⴰ, ⴷ Col·lectivaT

ⴰⵍⴱ ⵓⴽⵜⵉⵎ (ALP

ⵓⵙⵏⵜⵉ ⵏ "ⴰⵡⴰⵍ" (Awal) ⵜⴻⵜⵜⵓⵙⵏⵜⴰ ⴳ ⴽⴰⵟⴰⵍⵓⵏⵢⴰ, ⴷⴳ ⵍⵍⴰⵏ ⵓⴳⴳⵓⵔ ⵏ 100,000 ⵏ ⵉⵎⵙⵙⴰⵡⴰⵍⵏ ⵙ ⵜⵎⴰⵣⵉⵖⵜ ⴳ ⵢⴰⵏ ⵡⴰⵎⵓⵔ ⴷⴰ ⵉⵍⴰⵏ ⴰⵎⵣⵔⵓⵢ ⴳ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵏⵏⵙ ⵉⴳⴳⵯⵔⴰⵏ ⴰⵎ ⵜⴰⴽⴰⵟⴰⵍⴰⵏⵜ ⴷ ⵜⵓⴽⵙⵉⵟⴰⵏⵜ ⵜⴰⵔⴰⵏⵉⵜ.

ⴰⵎⵏⴰⴹ ⴰⴷ ⴰⵔ ⴷ ⵉⵜⵜⴰⵡⵉ ⴰⵙⵏⴰⵍ ⴰⵎⵔⵔⵙⴰⵍⴰⵏ ⴷ ⵜⵓⵚⴽⵉⵡⵉⵏ ⵜⵉⵏⴰⵎⵓⵏⵉⵏ ⵉⵙⵖⴰⵡⵙⴰⵏ ⵉ ⵜⵙⵏⵜⴰⵢ ⵏ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵜⴰⵜⵉⴽⵏⵓⵍⵓⵊⵜ ⵏ ⵜⵓⵜⵍⴰⵢⵜ, ⵎⴽ ⵍⵍⵉ ⵉⵙⵎⵉⵍⵉ ⴳ ⵜⵙⵏⵜⴰⵢ ⵏ Aina[7] ⴷ Araina[8].

ⵉⵡⵜⵜⴰⵙⵏ ⵉⵅⴰⵜⴰⵔⵏ ⵏ ⵓⵙⵏⵜⵉ ⵏ "ⴰⵡⴰⵍ" (Awal) ⴳⵉⵙⵏ:

1. ⴰⵃⵟⵟⵓ ⴷ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⵙ ⵉⵎⴰⵙⵙⵏ ⵉⵎⵓⵟⵟⵓⵏⵏ ⵉⵙⵏⴼⵍⵓⵍⵏ,
2. ⴰⵣⵣⵓⴽⵔ ⵏ ⵜⴷⵔⴰⵡⵜ ⵜⴰⵏⴰⵎⵓⵏⵜ ⵙ ⵓⵙⵏⴼⵍⵓⵍ ⵏ ⵉⵙⴼⴽⴰ,
3. ⴰⵙⴱⵓⵖⵍⵓ ⵏ ⵜⴻⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵏ ⵜⵡⵉⵙⵉ ⵙ ⵓⵖⴱⴰⵍⵓ ⵢⵓⵇⵣⵎⵏ, ⴳⵉⵙⵏⵜ ⴰⵏⴳⵔⴰⵡ ⵏ ⵜⵙⵓⵖⵍⵜ ⵜⴰⵡⵓⵔⵎⴰⵏⵜ ⴷ ⵜⵓⴽⵣⴰ ⵏ ⵡⴰⵡⴰⵍ ⵉⵎⴰⴷⴷⴰⵏ ⴷ ⵜⵎⴰⵣⵉⵖⵜ,
4. ⴰⵙⵉⵍⵉ ⵏ ⵉⵙⵓⴳⴰⵎⵏ ⵉⵏⵎⵍⴰⵏⵏ ⵉ ⵓⵍⵎⵎⵓⴷ ⵏ ⵜⵓⵜⵍⴰⵢⵜ,
5. ⴷ ⵓⵙⴷⵓⵙ ⵏ ⵓⵎⵢⴰⵡⴰⴹ ⴳⵔ ⵉⵎⵙⵙⴰⵡⴰⵍⵏ ⴰⴼⴰⴷ ⴰⴷ ⵜⴷⵓⵙ ⵜⵎⴰⴳⵉⵜ ⵜⴰⴷⵍⵙⴰⵏⵜ.

ⵜⵉⵣⵎⵎⴰⵔ ⵜⵉⵎⵣⵡⵓⵔⴰ ⵙⵔⵙⵏⵜ ⴰⵙⵉⴷⴷ ⵖⴼ ⵓⵙⵎⵓⵏ ⴰⵡⴼⵓⵙ ⵏ ⵜⵡⵉⵏⴰⵙ ⵉⵜⵜⵓⵙⵓⵖⵍⵏ, ⵎⴰⵛⴰ ⵜⴰⵖⴰⵔⴰⵙⵜ ⴰⴷ ⵜⵙⵎⵍⴰ ⴷ ⵉⵙ ⵓⵔ ⵜⴳⴳⵓⴷⵉ ⵉ ⵓⵙⵎⵖⵓⵔ ⵙ ⵉⴼⴹⵏ ⵏ ⵜⵢⵓⴳⵉⵡⵉⵏ ⵏ ⵜⵡⵉⵏⴰⵙ ⴷⴰ ⵉⵜⵜⵓⵙⵔⴰⵏ ⵉ ⵢⴰⵜ ⵜⵙⵓⵖⵍⵜ ⵜⴰⵡⵓⵔⵎⴰⵏⵜ ⵉⵎⵓⵔⵙⵏ. ⵖⴼ ⵓⵢⴰ, ⵉⴹⴼⴰⵇ ⵓⵙⵏⵜⵉ ⴰⴷ ⵜⴰⵖⴰⵔⴰⵙⵜ ⵏ ⵡⴰⵏⵙⴰⵢ ⴰⵡⴰⵎⴰⵏ ⴷⴰ ⵉⵙⵙⴱⵖⴰⵙⵏ ⴰⴷⵔⴰ ⴰⵎⴰⵜⴰⵢ, ⴷ ⵓⵙⵖⴰⵎⴰ ⵏ ⵜⵖⴰⵔⴰ ⵙ ⵉⵎⵥⵍⴰ ⵏ ⵓⵙⴷⴷⵉⴷ ⵙ ⵉⵏⴳⴳⵯⴰ.

3.2. ***ⵜⴰⴷⴰⴱⵓⵜ ⵏ awaldigital.org***

ⵜⴰⴷⴰⴱⵓⵜ ⵏ awaldigital.org[9] ⵜⴳⴰ ⵜⴰⵔⵙⵍⵜ ⵏ ⵓⵙⵏⵜⵉ. ⴽⵔⴰⵢⴳⴰⵜ ⵓⵎⵙⵡⵓⵔⵉ ⵉⵣⵎⵔ ⴰⴷ ⵉⴽⵛⵎ ⵙ ⵢⵉⵏⵖⵎⵉⵙⵏ ⵖⴼ ⵓⵙⵏⵜⵉ ⴷ ⴰⴷ ⵉⵙⵎⵔⵙ ⵜⵉⵙⵏⵙⵉ ⵏ ⵜⵙⵓⵖⵍⵜ ⵜⴰⵡⵓⵔⵎⴰⵏⵜ ⵉⵜⵜⵓⵙⵉⴷⴼⵏ. ⵓⵏⵓⵖ 2 ⴰⵔ ⵉⵙⵎⵉⵍⵉ ⵜⴰⵙⵏⴰ ⵏ "ⵜⴰⴷⵔⴰⵡⵜ" ⵎⴰⵏⵉ ⴳ ⵣⵎⵔⵏ ⵉⵎⵙⵡⵓⵔⵉⵢⵏ ⵉⵜⵜⵓⵣⵎⵎⴰⵎⵏ ⴰⴷ ⴷⵔⵓⵏ ⵙ ⵜⵙⵓⵖⴰⵍ ⵏⵏⵙⵏ, ⵎⴰⵏⵉ ⴳ ⴷ ⵜⵙⵎⵍⴰ ⵜⵡⵉⵏⵙⵜ ⵜⴰⵖⴱⴰⵍⵓⵜ ⴳ ⵓⵥⵍⵎⴰⴹ ⴷ ⵜⵡⵉⵏⵙⵜ ⵏ ⵓⵡⵜⵜⴰⵙ ⴳ ⵓⴼⴰⵙⵉ. ⴷⴰ ⵙⵜⴰⵢⵏ ⵉⵎⵙⵡⵓⵔⵉⵢⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵉ ⵙⵏⴰⵜ ⵜⵙⴳⵉⵡⵉⵏ, ⵙ ⵜⵉⵅⵚⵚⵉ ⴰⴷ ⵜⴳ ⵢⴰⵜ ⴳⵉⵙⵏ ⵙ ⵜⴷⵔⵙⵉ ⵜⴰⵎⴰⵣⵉⵖⵜ, ⴷⴰ ⵎⴰ ⵜⴻⵜⵜⵢⴰⵔⴰ ⵙ ⵓⴳⵎⵎⴰⵢ ⵏ ⵜⴼⵉⵏⴰⵖ ⵏⵖ ⴰⵍⴰⵜⵉⵏ.

ⴰⵡⴰⵍ-ⵢⴰⵏ ⵓⵙⵏⵜⵉ ⵉⵖⵍⵉⵏ ⵙ ⵜⵣⵎⵔⵜ ⵏ ⵜⵎⵓⵏⵜ ⵉ ⵓⵙⴱⵓⵖⵍⵓ ⵏⵉⵙⵓⴳⴰⵎⵏⵏ

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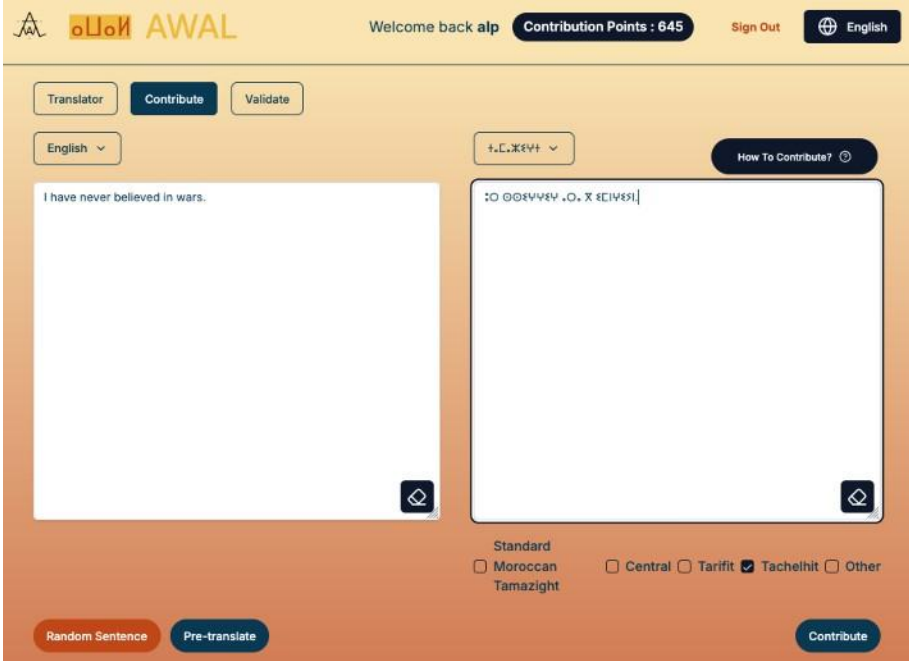
7 https://projecteaina.cat/
8 https://www.projecte-araina.org/
9 https://awaldigital.org/

ⴰⵍⴱ ⵓⴽⵜⵉⵎ (ALP



ⵓⵏⵓⵖ 2: ⵜⴰⵙⵏⴰ ⵏ "ⵜⴰⴷⵔⴰⵡⵜ" ⴷⴰ ⵜⵜⴰⴷⴼⴰ ⵉⵎⵙⵡⵓⵔⵉⵢⵏ ⵉⵜⵜⵓⵣⵎⵎⴰⵎⵏ ⴰⴷ ⵔⵏⵓⵏ ⵜⵉⵙⵓⵖⴰⵍ ⵏⵏⵙⵏ.

ⵣⵛⴰⵇⵏ ⵉⵎⵙⵡⵓⵔⵉⵢⵏ, ⵙ ⵓⴼⵔⴰⵏ ⵏⵏⵙⵏ, ⴰⴷ ⵙⵔⵙⵏ ⵜⴰⵏⵜⴰⵍⴰ ⵙ ⵜⵜⴰⵔⴰⵏ. ⵜⴰⵎⵣⵍⴰⵢⵜ ⵏ "ⵜⵡⵉⵏⵙⵜ ⵜⴰⵎⵙⴰⵎⵎⴰⵜ" ⴰⵔ ⴷ ⵜⵙⵙⵉⴽⵍⵉ ⵜⵉⵡⵉⵏⴰⵙ ⵙⴳ ⵜⵙⵉⵍⴰ ⵏ ⵉⵙⴼⴽⴰ ⵏ ⵉⵛⵇⵉⵚⵏ ⵉⵍⴰⵏ ⵜⵓⵔⴰⴳⵜ ⵏ Creative Commons ⵙ ⵜⵏⴰⴽⴰ ⵏ ⵓⵖⴱⴰⵍⵓ.

ⴰⵙⵜⴰⵢ ⵏ "ⵜⴰⵣⵡⴰⵔⵔⵙⵓⵖⵍⵜ" ⴰⵔ ⵜⵙⵙⵓⵖⵓⵍ ⵙ ⵜⵖⴰⵔⴰⵙⵜ ⵜⴰⵡⵓⵔⵎⴰⵏⵜ ⴰⵛⵇⵉⵚ ⴰⵖⴱⴰⵍⵓ ⵙ ⵜⵓⵜⵍⴰⵢⵜ ⵏ ⵓⵡⵜⵜⴰⵙ ⵙ ⵓⵙⵎⵔⵙ ⵏ ⵓⵣⵓⵔⵜ ⵏ ⵜⵙⵓⵖⵍⵜ ⵜⴰⵡⵓⵔⵎⴰⵏⵜ ⵉⵜⵜⵓⵙⵉⴷⴼⵏ.

ⵉⵅⵚⵚ ⵉⵍⵎⵎⴰ ⵖⴼ ⵉⵎⵙⵡⵓⵔⵉⵢⵏ ⴰⴷ ⵙⵖⵓⴷⵏ ⵜⴰⵙⵓⵖⵍⵜ ⴰⴷ ⴷⴰⵜ ⵏ ⵡⴰⵣⵏ ⵏⵏⵙ, ⵎⴰ ⴰⴷ ⵉⵙⴽⴰⵔⵏ ⵢⴰⵏ ⵓⵣⵓⵣⵣⵔ ⵏ ⵜⵡⵓⵔⵉ ⵏ ⵛⴰⵇⵜ-ⴰⵙⵖⴷ ⴷⴰ ⵉⵙⴱⵓⵖⵍⵓⵏ ⵜⵉⵇⵡⵉ.

ⵢⴰⵏ ⵓⵏⴳⵔⴰⵡ ⵏ ⵜⵙⴼⵓⵔⴰⵔⵜ ⴰⵔ ⵢⴰⴽⴽⴰ ⵜⵉⵏⵟⵟⴰⵛ ⵖⴼ ⴽⵔⴰⵢⴳⴰⵜ ⵓⵙⴽⴽⵉⵍ ⵉⵜⵜⵓⵙⵉⴷⴼⵏ ⴳ ⵙⵏⴰⵜ ⵜⵏⴰⴽⵡⵉⵏ ⵏ ⵓⵖⴱⴰⵍⵓ ⴷ ⵓⵡⵜⵜⴰⵙ, ⴷ ⵣⵛⴰⵇⵏ ⵉⵎⵙⵡⵓⵔⵉⵢⵏ ⴰⴷ ⵣⵇⵏ ⴰⵙⵎⵉⵍ ⵏⵏⵙⵏ ⴳ ⵜⴼⵍⵡⵉⵜ ⵏ ⵉⵎⵣⵡⵓⵔⴰ. ⵉⵎⵉⵙ ⴰⴷ ⴷⴰ ⵉⵙⴽⴰⵔ ⵢⴰⵏ ⵓⵎⵏⴰⵛ ⵏ ⵓⵎⵣⵉⵣⵡⵔ ⵏ ⵓⵙⴰⵜⵍ, ⴷ ⴰⵔ ⵜⵙⵙⴱⵖⴰⵙ ⵜⴰⴷⵔⴰⵡⵜ ⵉⵙⵓⵍⵏ.

ⴰⵏⴳⵔⵓⴷⵎ ⵏ ⵜⵙⵓⵖⵍⵜ ⴰⵔ ⵜⵙⵏⴰⵍ ⵜⴰⵙⵓⵖⵍⵜ ⵜⴰⵙⵉⵏⴰⵏⵉⵍⴰⵏⵜ ⴳⵔ ⵜⵎⴰⵣⵉⵖⵜ ⴷ

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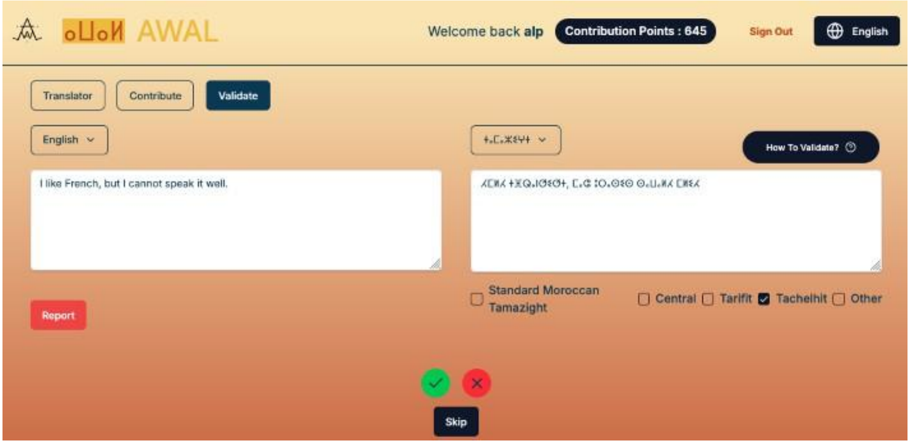
ⵎⵏⵏⴰⵡⵜ ⵜⵓⵜⵍⴰⵢⵉⵏ, ⴳⵉⵙⵏⵜ ⵜⴰⴽⴰⵟⴰⵍⴰⵏⵜ, ⵜⴰⵄⴱⵍⵢⵓⵏⵜ, ⵜⴰⵃⵇⴰⵏⵙⵉⵙⵜ, ⴷⴰⴹⵔⵉⵊⴰ, ⴷ ⵜⵏⴳⵍⵉⵣⵜ. ⵜⴰⴷⵔⴰⵡⵜ ⵙ ⵜⵢⵓⴳⵉⵡⵉⵏ ⵏ ⵜⵡⵉⵏⴰⵙ ⵜⵀⵜⵜⵢⵓⵔⴰⴳ ⵓⵍⴰ ⵙ ⵜⵓⵜⵍⴰⵢⵉⵏ ⴰⴷ.

ⴰⵍⴱ ⵓⴽⵜⵉⵎ (Alp



ⵓⵏⵓⵖ 3: ⴰⵎⵉⵅⴰⵇ ⵏ ⵓⵙⴷⴷⵉⴷ.

ⴰⵙⵡⴰⵜⵜⵓ ⵏ ⵜⵖⴰⵔⴰ ⵉⵜⵜⵓⵙⴽⴰⵔ ⵙ ⵓⵙⴷⴷⵉⴷ ⵙ ⵉⵏⴳⴳⵯⴰ (ⵜⴰⵡⵍⴰⴼⵜ 3), ⴷⴳ ⴷⴰ ⵣⵣⵔⴰⵢⵏ ⵉⵎⵙⵡⵓⵔⵉⵏ ⵜⵉⵙⵓⵖⵉⵍⵉⵏ ⴷⴰ ⴼⴽⴰⵏ ⵡⵉⵢⵢⴰⴹ. ⵉⵎⵙⴷⴷⵉⴷⵏ ⴷⴰ ⵙⵙⵎⵔⴰⵙⵏ ⵉⵎⴰⵏⴰⵔⵏ ⵏ ⵜⵉⵔⵉⵜ ⵉⴱⴷⴷⴰⵏ ⵖⴼ ⵓⵏⴰⵎⴽ, ⵜⴰⵙⵍⵓⵍⵜ, ⴷ ⵜⵓⴳⵣⵜ ⵜⴰⵊⵇⵇⵓⵎⵜ, ⴰⵏⴷⴰ ⵙⵏⴰⵜ ⵏ ⵜⵏⵖⵣⵉⵡⵉⵏ ⴷⴰ ⵙⵙⵉⴷⴷⵉⵏⵜ ⵜⵉⴽⵛⵉⵎⵉⵏ ⵖⵔ ⵓⵎⴰⴳⵔⴰⴷ ⵉⵜⵜⵓⵙⵖⵣⵏ ⵙ ⵓⵙⴷⴷⵉⴷ ⵙ ⵉⵏⴳⴳⵯⴰ. ⵙⵉⵏ ⵉⵣⵣⵔⵉⵜⵏ ⵏ ⵓⵙⵖⵣⵏ ⴰⵔ ⵙⵙⵎⵓⵜⵜⵓⵢⵏ ⵜⵓⴷⵉⴼⵉⵏ ⵙ ⵡⵓⴳⵔⵉⵡ ⵉⵜⵜⵓⵙⵖⵣⵏⵏ.

ⵜⴰⵎⴰⴳⵉⵜ ⵜⴰⵎⵅⵇⵉⵢⵜ ⵏ ⵜⴱⴰⴷⵓⵜ ⴰⵔ ⵜⵙⵎⵉⵍⵉ ⵜⴰⵎⴰⴳⵉⵜ ⵜⴰⴷⵍⵙⴰⵏⵜ ⵜⴰⵎⴰⵣⵉⵖⵜ ⴷ ⴰⵔ ⵜⵜⵔⴰⵔⴰ ⵖⴼ ⵉⵙⴱⴷⴰⴷⵏ ⵉⵅⵍⵉⵏ ⵙ ⵜⵓⵜⵍⴰⵢⵜ, ⵙ ⵜⵅⵍⴰⵢⵜ ⴰⵎⵣⴰⵔⴰⵢ ⵏⵏⵙ ⴰⵏⵜⴰⵍⴰⵏ ⴷ ⵉⵎⵣⴰⵔⴰⵢⵏ ⵏ ⵓⴳⵎⵎⴰⵢ. ⴳ ⵓⴷⵖⴰⵔ ⵏ ⵓⵙⵔⵓⵙ ⵏ ⵢⴰⵏ ⵓⵙⵏⵡⴰⵢ ⴰⵏⵜⴰⵍⴰⵏ ⵉⵥⵥⵓⵔⵏ, ⴰⵔ ⵉⵙⴱⵔⵔⴰⴽ "ⴰⵡⴰⵍ" (Awal) ⵙ ⵜⴷⵔⴰⵡⵉⵏ ⵏ ⵉⵎⵙⵙⴰⵡⴰⵍⵏ ⵏ ⴰⴽⴽⵯ ⵜⴰⵏⵜⴰⵍⴰⵢⵉⵏ ⵜⵉⵎⴰⵣⵉⵖⵉⵏ[10].

3.3. ***ⴰⵙⵎⵓⵏ ⵏ ⵉⵙⴼⴽⴰ ⵏ ⵉⵎⵙⵍⵉ ⵙ Common Voice***

ⴰⵙⵎⵓⵏ ⵏ ⵉⵙⴼⴽⴰ ⵏ ⵉⵎⵙⵍⵉ ⵉⵜⵜⵓⵙⴽⴰⵔ ⵙ ⵜⴱⴰⴷⵓⵜ ⵏ Common Voice ⵏ ⵎⵓⵅⵉⵍⵍⴰ[11]. ⴰⵙⵉⴷⴼ ⴰⴷ ⵉⴳⵟⵟ ⵜⴰⵙⵓⵖⵍⵜ ⵏ ⵓⵏⴳⵔⵓⴷⵎ ⵏ ⵜⴱⴰⴷⵓⵜ ⵙ ⵜⵎⴰⵣⵉⵖⵜ ⴷ ⵓⵙⴳⴰⵜⴰⵔ ⵏⵏⵙ ⵙ ⵢⴰⵜ ⵜⴳⵔⵓⵎⵎⴰ ⵏ ⵜⵡⵉⵏⴰⵙ ⵉⵡⴰⵍⵎⵏ ⵉ ⵓⵣⵎⵎⵓⵎ. ⵓⵏⵓⵖ ⵡⵉⵙⵙ 4 ⴰⵔ ⵜⵙⵎⵉⵍⵉ ⴰⵎⵉⵅⴰⵇ ⵏ ⵓⵣⵎⵎⵓⵎ. ⴷⴰ ⵥⵥⵔⴰⵏ ⵉⵎⴷⵔⴰⵡⵏ ⵜⵉⵡⵉⵏⴰⵙ ⴷⴰ ⵅⵇⵇⴰⵏ ⵙ ⵉⵎⵙⵍⵉ ⵏⵏⵙⵏ ⵢⴰⵜⵜⵓⵢⵏ, ⵙⵙⵉⵍⵖⵏ ⵢⴰⵏ ⵡⵓⴳⵔⵉⵡ ⵏ ⵡⴰⵡⴰⵍ ⵉ ⵓⵙⴽⵣ ⴰⵡⵓⵔⵎⴰⵏ ⵏ ⵡⴰⵡⴰⵍ.

10 ⴷⴰ ⵜⴱⴹⴹⵓ ⵜⴱⴰⴷⵓⵜ ⵜⵉⴷⵔⴰⵡⵉⵏ ⵖⴼ ⵙⵎⵎⵓⵙⵜ ⵜⵎⵣⴰⵔⴰⵢⵉⵏ: ⵜⴰⵎⴰⵣⵉⵖⵜ ⵜⴰⵏⴰⵡⴰⵢⵜ ⵏ ⵡⴰⵎⵓⵔⴰⴽⵓⵛ, ⵜⴰⵎⴰⵣⵉⵖⵜ ⵏ ⵡⴰⵎⵎⴰⵙ, ⵜⴰⵔⵉⴼⵉⵜ, ⵜⴰⵛⵍⵃⵉⵢⵜ, ⴷ ⵜⵉⵢⴰⴹ. ⴰⵙⵎⵉⵍ ⴰⴷ ⵉⴳⴰ ⵢⴰⵏ ⵓⵎⵙⴰⵙⴰ ⴰⵜⵡⴰⵍⴰⵏ ⴳⵔ ⵜⴰⵏⵏⴰⵢⵉⵏ ⵜⵉⵏⴰⵎⵓⵏⵉⵏ ⵉⵎⵣⴰⵔⴰⵢⵏ ⵖⴼ ⵓⵙⵏⵡⴰⵢ ⴰⵏⵜⴰⵍⴰⵏ, ⴷ ⴰⵔ

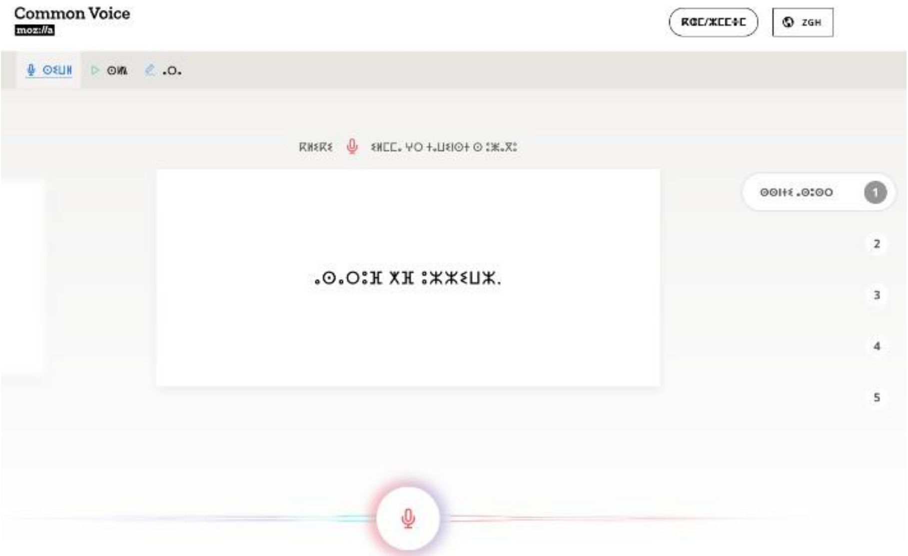
ⴰⵡⴰⵍ-ⵢⴰⵏ ⵓⵙⵏⵜⵉ ⵉⵖⵍⵉⵏ ⵙ ⵜⵣⵎⵔⵜ ⵏ ⵜⵎⵓⵏⵜ ⵉ ⵓⵙⵃⵓⵖⵍⵓ ⵏ ⵉⵙⵓⴳⴰⵎⵏⵏ

19 ⵉⵙⵉⵜⵜⵉ ⵙ ⵜⵉⵅⵚⵚⵉ ⴽⵔⴰ ⵏ ⵜⵏⵜⵍⴰⵢⵉⵏ, ⵙ ⵜⵥⵍⴰⵢⵜ ⵜⵉⴷⴰ ⵉⵍⵍⴰⵏ ⴳ ⵃⵇⵇⴰ ⵏ ⵡⴰⵎⵓⵔⴰⴽⵓⵛ.

11 https://commonvoice.mozilla.org/zgh

ⴰⵍⴱ ⵓⴽⵜⵉⵎ (ALP

ⴰⵙⴱⵓⵖⵍⵓ. ⵉⵍⵍⴰ ⴷⴰⵖ ⵢⴰⵏ ⵓⵏⴳⵔⴰⵡ ⵏ ⵓⵙⴷⴷⵉⴷ ⵙ ⵉⵏⴳⴳⵯ ⴳ "Common Voice".



ⵓⵏⵓⵖ 4: ⴰⵙⵎⵓⵏ ⵏ ⵉⵙⴼⴽⴰ ⵏ ⵉⵎⵙⵍⵉ ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⵙ Common Voice.

3.4. ⵜⴰⴷⵔⴰⵡⵜ ⵜⴰⵏⴰⵎⵓⵏⵜ ⴷ ⵜⵣⵎⵎⴰⵔ ⵏ ⵓⵣⵓⵣⵔ

ⵜⵣⵎⵎⴰⵔ ⵍⵖ ⵏ ⵓⵣⵣⵓⵣⵔ ⵏⵙⵙⵏⵎⵔⵙ ⵙⴳⵉⵙⵏⵜ ⴰⵎⵎⴰⴽⵏ ⵏ ⵓⵎⵢⴰⵡⴰⴹ ⵏⴰⵎⵓⵍⵍ ⴰⵎ ⵉⵏⵙⵜⴰⴳⵕⴰⵎ, ⴼⵉⵙⴱⵓⴽ, ⵍⵉⵏⴽⴷⵉⵏ, ⴷ ⵜⴱⴰⴷⵓⵜⵉⵏ ⵏ ⵜⵉⵍⵉⴳⵕⴰⵎ, ⴳ ⵜⴰⵎⴰ ⵏ ⵓⴼⵙⵉⵔⵏ ⴳ ⵉⵎⵏⵓⵇⵇⴰⵔⵏ ⵉⴷⵍⵙⴰⵍⵍ ⴷ ⵢⴰⵏ ⵓⴷⴰⵜⴰⵜⵓⵏ ⴰⵎⴰⵜⴰⵔ.

Datathon Awal ⵉⵜⵜⵓⵙⵏⵎⴰⵍⴰ ⴳ 17 ⴼⵓⵔⴰⵔ ⵏ ⵓⴷⴳⴳⵯⴰⵙ ⵏ 2024 ⴳ ⴱⴰⵔⵛⴰⵍⵓⵏⴰ, ⵉⴳⴰ ⴰⵎⵏⵓⵇⵇⴰⵔ ⵏ ⵓⵙⵉⴷⴼ ⵏ ⵓⵙⵏⵜⵉ. ⵙ ⵓⵙⵏⵎⴰⵍⴰ ⵍⵍⵙ ⵙ ⵓⵙⵔⵉⴷ ⴷ ⵓⵍⴰ ⴳ ⵓⴷⵖⴰⵔ, ⵉⵣⵎⵔ ⵓⴷⴰⵜⴰⵜⵓⵏ ⴰⴷ ⵏ ⵜⴰⴳⴳⴰⵔⴰ ⵏ ⵉⵎⴰⵍⴰⵙⵙ ⴰⴷ ⵉⵙⵎⵓⵏ ⵙ ⵓⵎⵓⵔⵙ ⵓⴳⴳⵓⵔ ⵏ 3,500 ⵏ ⵜⵡⵉⵏⴰⵙ ⵉⵜⵜⵓⵙⵓⵖⵍⵏ ⴷ ⵢⴰⵜ ⵜⵙⵔⴰⴳⵜ ⵏ ⵉⵣⵎⵎⴰⵎⵏ ⵏ ⵉⵎⵙⵍⵉ ⵙ ⵜⵎⴰⵣⵉⵖⵜ, ⵙ ⵜⴷⵔⴰⵡⵜ ⵙⴳ ⴽⴰⵟⴰⵍⵓⵏⵢⴰ, ⴰⵎⵓⵔⴰⴽⵓⵛ, ⴷ ⵉⴷⵖⴰⵔⵏ ⵉⵎⵣⴰⵔⴰⵢⵏ ⵏ ⵚⴱⵍⵢⵓⵏ. ⵍⵍⵉⴼ ⵓⵎⵏⵓⵇⵇⴰⵔ ⴰⴷ, ⵉⵙⴽⵔ ⵓⵙⵏⵜⵉ ⵜⵉⵙⵡⵓⵔⵉⵡⵉⵏ ⴷ ⵓⴼⵙⵉⵔⵏ ⵉⵜⵜⵡⴰⵡⵜⵜⴰⵙⵏ ⴳ ⴱⵉⵍⴱⴰⵡ, ⵜⵓⵕⵟⵓⵙⴰ, ⴷ ⴱⵉⴽ.

3.5. ⵉⵙⵏⵎⴽⵜⴰⵜⵏ ⵜⵉⵎⴰⵢⵏⵓⵜⵉⵏ ⴷ ⵓⴽⵛⴰⵎ ⵙ ⵉⵙⴼⴽⴰ

ⴰⵔ 13 ⵢⵓⵏⵢⵓ 2025, ⵜⵙⵎⵓⵏ ⵜⴱⴰⴷⵓⵜ 286 ⵏ ⵉⵎⵙⵡⵓⵔⵉⵢⵏ ⵉⵜⵜⵓⵣⵎⵎⴰⵎⵏ, ⵎⴰⵛⴰ ⵖⴰⵙ 66 ⵏ ⵙⴳⵉⵙⵏ (23%) ⴰⴷ ⵉⴷⵔⵓⵏ ⵙ ⵜⵙⵓⵖⴰⵍ ⴳ ⵜⴱⴰⴷⵓⵜ. ⵉⵎⵙⵡⵓⵔⵉⵢⵏ ⴷⴰ ⵉⵇⵇⵉⵎⵏ ⵣⵎⵎⵓⵎⵏ ⵎⴰⵛⴰ ⵓⵔ ⵙⵙⴽⵛⵎⵏ ⴰⵡⴷ ⴽⵔⴰ ⵏ ⵜⵓⵎⴰⵢⵜ. ⵙⴳ ⵜⵣⵡⵉⵔⴰ ⵍⵍⵙ ⴳ ⵢⵍⵍⴰⵢⵔ ⵏ ⵓⵙⴳⴳⵯⴰⵙ ⵏ 2024, ⵜⵙⵎⵓⵏ ⵜⴱⴰⴷⵓⵜ 6,421 ⵏ ⵜⴷⵔⴰⵡⵉⵏ ⵙ ⵓⵎⴰⵜⴰ, ⴳⵉⵙⵏⵜ

2,182 (34%) ⵜⵜⵓⵙⵖⵣⴰⵏⵜ. ⴳⵔ ⵉⵎⵙⵡⵓⵔⵉⵢⵏ ⵉⴷⵔⴰⵡⵏ, ⴰⵏⴰⵎⵎⴰⵙ ⵉⴳⴰ 86 ⵏ ⵜⴷⵔⴰⵡⵉⵏ ⵉ ⴽⵓ ⵓⵎⵙⵡⵓⵔⵉ .

ⵓⵟⵟⵓⵏ ⵏ ⵜⵙⵓⵖⴰⵍ ⵉⵜⵜⵓⵙⵎⵓⵏⵏ ⵉ ⴽⵓ ⵜⵢⵢⵓⴳⴰ ⴰⵔ ⵉⵍⵍⴰ ⴳ ⵓⵖⴰⵡⴰⵙ 1. ⵜⴰⴽⴰⵟⴰⵍⴰⵏⵜ-ⵜⴰⵎⴰⵣⵉⵖⵜ (ⴰⵙⴽⴽⵉⵍ ⴰⵍⴰⵜⵉⵏ) ⵙⵎⵍⴰ ⴷ ⵉⵙ ⵜⴳⴰ ⵜⴰⵢⵢⵓⴳⴰ ⵜⴰⵎⵣⵡⴰⵔⵓⵜ ⴰⴽⴽⵯ ⴳ ⵓⴼⴰⵔⵙ ⵙ ⵎⴰⵢⴷ ⵉⵍⴽⵎⵏ 1,718 ⵏ ⵜⴷⵔⴰⵡⵉⵏ, ⵜⴹⴼⵕ ⵜⵜ ⵜⴰⵏⴳⵍⵉⵣⵜ-ⵜⴰⵎⴰⵣⵉⵖⵜ (ⴰⵙⴽⴽⵉⵍ ⵏ ⵜⵉⴼⵉⵏⴰⵖ) ⵙ 1,539 ⵏ ⵜⴷⵔⴰⵡⵉⵏ, ⴷ ⵜⵚⴱⵍⵢⵓⵍⵜ-ⵜⴰⵎⴰⵣⵉⵖⵜ (ⴰⵙⴽⴽⵉⵍ ⴰⵍⴰⵜⵉⵏ) ⵙ 1,203 ⵏ ⵜⴷⵔⴰⵡⵉⵏ.

ⵜⴰⵎⴰ ⵏ ⵜⵙⵓⵖⴰⵍ ⵏ ⵉⴹⵕⵉⵚⵏ, ⵉⵙⵎⵓⵏ ⵓⵙⵏⵜⵉ ⵏ "ⴰⵡⴰⵍ" (Awal) 3 ⵏ ⵜⵙⵔⴰⴳⵉⵏ ⵏ ⵉⵙⴼⴽⴰ ⵏ ⵉⵎⵙⵍⵉ ⵙ ⵜⴱⴰⴷⵓⵜ ⵏ Common Voice, ⵍⵍⴰⵏⵜ ⴳⵉⵙⵏⵜ 2 ⵏ ⵜⵙⵔⴰⴳⵉⵏ ⵜⵜⵓⵙⵖⵣⴰⵏⵜ[12].

	ⵜⵉⴼⵉⵏⴰⵖ	ⴰⵍⴰⵜⵉⵏ	ⵜⴰⵎⵓⵜⵜⵔⵜ
ar	11	10	21
ary	311	136	447
ca	395	1718	2113
es	90	1203	1293
en	1539	693	2232
fr	83	232	315
ⵜⴰⵎⵓⵜⵜⵔⵜ	2429	3992	6421

ⵜⴰⴼⵍⵡⵉⵜ 1: ⵜⴰⴷⵔⴰⵡⵜ ⴳ ⴽⵓ ⵜⴰⵢⵓⴳⵜ ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ ⴰⵔ 13/06/2025.

ⴰⵔ ⵏⵜⵜⴷⵔⴰⵡ ⴰⴽⴽⵯ ⵙⴼⴽⴰ ⵉⵡⵏⵜⵓⵜⵍⴰⵢⴰⵏⵏ ⵏ ⵓⴹⵕⵉⵚ ⵙ ⵜⵙⴳⵉⵜ ⵏⵏⵖ ⴳ Hugging Face[13] ⴳ ⵜⵉⵣⵉ ⴷⴳ ⵉⵣⵎⵔ ⵢⴰⵏ ⴰⴷ ⵉⴽⵛⵎ ⵖⵓⴷⴰ ⵙ ⵉⵙⴼⴽⴰ ⵏ ⵉⵎⵙⵍⵉ ⵙⴳ ⵜⴱⴰⴷⵓⵜ ⵏ Common Voice[14]. ⵜⵓⴽⴽⵙⵉⵡⵉⵏ ⵜⵉⵏⵎⵢⴰⵔⵉⵏ ⵏ ⵉⵙⴼⴽⴰ ⵙⴳ ⵜⴱⴰⴷⵓⵜ ⵏ "ⴰⵡⴰⵍ" (Awal) ⴰⵔ ⵜⵜⴹⵎⴰⵏⵏⵜ ⴰⴷ ⵜⵇⵇⵉⵎ ⵜⵙⴳⵉⵜ ⴰⵔ ⵜⵙⵙⴽⵛⴰⵎ ⵜⵉⴷⵔⴰⵡⵉⵏ ⵜⵉⵎⴰⵢⵏⵓⵜⵉⵏ. ⵉⵙⵖⴰⵍⵏ ⵏ ⵉⵙⴼⴽⴰ ⴳ ⵜⵉⵣⵉ ⵏ ⵜⵉⴷⵜ ⵍⵍⴰⵏⵜ ⴳ ⵜⴰⵙⵏⴰ ⵏ ⵓⵙⵏⵓⴱⴳ ⵏ "ⴰⵡⴰⵍ" (Awal).

3.6. ⵉⵡⵜⵜⴰ, ⵜⵉⵏⵥⵕⵉⵏ ⴷ ⵓⴱⵔⵉⴷ ⵖⵔ ⴷⴰⵜ

ⵏⵏⵉⴼ 18 ⵏ ⵡⴰⵢⵢⵓⵔⵏ ⵏ ⵜⴷⵔⴰⵡⵜ ⵜⴰⵏⴰⵎⵓⵏⵜ, ⵉⵙⵎⵍⴰ ⴷ ⵓⵙⵏⵜⵉ ⵏ "ⴰⵡⴰⵍ" (Awal) ⵎⵏⵏⴰⵡⵜ ⵜⵏⵥⵕⵉⵏ ⴷⴰ ⵉⵍⴰⵏ ⵢⵢⴹⵉⵚ ⵖⴼ ⵜⴷⵔⴰⵡⵜ ⴷ ⵜⵎⵙⵙⵉⵙⵡⵜ ⵏ ⵓⵙⵎⵓⵏ ⵏ ⵉⵙⴼⴽⴰ. ⵙ ⵜⵡⵉⵙⵉ ⵏ ⵉⵎⵙⵏⴰⵍⴰⵜⵏ ⴷ ⵉⵎⵙⵡⵓⵔⵉⵢⵏ ⴷ ⵉⵎⴷⵔⵓⵡⵏ, ⵏⵓⴼⴰ ⵉⴱⵓⴷⴰ ⵉⴳⴰⵜⴰⵔⵏ ⴷⴰ ⵉⵙⴼⵔⴰⵡⵏ ⵎⴰ ⵖⴼ ⵓⵔ ⵜⵉⵡⴹ ⵜⵙⵏⵜⴰⵢⵜ ⵙ

ⴰⵍⵟ ⴻⴽⵜⵉⵎ (Alp

12 ⴰⵙⵙⴻⴼⵖ ⵏ ⴻⵎⴰⵡⴰⵍ ⴰⵎⵣⵣⴰⵔⴻ ⵏ ⵜⵅⴻⵔⵉ 22.0 (Common Voice Corpus 22.0 release)

13 https://huggingface.co/datasets/collectivat/amazic

14 https://commonvoice.mozilla.org/en/datasets

23

ⵉⵙⵡⵉⵔⵏⵏ ⵜⴷⵔⴰⵡⵜ ⴷⴰ ⵙ ⵏⵍⵍⴰ ⴰⵔ ⵏⵜⵜⵇⵇⵍ ⴳ ⵓⵎⵣⵡⴰⵔⵓ. =ⵉⵙⵎⵍⴰ ⴰⵖ ⵓⵙⴼⵙⵉ ⵏⵏⵖ ⵚⴹⵉⵚⵜ ⵜⵔⴳⴰⵍⵉⵏ:

1. **ⴰⴳⴷⵓⴷ ⴰⵎⴰⵜⴰ ⵏ ⵉⴰⵎⵙⴰⵡⴰⵍⵏ ⵙ ⵜⵎⴰⵣⵉⵖⵜ ⵓⵔ ⴼⵉⵍⵙⵏ ⴳ ⵜⵣⵎⵎⴰⵔ ⵏⵏⵙⵏ ⴳ ⵜⵖⵓⵔⵉ ⴷ ⵜⵉⵔⵔⴰ.** ⵎⵏⵏⴰⵡ ⵏ ⵎⴷⴷⵏ ⵓⵔ ⵙⵙⵉⵏⵏ ⵉ ⵜⵉⴼⵉⵏⴰⵖ ⴷ ⵓⵔ ⴷⵊⵉⵏ ⵓⴼⵉⵏ ⴰⵣⵎⵣ ⴰⴷ ⵜ ⵍⵎⴷⵏ. ⵡⴰⴳⴳⴰ ⴳⴰⵏ ⵉⵎⵙⵙⴰⵡⴰⵍⵏ ⵉⵣⵖⵔⴰⵏⵏ, ⴰⵅⵚⵚⴰⵚ ⴳ ⵉⴳⵎⴰⵎⵏ ⵏ ⵜⴳⵔⴰⵡⵜ ⵙⵎⵍⴰⵏ ⴷ ⵢⴰⵜ ⵜⵓⵔⴷⴰ ⵉⵖⵓⵟⵟⴰⵏ ⵖⴼ ⵜⵣⵎⵎⴰⵔ ⵏⵏⵙⵏ ⴳ ⵜⵉⵔⵔⴰ. ⴰⵡⴷ ⵡⵉⴷⴰ ⵉⵜⵜⴰⵔⴰⵏ ⵙ ⵜⵎⴰⵣⵉⵖⵜ ⵙ ⵓⴳⵎⵎⴰⵢ ⴰⵍⴰⵜⵉⵏ ⴳ ⵜⵔⴰⵟⵟⵓⵜⵉⵏ ⵏ ⵓⵎⵢⴰⵣⴰⵍ ⵏ ⵜⵡⵊⴰ ⵏⵖ ⴰⵎⵎⴰⴽⵏ ⵏ ⵓⵎⵢⴰⵡⴰⴹ, ⴰⵔ ⵙⴰⵇⵇⵓⵍⵏ ⴳ ⵜⵉⵔⵔⴰ ⵏⵏⵙⵏ ⵜⴰⵔⴰⵎⴰⴷⴷⵓⴷⵜ ⵉⵙ ⵓⵔ ⵜⵡⴰⵍⵎ ⵉ ⵉⵡⵜⵜⴰⵙⵏ ⵏ ⵓⵙⵎⵓⵏ ⵏ ⵉⵙⴼⴽⴰ. ⵉⵎⴷⵔⵓⵡⵏ ⴳ ⵜⵉⵙⵡⵓⵔⵉⵡⵉⵏ ⴰⵔ ⵜⵜⵉⵏⵉⵏ ⵎⵏⵏⴰⵡ ⵏ ⵜⵉⴽⴽⴰⵍ ⵎⴰⵙ "ⵓⵔ ⵜⵜⴰⵔⴰⵏ ⵙ ⵜⵖⴰⵔⴰⵙⵜ ⵉⵣⴷⴷⵉⴳⵏ" ⵏⵖ "ⵓⵔ ⵙⵙⵉⵏⵏ ⵜⴰⵍⵖⴰ ⵜⴰⵏⴰⵡⴰⵢⵜ". ⴰⵢⴰ ⴰⵔ ⵜⵏ ⵉⵜⵜⴰⴷⵊⴰ ⴰⴷ ⴽⴽⵙⵏ ⵉⴳⴼⴰⵡⵏ ⵏⵏⵙⵏ ⵙⴳ ⵜⴷⵔⴰⵡⵜ ⴳ ⵓⴷⵖⴰⵔ ⴷⴳ ⵔⴰⴷ ⵜⵜⵓⵣⵎⵎⵓⵎ ⵜⵉⵔⵔⴰ ⵏⵏⵙⵏ ⴷ ⴰⴷ ⵜⵜ ⵥⵕⵏ ⵡⵉⵢⵢⴰⴹ.
2. **ⵜⵓⵣⵣⵉⴼⵜ ⵏ ⵜⵙⵓⵖⵍⵜ ⵜⴰⵎⵥⵥⵢⴰⵏⵜ ⴰⵔ ⴷ ⵜⵜⴼⴼⵖⵏⵜ ⴰⵎ ⵢⴰⵜ ⵜⵖⴰⵔⴰⵙⵜ ⵉⵙⵉⵔⵎⵏ ⵉ ⵓⵙⵏⴼⵍⵓⵍ ⵏ ⵉⵙⴼⴽⴰ.** ⵜⵉⵣⵎⵎⴰⵔ ⵜⵉⵎⵉⵔⴰⵏⵉⵏ ⵏ ⵉⵎⵏⵣⴰⵖⵏ-ⵉⵎⵙⵏⵉⵍⵙⵏ ⴰⵔ ⵙⵔⵓⵙⵏⵜ ⵜⴰⵍⵍⵉⵏ ⵖⴼ ⵓⵙⵟⵖⵙ ⵏ ⵎⴷⴷⵏ ⵖⴼ ⵜⵉⵔⵔⴰ. ⴷ ⴰⵔ ⴷ ⵉⵇⵇⵍⵓⵢ ⵓⵙⵓⵖⵍ ⴰⵎ ⵢⴰⵜ ⵜⵖⴰⵔⴰⵙⵜ ⵉⵙⵉⵔⵎⵏ ⵉ ⵓⵙⵏⴼⵍⵓⵍ ⵏ ⵜⵓⵎⴰⵢⵜ. ⴳ ⵓⴷⵖⴰⵔ ⴰⴷ ⵏⵉⵏⵉⵢ ⵉ ⵉⵎⴷⵔⵓⵡⵏ ⴰⴷ ⵙⵏⴼⵍⵓⵍⵏ ⴰⴹⵕⵉⵚ ⴰⵣⵖⵔⴰⵏ, ⵜⵉⴽⴽⵉ ⵏ ⵜⵓⵎⴰⵢⵜ ⵏ ⵓⵖⵟⴰⵍⵓ ⵙ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵢⴰⴹⵏⵉⵏ—ⵏⵖ ⴰⴽⴽⵯ ⵜⵓⵎⴰⵢⵜ ⵉⵜⵜⵓⵙⵏⴼⵍⵓⵍⵏ ⵙ ⵜⵖⵉⵙⵜ ⵜⴰⵙⵎⴳⵓⵔⵜ (AI)—ⴰⵔ ⵉⵜⵜⴽⴽⵙ ⴰⵡⵜⵜⵓ ⴰⵙⵏⴼⵍⵓⵍⴰⵏ ⴷⴰ ⵉⴳⴷⵍⵏ ⴽⵉⴳⴰⵏ ⵖⴼ ⵜⴷⵔⴰⵡⵜ. ⵜⴰⵖⴰⵔⴰⵙⵜ ⴰⴷ ⵜⵙⵎⵍⴰ ⴷ ⴰⵎⵓⵔⵔⵙ ⴳ ⵜⵟⴰⴷⵓⵜⵉⵏ ⴰⵎ Tatoeba, ⴷⴳ ⵜⵉⵡⵉ ⴷ ⵜⵙⵓⵖⵍⵜ ⵜⴰⵎⴷⵔⴰⵡⵜ ⵙ ⵓⵙⵎⵓⵏ ⵏ ⵢⴰⵜ ⵜⵓⵎⴰⵢⵜ ⵜⴰⵎⵇⵔⴰⵏⵜ ⵏ ⵜⵎⴰⵣⵉⵖⵜ ⴳ ⴽⵉⴳⴰⵏ ⵏ ⵜⵏⵜⵍⴰⵢⵉⵏ. ⵉⵎⵉⵙ ⵏ ⵓⵙⴰⴳⵎ ⴰⵡⵓⵔⵎⴰⵏ ⵏ ⵜⵡⵉⵏⴰⵙ ⴳ ⵜⵟⴰⴷⵓⵜ ⵏ "ⴰⵡⴰⵍ" (Awal) ⴰⵔ ⵉⵜⵜⴽⴽⵙ ⴰⵡⵜⵜⵓ ⴰⴷ ⵙ ⵜⵓⴽⴽⵙⴰ ⵏ ⵜⵎⵓⴽⵔⵉⵙⵜ ⵏ "ⵎⴰ ⵔⴰⴷ ⴰⵔⴰⵖ?" ⴷⴰ ⵉⴳⴷⵍⵏ ⵜⴰⴷⵔⴰⵡⵜ.
3. **ⴰⵎⴰⵜⴰ ⵏ ⵜⴷⵔⴰⵡⵉⵏ ⴰⵔ ⴷ ⵜⵜⴰⵛⴽⴰⵏⵜ ⵙⴳ ⵉⴳⵎⴰⵎⵏ ⵏ ⵜⴳⵔⴰⵡⵜ ⵙⴳ ⵉⵎⵙⴷⴰⵡⵉⵢⵏ, ⵉⵎⵙⵏⵉⵍⵙⵏ, ⴷ ⵉⵎⵖⵏⴰⵙⵏ.** ⵡⴰⴳⴳⴰ ⵍⴽⵎⵏ ⴰⵖ ⴷ ⴽⵉⴳⴰⵏ ⵏ ⵜⵎⵔⴰⵔⵓⵜⵉⵏ ⵜⵓⵎⵏⵉⴳⵉⵏ ⵙⴳ ⵓⴳⴷⵓⴷ ⴰⵎⴰⵜⴰ ⴳ ⵉⵎⵏⵓⵇⵇⴰⵔⵏ, ⴰⵎⴰⵜⴰ ⵏ ⵉⴹⵉⵚ ⴳ ⵎⴰⴷ ⵉⵣⴷⵉⵏ ⵙ ⵓⴽⵔⵙⴰⵢ ⵏ ⵉⵙⴼⴽⴰ ⵢⵓⵛⴽⴰ ⴷ ⵙⴳ ⵉⵎⵖⵏⵖⵙⵏ ⴷ ⵉⵎⵙⴷⴰⵡⵉⵢⵏ ⴷⴰ ⵢⴰⴷ ⵉⵙⵙⵏⵏ ⴰⵜⵉⴳ ⵏ ⵜⵙⵎⵓⵚⵚⵓⵏⵜ ⵏ ⵜⵓⵜⵍⴰⵢⵜ—ⵎⴷⴷⵏ ⴷⴰ ⵢⴰⴷ ⵉⵙⵡⵡⵓⵔⵉⵏ ⴳ ⵜⵎⵙⵎⵓⵏⵉⵏ ⵜⵉⴷⵍⵙⴰⵏⵉⵏ, ⵉⵎⵔⵣⵓⵜⵏ, ⵏⵖ ⵡⵉⴷⴰ ⵉⵍⴰⵏ ⴰⵙⵍⵓⵖⵎ ⴰⵎⴰⴷⴷⵓⴷ ⴳ ⵜⵙⵏⵉⵍⵙⵜ. ⴰⵣⵓⵔⵜ ⵏ ⵓⵙⵎⵓⵏ ⴰⵎⴰⴳⵔⴰⵡ ⵉⵟⴷⴷ ⵖⴼ ⵢⴰⵏ ⵓⵙⵡⵉⵔ ⵏ ⵜⵖⵓⵔⵉ ⴷ ⵜⵉⵔⵔⴰ ⴷ ⵓⵙⵏⴰⵡⴰⵢ ⴷⴰ ⵓⵔ ⵉⵎⵛⴰⵛⴽⴰⵏ ⴷ ⵜⵉⵍⴰⵡⵜ ⵜⵉⵎⵉⵔⴰⵏⵜ ⵏ ⵓⴳⴷⵓⴷ ⴰⵎⴰⵜⴰ ⵉⵙⴰⵡⴰⵍⵏ ⵙ ⵜⵎⴰⵣⵉⵖⵜ, ⵙ ⵜⵥⵍⴰⵢⵜ ⴳ ⵓⵣⵡⴰⴳ. ⵉⵇⵇⴰⵏ ⴷ ⵖⴼ ⵓⵙⵏⵜⵉ ⴰⴷ ⵉⵙⵔⵙ ⵜⵉⵣⵎⵎⴰⵔ ⵏⵏⵙ ⵖⴼ

ⴰⵍⴱ ⵓⴽⵜⵉⵎ (Alp

ⵓⴳⴷⵓⴷ ⴰⴷ ⵓⵥⵍⴰⵢ ⵉⴳ ⵉⵔⴰ ⴰⴷ ⵉⵙⴽⵔ ⵉⵄⵉⵕ ⴳ ⵎⴰⴷ ⵉⵣⴷⵉⵏ ⵙ ⵓⴽⵙⴰⵢ ⵏ ⵉⵙⵃⴽⴰ, ⴳ ⵜⵉⵣⵉ ⴷⴰ ⴳ ⵔⴰⴷ ⵉⵛⵄⵓ ⴰⵣⵣⵓⵣⵔ ⵏⵏⵙ ⵉ ⵓⴳⴷⵓⴷ ⴰⵎⴰⵜⴰ ⴰⵃⴰⴷ ⴰⴷ ⵢⴰⴷⵊ ⵎⴷⴷⵏ ⴰⴷ ⵉⵙⴰⵏⵏ ⵓⴳⴳⵓⵔ ⵖⵃ ⵜⴰⵜⵉⴽⵏⵓⵍⵓⵊⵜ ⴷ ⴰⴷ ⵓⵙⴱⵖⵙⵏ ⴰⵃⴰⴷ ⴰⴷ ⵙⴱⵓⵖⵍⵓⵏ ⵜⵉⵣⵎⵎⴰⵔ ⵏⵏⵙⵏ ⴳ ⵜⵖⵓⵔⵉ ⴷ ⵜⵉⵔⵔⴰ.

4. **ⵓⵔ ⵉⵍⵍⵉ ⴽⵔⴰ ⵏ ⵓⵎⵙⴰⵙⴰ ⵖⵃ ⵓⵙⵎⴷⵢ ⵏ ⵜⵏⵜⴰⵍⵉⵢⵉⵏ ⴳ ⵜⴱⴰⴷⵓⵜ.**

ⵉⵡⵜⵜⵙ ⵓⵙⵏⵜⵉ ⴰⴷ ⵉⵙⴱⵔⵔⴽ ⴰⵎⵣⴰⵔⴰⵢ ⴰⵏⵜⴰⵍⴰⵏ ⵙ ⵓⵛⵄⴹⵓ

ⵏ ⵜⵖⴰⵔⴰ ⵏ ⵉⵙⴼⴽⴰ ⵙ ⵢⴰⵏ ⵓⵏⴳⵔⴰⵡ ⵏ ⵓⵙⵎⴰⵜⴰⵔ ⵏ ⵜⴷⵔⴰⵡⵉⵏ ⴷⴰ ⵉⵜⵜⴰⴷⵊⴰⵏ ⵉⵎⵙⵎⵔⴰⵙⵏ ⴰⴷ ⵙⵎⴰⵜⵔⵏ ⵜⴰⵏⵜⴰⵍⴰ ⵏⵏⵙⵏ. ⵎⴰⵛⴰ ⵜⴰⵖⴰⵔⴰⵙⵜ ⴰⴷ ⵜⵙⵎⵍⴰ ⴷ ⵜⵉⵎⵓⴽⵔⵉⵙⵉⵏ ⴳ ⵜⵡⵏⵏⴰⴹⵜ ⵜⴰⵎⵙⵏⵉⵍⵙⵜ ⵜⴰⵎⴰⵣⵉⵖⵜ. ⵜⴰⵎⴰⵣⵉⵖⵜ ⵜⴰⵏⴰⵡⴰⵢⵜ ⵜⴰⵎⵕⵕⵓⴽⵜ ⵜⵇⵇⵉⵎ ⵓⵔ ⵜⵜⵢⴰⵙⵙⴰⵏ ⴷⴰⵔ ⵎⵏⵏⴰⵡ ⵏ ⵉⵎⵙⵙⴰⵡⴰⵍⵏ ⵏ ⵓⵣⵡⴰⴳ ⴷ ⵡⵉⴷⴰ ⵢⵍⵎⴷⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵙ ⵜⵉⵎⵎⴰⵡⵜ ⴳ ⵜⴳⵎⵎⵉ. ⴳ ⵢⴰⵜ ⵜⵙⴳⴰ ⵢⴰⴹⵏⵉⵏ, ⴰⵔ ⵜⵙⵙⵓⵜⵓⵔ ⵜⴳⵔⴰⵡⵜ ⵜⴰⵙⴷⴰⵡⴰⵏⵜ ⴰⴷ ⵓⵔ ⵜⵜⵓⵙⵎⵔⴰⵙⵏ ⵉⵙⵎⴰⵜⴰⵔⵏ ⵉⵏⵜⴰⵍⴰⵏⵏ ⴰⴽⴽⵯ, ⴰⵛⴽⵓ ⵜⵍⵍⴰ ⵢⴰⴷ ⵜⴰⵎⵓⵏⵜ ⴳ ⵜⴰⵍⵖⴰ ⵏ ⵜⵉⵔⵔⴰ.

5. **ⴰⵎⵎⵔⴽⵙ ⵏ ⵡⴰⵡⴰⵍ ⴷ ⵜⵣⴷⴳⵉ ⵜⴰⵙⵏⵉⵍⵙⴰⵏⵜ ⴰⵔ ⴷ ⴰⴽⴽⴰⵏⵜ ⵜⵉⵏⵥⵕⵉⵏ ⵉ ⵜⵖⴰⵔⴰ ⵏ ⵉⵙⴼⴽⴰ.** ⵜⵉⴳⵔⴰⵡⵉⵏ ⵏ ⵓⵣⵡⴰⴳ ⴰⵔ ⵙⵙⴽⵛⴰⵎⵏⵜ ⴽⵉⴳⴰⵏ ⵏ ⵜⵉⴽⴽⴰⵍ ⵉⵔⵎⴰⵏ ⵙⴳ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵏ ⵜⵎⵣⴷⵓⵖⵜ ⵏⵏⵙⵏ, ⴳ ⵜⵉⵣⵉ ⴷⴳ ⵉⵎⵙⵙⴰⵡⴰⵍⵏ ⴳ ⵡⴰⵎⵓⵔⴰⴽⵓⵛ ⴰⵔ ⵔⴽⴽⵙ ⴷⴷⴰⵔⵉⵊⴰ ⴳ ⵜⵎⴰⵣⵉⵖⵜ ⵏⵏⵙⵏ. ⵜⵓⴼⵉⵜ ⵏ ⵜⴳⵓⵔⵉⵡⵉⵏ ⵜⵉⵎⴰⵣⵉⵖⵉⵏ ⵏ ⵜⵉⴷⵜ ⴳⵄⵄⵏⵜ ⵢⴰⵏ ⵓⵔⵣⵣⵓ ⵉⵖⵓⴱⴱⴰⵏ ⴳ ⵜⵏⵜⴰⵍⵉⵢⵉⵏ ⴷ ⵜⵎⵏⴰⴹⵉⵏ, ⵓⵍⴰ ⴰⴷⵡⵍ ⵙ ⵜⵎⵣⴰⵔⴰⵢⵉⵏ ⵏ ⵜⵎⵉⵣⴰⵔ ⵢⴰⴹⵏⵉⵏ—ⵢⴰⵜ ⵜⵡⵓⵔⵉ ⴷⴰ ⵉⵙⵓⵜⵓⵔⵏ ⵜⴰⵎⵓⵣⴰⵢⵜ ⵜⴰⵙⵏⵉⵍⵙⴰⵏⵜ ⴳ ⵓⴷⵖⴰⵔ ⵏ ⵜⵓⵙⵙⵏⴰ ⵜⴰⴳⴰⵎⴰⵏⵜ. ⵏⵥⵕⴰ ⵎⴰⵙ ⴷ ⵜⵉⵎⵖⴰⵔⵉⵏ ⵜⵉⴳⴰⵜⴰⵔⵉⵏ ⴳ ⵓⵣⵡⴰⴳ ⵙⵓⵍⵏⵜ ⵓⵎⵥⵏⵜ ⵜⴰⵍⵖⵉⵡⵉⵏ ⵜⵉⵏⵜⴰⵍⴰⵏⵉⵏ ⵉⵣⴷⴷⵉⴳⵏ ⴳ ⵓⵙⵎⵣⴰⵣⴰⵍ ⴷ ⵉⵎⵙⵙⴰⵡⴰⵍⵏ ⵉⵎⵥⵥⵢⴰⵏⵏ. ⴰⵢⴰ ⴰⵔ ⵉⵙⵎⴰⵜⴰⵔ ⵎⴰⵙ ⴷ ⵉⴹⵉⵄ ⵏ ⵓⵏⵢⴰⵍⴽⴰⵎ ⴰⵜⵓⵜⵍⴰⵢⴰⵏ ⴰⵔ ⵜⵜⴳⴳⴰⴷⴰⵢ ⴳⵔ ⵜⵙⵓⵜⵉⵏ ⴷ ⵓⵣⴰⵣⵓ ⴰⵔⴰⴽⴰⵍ ⵖⴼ ⵜⴳⵔⴰⵡⵉⵏ ⵜⵉⵣⵖⵔⴰⵏⵉⵏ.

6. **ⵢⴰⵜ ⵜⵖⴰⵔⴰⵙⵜ ⵜⴰⴳⵔⴰⵖⵍⴰⵏⵜ ⵜⵣⴹⴰⵕ ⴰⴷ ⵜⵙⵏⴼⵍⵓⵍ ⵓⴳⴳⵓⵔ ⵉⴹⵉⵄ.** ⵜⴰⵙⵓⴼⵖⵜ ⵏ ⵜⵓⵎⴰⵢⵜ ⴷⴰ ⵉⵍⵍⴰⵏ ⵙ ⵓⵎⴰⵜⴰ ⵙ ⵜⴽⴰⵟⴰⵍⴰⵏⵜ ⵜⵙⴷⵔⵓⵙ ⴰⵍⴽⴰⵎ ⵙ ⵓⵣⵡⴰⴳ ⵉⵎⴰⵣⵉⵖⵏ ⵉⴳⵔⴰⵖⵍⴰⵏⵏ ⴳ ⴱⵍⵊⵉⴽⴰ, ⴼⵕⴰⵏⵙⴰ, ⴷ ⵜⵎⵏⴰⴹⵉⵏ ⵢⴰⴹⵏⵉⵏ, ⴷ ⵜⴳⴷⵍ ⴰⵡⴷ ⴰⵙⵉⵡⴹ ⴷ ⵉⵎⵣⴷⴰⵖⵏ ⴳ ⵡⴰⵎⵓⵔⴰⴽⵓⵛ, ⴷⴰ ⵔⴰⴷ ⵢⴰⵡⵙⵏ ⴳ ⵓⵙⵎⵖⵓⵔ ⵏ ⵜⴷⵔⴰⵡⵜ ⵙ ⵜⵖⴰⵔⴰⵙⵜ ⵜⴰⴳⴰⵜⴰⵔⵜ. ⴰⵢⴰ ⵔⴰⴷ ⵉⴳⵄⵄ ⴰⵎⵢⴰⵡⴰⵙ ⴷ ⵜⵎⵔⵙⴰⵍ ⴳ ⴱⵕⵕⴰ ⵏ ⴽⴰⵟⴰⵍⵓⵏⵢⴰ, ⵎⴰ ⵢⴰⴷ ⵓⵔ ⵉⵜⵜⴰⴷⵊⴰ ⴰⵙⴰⵜⵉ ⴰⵎⵉⵔⴰⵏ.

ⵡⴰⴳⴳⴰ ⵍⵍⴰⵏⵜ ⵜⵉⵏⵥⴰⵕ ⴰⴷ, ⵉⵙⵎⵍⴰ ⴷ ⵓⵙⵏⵜⵉ ⵉⴱⵔⵉⴷⵏ ⵉⵍⴰⵏ ⴰⵜⵉⴳ ⵙ ⴷⴰⵜ. ⴰⵙⴱⵔⵔⴽ ⵓⵎⵏⵉⴳ ⴷ ⵓⴼⵔⵔⴰ ⴰⵎⵉⵔⵉⵡ ⴷⴰ ⴷ ⵉⵙⵏⴼⵍⵓⵍ ⵓⵙⵏⵜⵉ ⵏ "ⴰⵡⴰⵍ" (Awal) ⴰⵔ ⵉⵙⵎⴰⵜⴰⵔ ⵖⴼ ⵓⵙⵎⴽⵍ ⴰⵎⵇⵔⴰⵏ ⵏ ⵜⴳⵔⴰⵡⵜ ⴳ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵜⴰⵜⵉⴽⵏⵓⵍⵓⵊⵜ ⵏ ⵜⵓⵜⵍⴰⵢⵜ. ⵎⵏⵏⴰⵡ ⵏ ⵎⴷⴷⵏ, ⵙ ⵜⵎⵏⵜⵉⵍⵜ ⵏ ⵜⵙⵏⵜⴰⵢⵜ ⴰⴷ, ⵙⵙⵎⵖⵓⵔⵏ ⵙ ⵜⵙⵡⵉⵏⴳⵎⵜ ⵎⴰⵙ ⴷ ⵜⴻⵜⵉⴽⵏⵓⵍⵓⵊⵉⵏ ⵜⵉⵎⵏⵉⴷⵉⵏ ⵣⴹⴰⵕⵏⵜ ⴰⴷ ⵉⵍⵉⵏⵜ ⵓⵍⴰ ⵙ ⵜⵓⵜⵍⴰⵢⵜ ⵏⵏⵙⵏ ⵜⴰⵢⵎⵎⴰⵜ.

ⴰⵎ ⵓⴱⵔⵉⴷ ⵙ ⴷⴰⵜ, ⵜⴰⵖⴰⵔⴰⵙⵜ ⵉⵙⵉⵔⵎⵏ ⴰⴽⴽⵯ ⴰⵔ ⵜⵙⵓⵜⵓⵔ ⴰⵙⵣⴷⵉ ⵏ ⵜⵣⵎⵎⴰⵔ ⵖⴼ ⵜⴳⵔⴰⵡⵉⵏ ⵜⵉⵙⴷⴰⵡⴰⵏⵉⵏ ⴷ ⵜⵉⵏ ⵉⵎⵖⵏⴰⵙⵏ ⴷⴰ ⵉⴹⵟⴼⵏ ⵜⴰⵎⵓⵣⴰⵢⵜ ⵜⴰⵎⵙⵏⵉⵍⵙⵜ ⴷ ⵜⵓⵙⵙⵏⴰ ⵜⴰⵜⵉⴽⵏⵓⵍⵓⵊⵜ ⵉ ⵓⵃⵟⵟⵓ ⴰⵎⵓⵟⵟⵓⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ. ⵉⵎⴷⵔⵓⵡⵏ ⴰⴷ ⵣⵎⵔⵏ ⴰⴷ ⵄⴽⴽⵓⵏ ⵜⵉⴳⵔⵓⵎⵎⵉⵡⵉⵏ ⵏ ⵉⵙⴼⴽⴰ ⵏ ⵜⵔⵙⴰⵍ ⴳ ⵜⵉⵣⵉ ⴷⴳ ⴰⵔ

ⴰⵍⵟ ⵓⴽⵜⵉⵎ (Alp

ⵉⵙⵟⵓⵖⵍⵓ ⵓⵙⵏⵜⵉ ⵉⵃⵔⴷⵉⵙⵏ ⵉⵙⴳⴰⵎⴰⵏⵏ ⵉⵏⵙⵎⴰⴷⵏ ⵍⵍⵉ ⵉⵚⴽⴽⵓⵏ ⵜⴰⵃⵍⵙⵜ ⴳ ⵜⵉⵔⵔⴰ ⴷⴰⵔ ⵓⴳⴷⵓⴷ ⴰⵎⴰⵜⴰ. ⵖⵃ ⵓⵢⴰ, ⴰⵙⵎⵙⴰⵙⴰ ⵏ ⵜⵟⴰⴷⵓⵜ ⴰⵃⴰⴷ ⴰⴷ ⵜⵙⵟⵔⵔⴽ ⵉⵙⵉⴷⵃⵏ ⵏ ⵉⵎⵙⵍⵉ ⴳ ⵜⴰⵎⴰ ⵏ ⵓⴹⵇⵉⵚ, ⵉⵖⵢ ⴰⴷ ⵉⵙⴷⵔⵓⵙ ⵜⵉⵎⵓⴽⵔⵉⵙⵉⵏ ⵏ ⵜⵉⵍⵉⵜ ⵏ ⵜⴷⵔⴰⵡⵉⵏ ⴳ ⵙⵏⴰⵜ ⵜⵟⴰⴷⵓⵜⵉⵏ ⵉⵎⵣⴰⵔⴰⵢⵏ. ⵜⵉⵏⵥⴰⵇ ⴰⴷ ⵏⵙⵎⵍⴰ ⴷⵉ ⴰⵔ ⵙⵎⴰⵜⴰⵔⵏⵜ ⵓⵍⴰ ⵖⵃ ⵜⵅⵚⵚⵉ ⵏ ⵜⵎⴷⵔⴰⵡⵉⵏ ⵜⵉⵎⵔⵔⵙⴰⵍⴰⵏⵉⵏ ⵏ ⵓⵣⵎⵣ ⴰⵖⵣⵣⴰⵃ ⴷ ⵜⵎⵔⵔⵙⴰⵍ ⵜⵉⵙⴳⵎⴰⵏⵉⵏ ⴳ

ⵡⴰⵎⵓⵔⴰⴽⵓⵛ, ⴷⴳ ⴰⴽⴽⴰⵏⵜ ⵜⵣⵎⵎⴰⵔ ⵏ ⵓⵙⵏⴰⵡⴰⵢ ⵓⴳⴳⵓⵔ, ⴷ ⵍⵍⵉ ⴳ ⵉⵜⵜⵓⵙⵉⴷⴼ ⵓⵙⵍⵎⴷ ⵏ ⵜⵉⵔⵔⴰ ⴳ ⵓⵙⴳⵎⵉ ⴰⵎⴰⴷⴷⵓⴷ[15].

4. ⵜⴰⵔⴳⴰⵍⵜ

ⴰⵔ ⵉⵙⵎⵉⵍⵉ ⵓⵙⵏⵜⵉ ⵏ "ⴰⵡⴰⵍ" (Awal) ⵎⴰⵙ ⴷ ⴰⵙⴱⵓⵖⵍⵓ ⵏ ⵜⴰⵜⵉⴽⵏⵓⵍⵓⵊⵜ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵙ ⵜⴷⵔⴰⵡⵜ ⵜⴰⵏⴰⵎⵓⵏⵜ ⵉ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵜⵉⴷⵔⵓⵙⵉⵏ ⴳ ⵓⵙⵎⴷⵢⴰ ⵉⵔⴰ ⴰⵙⵎⵙⴰⵙⴰ ⴷ ⵜⵉⵍⴰⵡⵉⵏ ⵜⵉⵙⵏⵉⵍⵙⵉⵏ ⵜⵉⴷⵖⵔⴰⵏⵉⵏ, ⴷ ⵓⵔ ⵉⵖⵢ ⴰⴷ ⵉⵙⵏⵏⵖⵍ ⵙ ⵜⵖⴰⵔⴰⵙⵜ ⵜⴰⴼⵔⴰⵔⵜ ⵉⵣⵓⵔⴰⵜ ⵉⵜⵜⵓⵙⴽⴰⵔⵏ ⵉ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵉⵜⵜⵓⵙⵏⵡⴰⵏ. ⵡⴰⵅⵅⴰ ⵉⵙⵎⵓⵏ ⴰⵙⵉⵔⵎ ⵏⵏⵖ ⵏ 18 ⵏ ⵡⴰⵢⵢⵓⵔⵏ ⵉⵙⴼⴽⴰ ⵉⵍⴰⵏ ⴰⵏⴰⵎⴽ ⴷ ⵉⵙⵎⵓⵙⵙ ⴰⴼⵔⵔⴰ ⴰⵏⴰⵎⵓⵏ, ⵉⵙⵎⵍⴰ ⴷ ⴰⵡⴷ ⵜⵉⵎⵓⴽⵔⵉⵙⵉⵏ ⵜⵉⵅⴰⵜⴰⵔⵉⵏ ⴳⵔ ⵜⵓⵔⴷⴰⵡⵉⵏ ⵏ ⵓⵙⵎⵓⵏ ⴰⵎⴳⵔⴰⵡ ⴷ ⵓⵎⵏⴰⴹ ⴰⵙⵏⵎⵓⵏⵉⵍⵙ ⵉⴽⵔⵔⵙⵏ ⵏ ⵉⵎⵙⵙⴰⵡⴰⵍⵏ ⵙ ⵜⵎⴰⵣⵉⵖⵜ. ⴳ ⵢⴰⵜ ⵜⵡⵓⵔⵉ ⵉⵣⴷⵉⵏ, ⴰⵔ ⵏⵙⵖⵓⴷ ⵏⵙⵜⵉ ⵜⴰⴳⵔⵓⵎⵎⴰ ⵏ ⵉⵙⴼⴽⴰ ⵜⵉⵏⴰⵡⴰⵢⵉⵏ ⵏ ⵜⵙⵓⵖⵍⵜ ⵜⴰⵡⵓⵔⵎⴰⵏⵜ, ⴷ ⴰⵔ ⵏⵙⵏⵎⴰⵍⴰ ⵉⵣⵓⵔⴰⵜ ⵏ ⵜⵙⵓⵖⵍⵜ ⵜⴰⵡⵓⵔⵎⴰⵏⵜ ⵙ ⵓⵙⵎⵔⵙ ⵏ ⵉⵙⴼⴽⴰ ⵉⵜⵜⵓⵙⵎⵓⵏⵏ. ⵙ ⵎⴰⴷ ⵜⴳⴰ ⵢⴰⵜ ⵜⵙⵏⵜⴰⵢⵜ ⵏ ⵓⵣⵡⴰⴳ ⵉⵍⴰⵏ ⴰⵙⴷⵔⵉⵎ ⴰⴳⴷⵓⴷⴰⵏ, ⴰⵔ ⵉⵙⵉⴷⴷ ⵓⵙⵏⵜⵉ ⵏ "ⴰⵡⴰⵍ" (Awal) ⵖⴼ ⵓⵎⵢⴰⵡⴰⵙ ⵉⵣⴳⵔⵏ ⵉⵡⵜⵜⴰ ⴷⴰ ⴷ ⵉⵙⵎⵍ ⵜⵉⵍⴰⵡⵜ ⵜⴰⴳⵔⴰⵏⴰⵎⵓⵔⵜ ⵏ ⵜⴳⵔⴰⵡⵉⵏ ⵏ ⵉⵎⵙⵙⴰⵡⴰⵍⵏ ⵙ ⵜⵎⴰⵣⵉⵖⵜ. ⴰⵔ ⵏⵙⵙⵓⵜⵓⵔ ⵓⴳⴳⵓⵔ ⵏ ⵓⵙⵏⴰⵍ ⴰⵎⵔⵙⴰⵍⴰⵏ ⴷⴰ ⵉⵙⵎⵓⵏⵏ ⵜⵉⵣⵎⵎⴰⵔ ⵜⵉⵏⴰⵎⵓⵏⵉⵏ ⵏ ⵜⵔⵙⴰⵍ ⴷ ⵓⵙⵖⵉⵡⵙ ⴰⵎⴰⴷⴷⵓⴷ ⵏ ⵜⵓⵜⵍⴰⵢⵜ, ⴰⴼⴰⴷ ⴰⴷ ⵏⵣⵔⵉ ⵏⵏⵉⴼ ⵜⵙⵏⵜⴰⵢ ⵉⴱⴷⴷⵏ ⵖⵔ ⵢⴰⵏ ⵓⵙⴱⵓⵖⵍⵓ ⵉⵎⵙⴰⵙⴰⵏ ⵏ ⵜⴰⵜⵉⴽⵏⵓⵍⵓⵊⵜ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵍⵍⵉ ⵉⵜⵜⴰⵡⵙⵏ ⵉ ⵉⵎⵙⵙⴰⵡⴰⵍⵏ ⵏⵏⵉⴳ ⵏ ⵉⵡⵜⵜⴰ ⴷ ⵜⵙⵓⵜⵉⵏ.

5. ⴰⵙⵏⵉⵎⵎⵔ

ⴰⵎⴳⵔⴰⴷ ⴰⴷ ⵉⴳⴰ ⵜⴰⵢⴰⴼⵓⵜ ⵏ ⵓⵔⵣⵣⵓ ⵉⵜⵜⵓⵙⴽⴰⵔⵏ ⴷⴷⴰⵡ ⵏ ⵓⵙⵏⵜⵉ ⵏ Som Part ⵏ ⵙⵢⵉⵎⴰⵏ (CIEMEN) ⴷ Fundació pels Drets Col·lectius dels Pobles, ⴷⴰ ⵢⵓⵎⵥⵏ ⴰⵙⴷⵔⵉⵎ ⵙⴳ ⵜⵙⵏⵓⵔⴰⵢⵜ ⵜⴰⴽⴰⵟⴰⵍⴰⵏⵜ ⵏ ⵓⵎⵢⴰⵡⴰⵙ ⵉ ⵓⵙⴱⵓⵖⵍⵓ (ACCD) ⴷ ⵜⵖⵉⵡⴰⵏⵜ ⵏ ⴱⴰⵔⵛⴰⵍⵓⵏⴰ.

ⵏⵙⵙⵏⴽⴰⴷ ⴰⵙⵏⵉⵎⵎⵔ ⵏⵏⵖ ⴰⵎⵣⴷⴰⵢ ⵉ ⵍⴰⵍⵍⴰ ⵖⵉⵣⵍⴰⵏ ⴱⴰⵔⵢⴰⵍⴰ, ⴱⵕⴰⵀⵉⵎ ⵙⵙⴰⵄⵉⴷⵉ, ⵎⵓⵃⵎⵎⴰⴷ ⴰⵢⵎⴰⵏ ⴼⴰⵔⵃⵉ, ⴷ ⵏⴰⵚⵕ ⵊⴰⴱⵓⵊⴰ ⵖⴼ ⵜⵉⵡⵉⵙⵉ ⵏⵏⵙⵏ ⵉⵍⴰⵏ ⴰⵜⵓⴳ ⴷ ⵜⴰⵏⵏⴰⵢⵉⵏ ⵏⵏⵙⵏ ⴷⴰ ⵢⴰⵡⵙⵏ ⴳ ⵓⵙⴱⵓⵖⵍⵓ ⵏ ⵓⵔⵣⵣⵓ ⴰⴷ.

ⵏⵙⵏⵉⵎⵎⵔ ⴷⴰⵖ ⵓⵍⴰ ⴰⴽⴽⵯ ⵉⵎⵅⴰⵙⵏ ⴷⴰ ⵢⴰⵡⵙⵏ ⴳ ⵜⵙⴰⵢⵔⴰⵔⵜ ⵏ "ⴰⵡⴰⵍ" (Awal) ⴷ ⵍⵍⵉ ⵉⴷⵔⴰⵏ ⴳ ⵜⵙⴰⵡⵔⵉⵏ ⵏⵏⵖ, ⵙ ⵓⴷⵔⴰ ⵏ ⵜⵔⵎⵉⵜⵉⵏ ⵏⵏⵙⵏ ⴷ ⵜⴰⵏⵏⴰⵢⵉⵏ ⵖⴼ ⵜⵓⵙⵙⵏⴰ ⵏⵏⵙⵏ ⴳ ⵜⵎⴰⵣⵉⵖⵜ ⴷ ⵜⴰⵜⵉⴽⵏⵓⵍⵓⵊⵜ .

ⵉⵙⵓⴳⴰⵎⵏ

ⴰⴷⵉⵍⴰⵏⵉ ⴷ., ⵍⵢⵓ ⵀ., ⵛⵉⵏ ⵣ., ⴼⴰⵙⵉⵍⵢⵉⴱ ⵏ., ⴰⵍⴰⴱⵉ ⵊ., ⵎⴰⵡ ⵢ., ⴳⴰⵡ ⵀ. ⴷ ⵍⵉⵢ ⵉ.

ⴰⵍⵅ ⴻⴽⵜⵉⵎ (ALP

(2024). SIB-200: ⵜⴰⵔⴰⵅⵅⴻⵜ ⵏ ⵉⵙⵊⴽⴰ ⵏ ⴻⵙⵜⴰⵍ ⵉⵊⵙⵙⴻⵙⵏ, ⵉⵙⵎⴻⵜⵜⵔⵏ, ⵉⵎⵖⵖⴻⵔⵏ ⵉ ⴻⵙⵏⵎⴰⵍⴰ ⵏ ⵉⵙⵏⵜⴰⵍ ⴳ ⴻⴳⴳⴻⵔ ⵏ 200 ⵏ ⵜⴻⵜⵍⴰⵢⵉⵏ ⴷ ⵜⵏⵜⴰⵍⵉⵡⵉⵏ. ⴳ ⴳⵔⴰⴼⴰⵎ ⵢ. ⴷ ⵅⴻⵔⵅⵔ ⵎ.,

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15 ⵡⴰⵣⵣⴰ ⵏⵙⴽⵔ ⵜⵉⵔⵎⵉⵜⵉⵏ ⵉⴳⴳⴻⵜⵏ ⴰⵊⴰⴷ ⴰⴷ ⵏⵙⵅⴷⴷ ⵜⴰⵎⴷⵔⴰⵡⵜ ⴰⴽⴷ ⵉⵔⴽⴰⵎ, ⴻⵔ ⵜⴰ ⵏⴻⵎⵉⵥ ⴰⵡⴷ ⵢⴰⵜ ⵜⵎⴰⵔⴻⵔⵜ ⵙⴳ ⴷⴰⵔ ⵜⵎⵔⵙⵍⵜ.

ⵉⵎⵥⵕⴰⴳⵏ, ⵜⵉⵎⵃⴰⵍ ⵏ ⵓⴳⵔⴰⵡ ⵡⵉⵙⵙ 18 ⵏ ⵢⵉⴳⴼ ⵓⵕⵓⴱⴱⵉ ⵏ ⵜⵙⵍⵖⴰ ⵏ ⵜⵙⵏⵉⵍⵙⵜ ⵜⴰⵎⵙⵙⵓⴷⵙⴰⵏⵜ (ⴰⴽⵙⴰⵢ 1: ⵜⵉⵡⵍⴰⴼⵉⵏ ⵜⵉⵖⵣⴼⴰⵏⵉⵏ), ⵜ. 226-245. ⵜⴰⵙⵍⵖⴰ ⵏ ⵜⵙⵏⵉⵍⵙⵜ ⵜⴰⵎⵙⵙⵓⴷⵙⴰⵏⵜ.

ⵄⵎⵔⵉ ⵙ., ⵣⵏⴽⵡⴰⵔ ⵍ. ⴷ ⵓⵟⴰⵀⴰⵊⴰⵍⴰ ⵎ. (2017). ⴰⵚⵚⴽⵓ ⵏ ⵡⵓⴳⵔⵉⵡ ⴰⵎⴰⵣⵉⵖ ⵉⵍⵖⴰⵙⵏⴰⵢⵏ. ⴳ ⵡⴰⵔⵔⴰⵜⵏ ⵏ ⵓⴳⵔⴰⵡ ⴰⴳⵔⴰⵖⵍⴰⵏ ⵡⵉⵙ 2 ⵖⴼ ⵉⵙⴼⴽⴰ ⵉⵎⵇⵇⵔⴰⵏⵏ, ⴰⵙⵉⴳⵏⵡ ⴷ ⵜⵙⵏⵙⵉⵡⵉⵏ, ⴰⵎⴳⵔⴰⴷ 8. ⵜⴰⵙⵍⵖⴰ ⵏ ⵜⵎⴰⵛⵉⵏⵏ ⵏ ⵓⵙⵎⴽⵍ.

ⴰⵔⴷⵉⵍⴰ ⵔ., ⴱⵔⴰⵏⵙⵓⵏ ⵎ., ⴷⴰⴼⵉⵙ ⴽ., ⴽⵓⵃⵍⵔ ⵎ., ⵎⴰⵢⵔ ⵊ., ⵃⵉⵏⵔⵉⵜⵉ ⵎ., ⵎⵓⵔⴰⵢⵙ ⵔ., ⵙⴰⵏⴷⵔⵣ ⵍ., ⵜⴰⵢⵔⵣ ⴼ. ⴷ ⴼⵉⴱⵔ ⴳ. (2020). Common Voice: ⵢⴰⵏ ⵡⵓⴳⵔⵉⵡ ⵏ ⵡⴰⵡⴰⵍ ⴰⴳⵜⵓⵜⵍⴰⵢⴰⵏ ⴰⵎⵇⵇⵔⵢⴰⵏ. ⴳ ⴽⴰⵍⵥⵓⵍⴰⵔⵉ ⵏ. ⴷ ⴰⴽⴽⵯ, ⵉⵎⵥⵕⴰⴳⵏ, ⴰⵔⵔⴰⵜⵏ ⵏ ⵓⴳⵔⴰⵡ ⵡⵉⵙ 12 ⵏ ⵉⵙⵓⴳⴰⵎⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⴷ ⵓⵙⵉⵜⴳ, ⵜⵙ. 4218-4222. ⵜⴰⵙⵍⵖⴰ ⵜⵓⵔⵓⴱⵜ ⵏ ⵉⵙⵓⴳⴰⵎⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ.

ⵄⴰⵟⴰⵍⵍⴰⵃ ⴼ. ⴷ ⴱⵓⵍⵇⵏⴰⴷⵍ ⵙ. (2012) ⵙ ⵓⵙⵎⴽⵍ ⴰⵎⵙⵙⵓⴷⵙⴰⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵉⵏ ⵉⵍⴰⵏ ⵉⵖⴱⵓⵍⴰ ⵉⴷⵔⵓⵙⵏ: ⵙⵍⴰⵡⴰⵏ ⴰⴽⴽⵯ ⵜⵉⵔⵎⵉⵜⵉⵏ ⵖⴼ ⵜⵎⴰⵣⵉⵖⵜ ⵏ ⵡⴰⵎⵓⵔⴰⴽⵓⵛ. ⴳ ⵙⴰⴽⵓⵔⴰⵢ ⵙ., (ⴰⵎⵥⵕⴰⴳ), ⵜⵉⵥⵕⵉ ⴷ ⵜⵙⵏⵙⵉⵡⵉⵏ ⵉ ⵜⵖⵓⵣⴰ ⵜⴰⵏⵎⵓⵔⵜ ⵏ ⵉⴹⵕⵉⵚⵏ, ⵉⴳⴼ 9. IntechOpen.

ⵄⴰⵟⴰⵍⵍⴰⵃ ⴼ. ⴷ ⴱⵓⵍⵇⵏⴰⴷⵍ ⵙ.(2014) ⴰⵎⵙⴼⵜⵉ ⵏ ⵉⵎⵢⴰⴳⵏ ⵏ ⵜⵎⴰⵣⵉⵖⵜ. ⴳ ⵓⴳⵔⴰⵡ ⴰⴳⵔⴰⵖⵍⴰⵏ ⵏ ⵉⵙⵓⴳⴰⵎ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⴷ ⵓⵙⵜⴰⵍ.

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ⴱⵓⴽⵓⵙ ⵀ. (2014). ⴰⵙⵖⵉⵡⵙ ⵏ ⵓⵙⵏⴰⵡⴰⵢ ⵏ ⵜⵓⵜⵍⴰⵢⵜ ⵜⴰⵎⴰⵣⵉⵖⵜ: ⵜⵉⵔⵎⵉⵜ ⵜⴰⵎⵕⵕⵓⴽⵜ. ⵉⵍⵙ ⴷ ⵉⵎⵙⵍⵉ. ⴰⴽⵙⴰⵢ 6(1): 7-23.

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ⵙⵢⵉⵎⴰⵏ ⴷ ⵜⴰⴷⴷⴰⵔⵜ ⵜⴰⵎⴰⵣⵉⵖⵜ ⴳ ⴽⴰⵟⴰⵍⵓⵏⵢⴰ (2019). ⴰⵎⴰⴷⴰⵏ ⴰⵎⴰⵣⵉⵖ ⴳ ⴽⴰⵟⴰⵍⵓⵏⵢⴰ. ⵙⵢⵉⵎⴰⵏ.

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ⴰⵍⵅ ⴻⴽⵜⵄⵎ (ALP

"ⴰⴳⵔⴰⵎⵙⴰⵡⴰⵍ 2025", ⵔⴻⵜⵔⴷⴰⵎ, ⴼⴻⵍⴰⵏⴷⴰ.

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ⵉⵙⴼⴽⴰ ⴳ ⵜⴳⵔⵓⵎⵎⴰ ⵏ ⵉⵙⴼⴽⴰ ⵏ ⵡⴰⵡⴰⵍ ⵜⵓⴳⵜⵓⵜⵍⴰⵢⴰⵏⵉⵏ: ⴰⵙⵓⵖⵏ ⵏ ⵓⴼⵔⵔⴰ ⴰⵙⵏⵎⵓⵏⵉⵍⵙ ⴷ ⵓⵙⵖⴰⵡⵙ ⴰⵣⵡⴰⵔⴰⵏ ⵏ ⵜⵓⵜⵍⴰⵢⵜ. ⴳ ⵡⴰⵔⵔⴰⵜⵏ ⵏ ⵓⵎⵏⵓⴹⴹⴰⵔ ⵏ ⴰⵙⴳⴳⵯⴰⵙⴰⵏ ⵡⵉⵙ 63 ⵏ ⵜⵙⵍⵖⴰ ⵏ ⵜⵙⵏⵉⵍⵙⵉⵜ ⵜⴰⵎⵙⵙⵓⴷⵙⴰⵏⵜ, ⴱⵢⵉⵏⵏⴰ, ⵏⵏⵎⵙⴰ, 27 ⵢⵓⵍⵢⵓⵣ – 1 ⵖⵓⵛⵜ. ⵜⴰⵙⵍⵖⴰ ⵏ ⵜⵙⵏⵉⵍⵙⵜ ⵜⴰⵎⵙⵙⵓⴷⵙⴰⵏⵜ.

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