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PROPOSED SYSTEM ARCHITECTURE FOR COUGH DETECTION

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COVID-19 was a motivation for researchers to involve machine learning, deep learning, and artificial intelligence in detecting infections to stop its high speed spreading around all regions, inspired by others, cough detection was also a point of interest for many researchers before COVID-19 pandemic. Lqudaihi et al. [1] stated that 93 papers related to cough detection and classification

Manual detection of cough sound seems to be easy when it happens in a clinic, however when infected people don't realize their diseases or they don't care about other's health, they could travel in planes, trains or share restaurants and libraries with others. So the need raises for automated cough detection in a crowd of people.

The proposed system is designed to make classifications and detect cough sounds. There are four main stages after selecting the sound classification dataset (fig.1). The first stage is extracting the features from audio files such as the MFFCs, chromagram, Mel-spectrogram, spectral contrast, and tonal centroid features. The second stage is labeling stage, so we categorize the sound samples into cough and non-cough, then we fed the inputs into a CNN. Here we reach the training stage and record the results until we reach the optimal parameters according to the best results (changing epochs number, learning rate, etc.). The final stage, after generating the model, several tests will be applied on recorded sounds from volunteers.

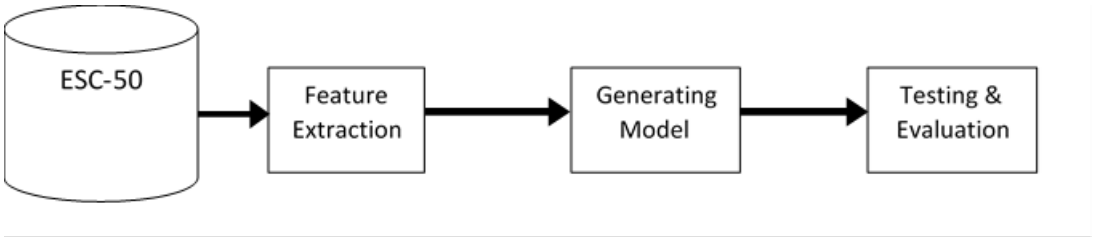

Figure 1. Proposed system architecture

Hickle library was used to save the extracted features in order to save time and to use the saved features every time we need them.

After extracting the features from audio files then saving them, the CNN will be ready to be fed from the built dataset. Keras library offers training and testing functions for the given dataset. After training stage ended up, the model was saved in *.h5 format, that was used for predicting new sound files.

The final system is designed to detect if cough exists in a given audio, thus, starting from the above detection method, a python code was designed to check the index of the first three highest detection percentages, so if the index is equal to that of cough category then cough exists otherwise cough does not exist.

The results showed an average accuracy of 85.37%, precision of 78.8% and a recall record of 91.9%, and also the performance results showed a very good cough detection system that can be applied in a public environment to detect cough sounds from individuals.

Forther more this architecture will be imbedded in our previous system that will help this architecture to take action after detecting the cough either by sending message to the people how are in charge in the detection and another actions we will talk about them later [2].

REFERENCES

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