

SoundKraft: A Gamified, Sensory-Adaptive Screening System for Geriatric Cognitive Impairment

Shah, Keyaan (School: Dhirubhai Ambani International School)

Gupta, Vanya (School: Fravashi International Academy)

Cognitive decline is common in aging populations, but early screening is critical to slowing its progression. Current screening tools like MoCA and MMSE are limited by their reliance on reading, writing, and manual dexterity—making them inaccessible for seniors with sensory impairments, low literacy, or diverse linguistic backgrounds. SoundKraft was developed to provide a more inclusive, engaging and accessible cognitive screening solution with comprehensive domain analysis. SoundKraft evaluates six cognitive domains—Memory, Attention, Language, Executive Function, Visuospatial Abilities, and Orientation—using interactive, game-based tasks enhanced by text-to-speech prompts, eye tracking, and audio-based interactions. Scoring employs the Analytic Hierarchy Process, assigning domain-specific weights. The system was validated using a k-fold cross-validation approach, where the participant pool was split into training and testing sets across multiple iterations to ensure robustness and generalizability. A test-retest protocol was also conducted with randomly selected participants to assess consistency. SoundKraft scores were statistically compared with MoCA, analyzing correlation and predictive accuracy. SoundKraft showed strong correlation with MoCA scores ($r = 0.80$) and demonstrated marginally higher sensitivity and specificity for detecting MCI. The system's engaging, culturally adaptive design increased participation and reduced test anxiety among seniors. SoundKraft offers a scalable, gamified, and culturally adaptive solution for cognitive screening in elderly populations. Its accessible design and strong correlation with established tools make it ideal for timely screening and improved care for cognitive decline for geriatric individuals.

Awards Won:

