Cough Classification Application
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Goals
- Develop a mobile application that classifies coughs into wet or dry.
- The application must be easily usable by average users with no medical training.
- Classify cough with accuracy higher than 80%.
- Classify cough in less than 40 seconds.

Abstract
People may experience wet or dry coughs, varying based on the kind and severity of the disease. Often times it is difficult to accurately identify the type of cough someone has without prior training. Additionally, many patients may find it difficult to see a doctor in a timely manner so that cough can be diagnosed. A cough classification application for mobile devices can eliminate the delay in being afflicted with a cough and getting proper help and treatment.

The Cough Classifier application has a simple and clean user interface that allows the user to record their cough, send the recording for analysis and receive a cough classification within 40 seconds.

Methodology
We divided the development of the application into three parts: machine learning algorithm development, mobile application development and connecting the machine learning algorithm to the mobile application.

A. Machine Learning Algorithm Development
- We used a total of 737 samples, with 8:2 ratio of training vs. testing samples (Figure 1)
- We extracted the following features from each audio sample into a matrix:
  1. Crest factor
  2. Skewness
  3. Band power
  4. Max frequency
- We used MATLAB to train different classifiers: KNN, SVM, ENSEMBLE, tree, linear discrimination, quadratic discrimination and logistic regression

B. Mobile Application Development
- We used Android studio to develop the mobile application.
- Figure 2 shows the user interface.

C. Connection
- We created a MATLAB server which we connected to the mobile application (client) by creating a socket through Java.

Results
- Testing different classifiers resulted in the training and testing accuracy (Figure 3)
- KNN classifier (K=5) resulted in the highest training and test accuracy.

Conclusion
- We created an easy, cheap and efficient way of identifying a cough at the user’s fingertips. It has an accuracy of 85%. Figure 5 shows the process of classifying a cough through our application.
- DISCLAIMER: This is not a replacement for a real doctor’s diagnosis.

References