

# Comparing Human and Machine Performance in Identifying L1 Backgrounds of Arabic Learners

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## Abstract

This study investigates the ability of automatic speech recognition (ASR) and human listeners to transcribe and identify the first language (L1) background of Arabic learners from diverse linguistic origins. Twenty-two advanced learners of Arabic as a second language, whose L1s included Chinese, European languages such as Russian, and African languages such as Swahili, read the *Rainbow Passage* in Arabic. Participants had studied Arabic for 1–15 years at a language institute in Saudi Arabia. Recordings were simultaneously processed by 2 AI systems for transcription and L1 classification. Additionally, ten native Arabic speakers were asked to perform the same tasks. Results showed that human listeners outperformed AI in both transcription accuracy and L1 identification. However, both humans and AI were more successful at recognizing Chinese and African speakers than European ones. Grouping participants into Chinese, European, and African language families revealed systematic differences in speech rate and segmental duration across groups. These findings highlight the interaction between phonological transfer and speech rhythm in Arabic as a second language, and they point to potential avenues for improving ASR systems trained on non-native Arabic speech.