Automating Early Grade Reading Assessments (EGRA) in African Languages Using Voice-Recognition AI (EGRA-AI)

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The Problem



70% of children in low-and middle-income countries can't read.

A lack of easy reading assessments makes fixing this problem difficult. In sub-Saharan Africa that rate is 87%. The main tool to assess early reading in LMIC contexts is the open access Early Grade Reading Assessment (EGRA). This test takes approximately 10 minutes to complete, making it time-consuming for teachers and expensive for program evaluation and monitoring at a national level.

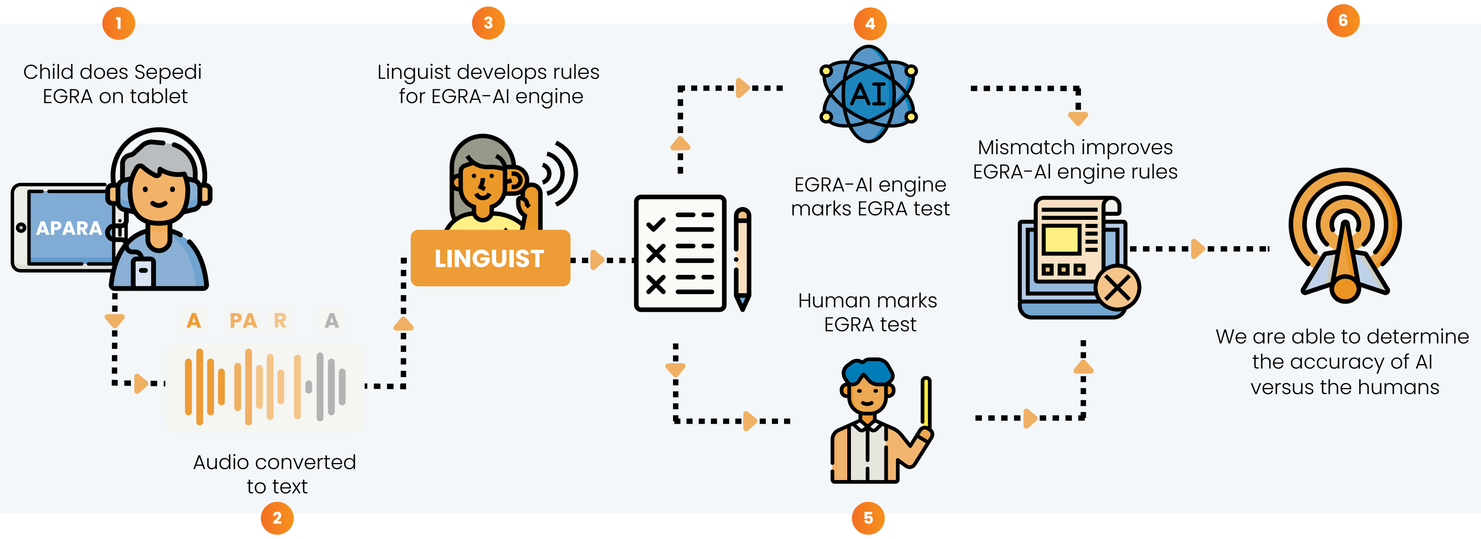


The Solution

New breakthroughs in voice-recognition AI show promising scope for automating EGRA (i.e. EGRA-AI). Using the ReadUp App developed by Western Sydney University, which uses a new open-source voice recognition model developed by Facebook (wav2vec 2.0) we are developing a pilot (EGRA-AI) that uses AI to automatically assess children's early reading abilities (letter-sounds and word-reading) in African languages.

Particularly important about wav2vec 2.0 is that it requires a minimal amount of training data to be effective. This is important for languages with little existing training data, such as most African languages. Further, other similar technology has only been tested in English whereas Wav2vec has already shown good performance on some African languages such as Swahili. Finally, it is possible to get it to work offline which mitigates potential connectivity issues in more rural areas in Africa.

How it works



Methodology

We are currently implementing a pilot in Limpopo Province, South Africa, to determine whether the EGRA-AI model can accurately convert speech to text at the phoneme level (letter-sound) in a small African language (Sepedi) with learners in grades 2 and 3.

- Facilitators conduct 1-to-1 traditional Sepedi EGRA with children
- Facilitators conduct 1-to-many Sepedi EGRA-AI with children using ReadUp to collect audio recordings
- A team of humans use ReadUp to mark Sepedi EGRA-AI audio recordings
- Sepedi EGRA-AI rules plugged into ReadUp generate automatic marks of the audio recordings e.g. a rolling "r" (rrrrr) should be marked as correct and "p" can be substituted for "b"

EXAMPLE

IPA 65 detected phonemes for "Apara"

apara; abara, aparra; abarra; abaraabara

- Analyze mismatches between human and Sepedi EGRA-AI marking, refine the rules.
- Produce rank order and skills assessment of the children for traditional EGRA vs Sepedi EGRA-AI scores.
- Analyse whether the model is biased e.g. performance of girls versus boys, low, medium and high performers on the 1-to-1 EGRA, rural versus urban.
- Analyse whether the model creates efficiencies e.g. can multiple learners complete it simultaneously and independetly.

50 schools visited

6 Teams conducting EGRA-AI

967 EGRA-AI tests conducted

32 Tablets deployed

100% EGRA-AI tests marked by humans

Early Lessons

- Gathering recordings from the field have various challenges such as connectivity, learner exposure to technology and suitable environment for recording.
- Even with low exposure to technology, as long as the UI uses an intuitive navigation system, children navigate effortlessly and require minimal oversight from instructors.
- Sepedi's transparent orthography makes IPA detection effective.
- Inconsistencies in teaching and learning present some challenges in evaluating results and setting suitable rules.

Future use cases

- The use of the model as an interactive learning tool to assess and remediate learner backlogs in African Languages.
- Expanding its use to formative assessments to target instruction at the level of the learner, particularly in areas with large class sizes.

Next steps

- Testing the use of the model on an additional South African language by piggybacking off a 150 school RCT in Q1 2024.

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