Gathering Ecological Data to Assess Real-life Benefits of Cochlear Implants

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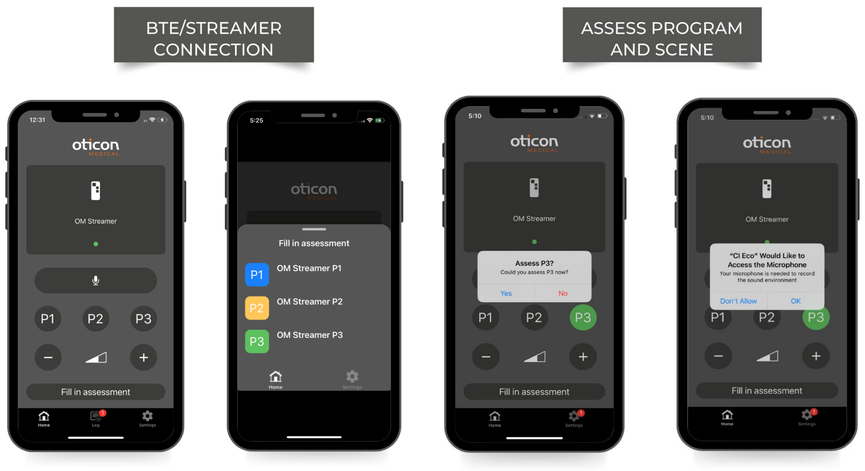
Introduction

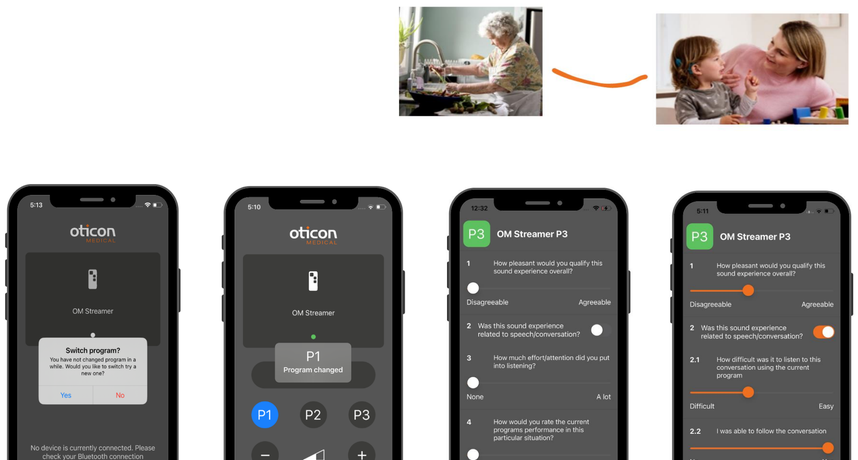
The Oticon Medical Field Research Platform (OMFRP) seeks to understand real-world benefits and difficulties experienced by CI users when using their devices in every-day life. The platform uses ecological momentary assessments (EMA) methodology to register individual CI users' feedback on their hearing and cognitive status. This tool can aid establishing direct feedback from the CI users, and also providing medical professionals with field data regarding CI devices based on data collected via the iOS app.

In order to address challenges faced by cochlear implant (CI) users, optimizing program selections autonomously according to users' hearing and cognitive needs should be considered for better support in different acoustic environments, mitigation of CI-related mental fatigue and enhancement of quality of life. To support the implementation, we developed a classifier to categorize different daily soundscapes, which will serve a marker of the dynamic soundscape to be co-registered with EMA and device information.

Methods

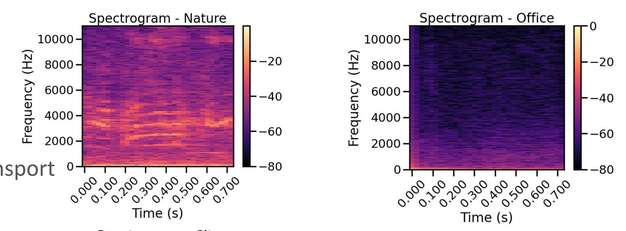
Field Research Platform functionality



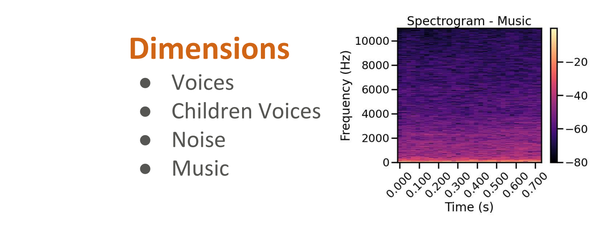


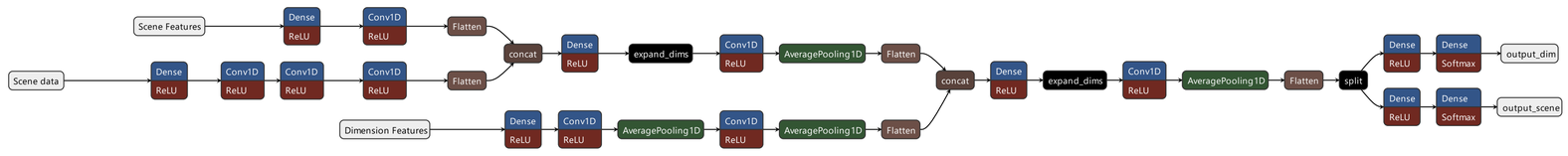
Acoustic scene and content classification

Scenes
- Nature
- City
- Cafe
- Public Transport
- Home
- Office



Dimensions
- Voices
- Children Voices
- Noise
- Music





Example Experiment (Planning)

Aim:

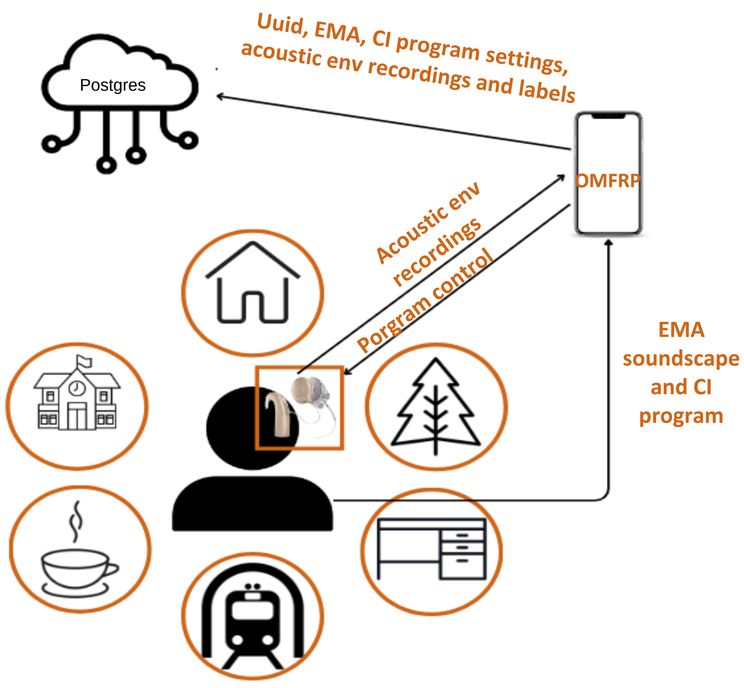
- Validate Ecological momentary assessment (EMA) method and OMFRP with in-lab data
- Assess EMA efficiency in comparing CI features

Design:

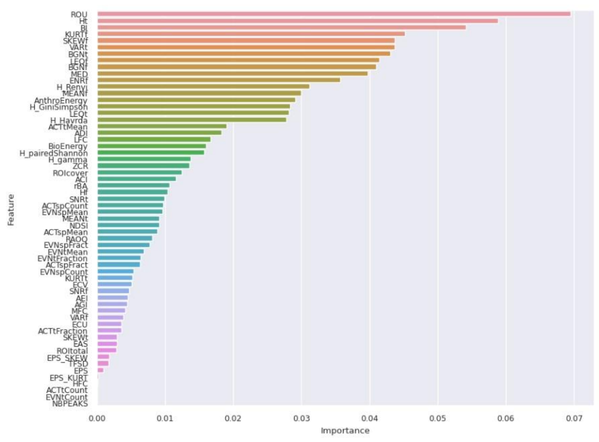
* 20 post-lingually deaf CI users in Seville University Hospital
* In-lab results collection ongoing (Speech-in-noise recognition in silence, cafe, traffic, and market)
* Field study 2-factor design:
  - **acoustic scene:** EMA assessment over 1-2 months on conversation success and fatigue in corresponding real-life acoustic situations
  - **CI feature:** Compare two programs that differ in noise reduction algorithm settings

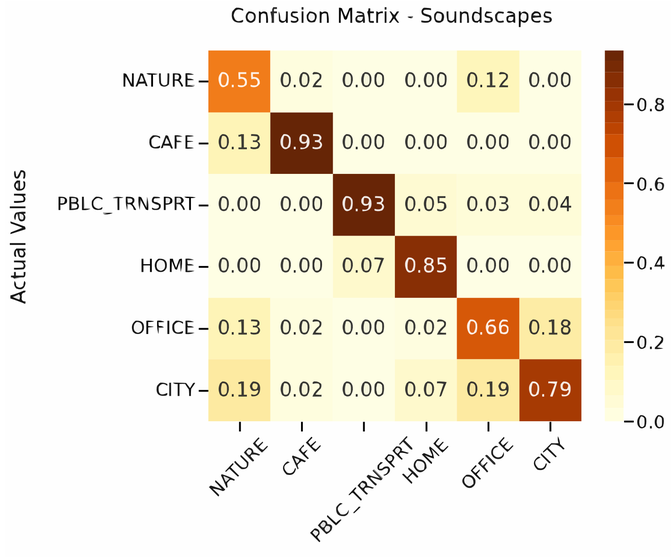
Planned Analysis:

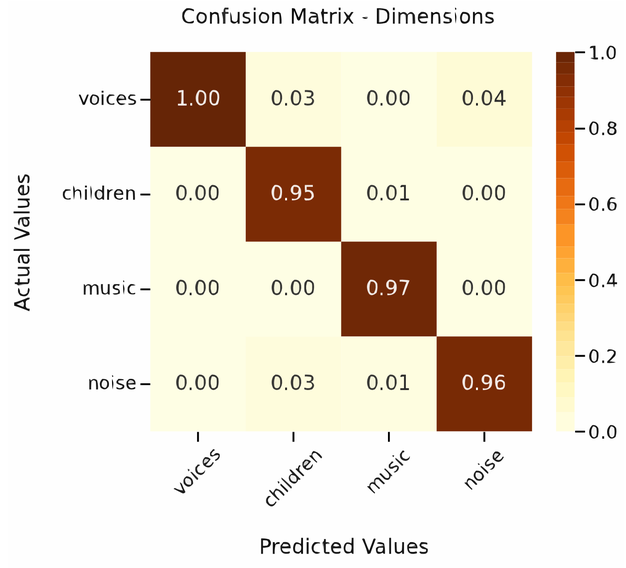
* main effect of acoustic scene, CI program and their interaction on lab and EMA collected data
* sensitivity and reliability comparison between lab and EMA collected data



Results







Discussion

Classification of acoustic scene requires different set of information and features than the classification of acoustic content (voice, children voice, music, noise). Future work is needed to find effective features that could better describe the dynamics of soundscape and the difficulty experienced by CI users.

EMA techniques can be useful for hearing research to capture the real-world benefits and difficulties experiences by CI users. This can better inform device tuning and individualisation, in order to provide higher standards of care for users and more information for the audiologists. However, the effectiveness of EMA method need to validated in clinical protocol to ensure the construct validity of this method and its relation with in-lab controlled experiments.

References

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Because sound matters

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