**Goal**

- **Goals ---- Helping people with hearing loss**
  - Aiming to help people suffering from hearing loss, we developed an Android application that can collect sound information.
  - Our App extracts the information hidden in the background sounds and convert it into text. If something dangerous is happening, our App will notify users on time.

**Motivations and Objectives**

- **Motivations**
  - Apply deep learning and mobile technology in hearing assistance area.
  - Various sound recognition.
  - Help people with hearing issues to have the environmental sound sensitivity.

- **Technical Objectives**
  - An Android application to identify sound classification.
  - Collect sound information around like barking, shooting, alarming, etc...
  - Send real-time notifications to users.

**Sound Signal Processing**

- MFCC (Mel-Frequency Cepstral Coefficients) based on LibROSA[1] extracts 40 features per audio.

**Neural Network Structure**

- A fully connected neural network built on TensorFlow.
- Classify up to 10 categories using UrbanSound8k[2] dataset.

**Android Development**

- Multi-thread audio recorder and background service ensure zero omission.
- Adjustable notification priority to avoid annoyance.
- Interactions with the server can effectively collect cases and achieve more robust model in the long term.

**Server Implementation**

- Serve a TensorFlow Model online.
- The server is based on Amazon Web Service(AWS).
- The server receives valid cases from App, continuously trains the neural network and send the new model to App.

**Results**

- Extract 40 MFCC features.
- 10 Classification categories.
- Accuracy over 96% on UrbanSound8k.
- Real-time response within one second.

**Future Development**

- Hot-update features.
- More layers to enhance the recognition accuracy.
- Move software to a smaller Linux device and iOS.

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**References**

[1] LibROSA: https://github.com/librosa/librosa