**Stress Detection on Audio**   
**Graphical Abstract**

**Dataset:**

**Source -** <https://dcapswoz.ict.usc.edu/wwwedaic/>

**Description –**

The dataset is partitioned into training, development, and test sets while preserving the overall speaker diversity -- in terms of age, gender distribution, and the eight-item Patient Health Questionnaire (PHQ-8) scores -- within the partitions. Whereas the training and development sets include a mix of WoZ and AI scenarios, the test set is solely constituted from the data collected by the autonomous AI.

Sessions with IDs in the range [300,492] are collected with WoZ-controlled agent and sessions with IDs [600,718] are collected with an AI-controlled agent. The data includes 219 participant directories, each following the below structure:

XXX\_P

● XXX\_AUDIO.wav

● XXX\_Transcript.csv

● **features**

○ XXX\_BoAW\_openSMILE\_2.3.0\_eGeMAPS.csv

○ XXX\_BoAW\_openSMILE\_2.3.0\_MFCC.csv

○ XXX\_BoVW\_openFace\_2.1.0\_Pose\_Gaze\_AUs.csv

○ XXX\_CNN\_ResNet.mat

○ XXX\_CNN\_VGG.mat

○ XXX\_densenet201.csv

○ XXX\_OpenFace2.1.0\_Pose\_gaze\_AUs.csv

○ XXX\_OpenSMILE2.3.0\_egemaps.csv

○ XXX\_OpenSMILE2.3.0\_mfcc.csv

○ XXX\_vgg16.csv

The Train/dev/test splits are also provided in the labels directory. Each split file includes: Participant\_ID, gender, PHQ\_Binary, PHQ\_Score, PCL-C(PTSD), PTSD Severity Additionally, the file Detailed\_PHQ8\_Labels.csv includes detailed answers to each question on the PHQ8 questionnaire. The detailed PHQ scores are the responses given to every single question on the PHQ8 questionnaire. This is useful in case a particular symptom is being studied, for example, you can have the rating given in response to “difficulty sleeping”.

The participants were segregated into ‘Patient’ and ‘Controlled’ on the basis of   
 ‘PHQ\_Binary’ column in the ‘train\_split’ csv file.

The below notebook contains the following work:

1. Extraction of tar files
2. Segregation of data into “Controlled” and “Patient”
3. Plotting of Mel-frequency cepstral coefficients (MFCC) graphs and storing them in “Pateint\_feat” and “Controlled\_feat” folders (present in the zip folder)

**Notebook Link** - <https://colab.research.google.com/drive/1wIGfZvZz7BqsNZ_XKfF0sVdCU0V9Mhb?usp=sharing>)

**No. of Patient directories**: 126

**No. of Controlled directories**: 37

Furthermore**, Local Binary Patterns (LBP)** feature extraction was implemented on

MFCC graph images. Eventually, saved the features to a csv file to further train it

on a classifier and LBP images were processed in “Controlled\_LBP” and

“Patient\_LBP” folders respectively.

**Notebook Link –**

<https://colab.research.google.com/drive/1z_YoIXl2s-jshcuFKeCiAHKF74j-GgXz?usp=sharing>

**Csv files and the LBP folders are present in the zip folder**

**A brief overview of the below notebook which applied Machine learning model:**

1. Loaded data from two CSV files containing features of controlled and patient samples.
2. Combined the datasets and split them into features (X) and labels (y).
3. Split the data into training and testing sets.
4. Trained Support Vector Machine (SVM) classifiers with linear kernel and varied regularization parameter (C).
5. Calculated F1 score to evaluate SVM classifier performance (F1 Score: 0.707).
6. Explored a range of learning rates for Multi-Layer Perceptron (MLP) classifiers with different hidden layer architectures.
7. Trained a Decision Tree classifier and calculated its accuracy (0.938).

**Architecture:**

1. **For Support Vector Machines (SVM):**

* Kernel: Linear
* Hyperparameter: Regularization parameter (C)
* Range for tuning: np.linspace(0.1, 100, num=100)

1. **For Multi-Layer Perceptron (MLP):**

* **Hidden Layer Architecture: (81,) and (40, 20,)**
* **Learning Rate: Varied from 0.00001 to 0.5**
* **Learning Rate Initialization: learning\_rate\_init**
* **Range for tuning: np.linspace(0.00001, 0.5, 100**

**Notebook link –**

[**https://colab.research.google.com/drive/1V07jWipUGuxOgZnqYK5pto0hcmRD231U?usp=sharing**](https://colab.research.google.com/drive/1V07jWipUGuxOgZnqYK5pto0hcmRD231U?usp=sharing)