# IDENTIFICATION OF MUSICAL INSTRUMENTS FROM AUDIO SAMPLE USING MACHINE LEARNING ALGORITHMS


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GitHub Repository:
https://github.com/lyrickhare/CS419_Ins_cla.git

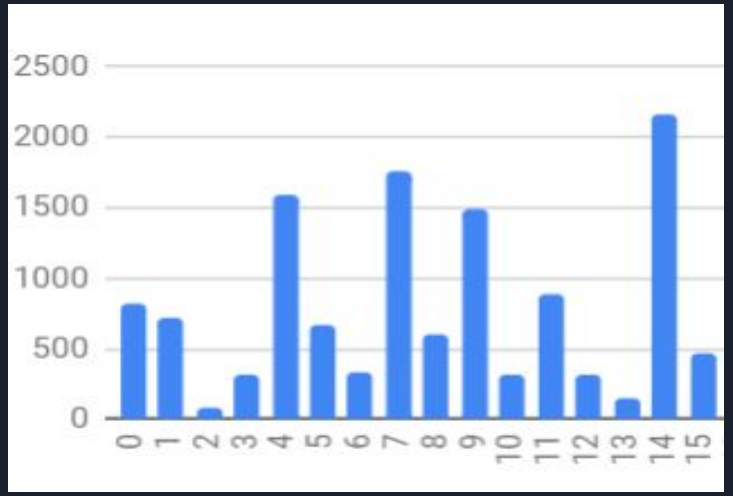
# Objectives

1. To identify the type of instrument playing in a 4 sec .wav file using various ML and DL algorithms.
2. Using Mel-frequency cepstral coefficients as the parameter to identify the type of instrument.
3. To compare the accuracy of various algorithms for this task.

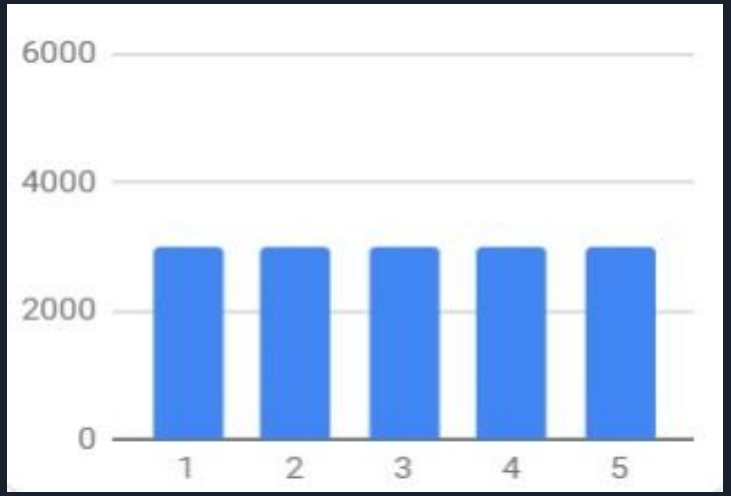
# Data-set (Google-NSynth)

1. Large dataset having 305,979 wav files.
2. Each file contains sound of an instrument for 4 sec duration
3. Each instrument file is with a unique pitch, timbre, and envelope
4. All the labels are in a .json file format.

# Data-set (Google-NSynth)




Imbalanced Dataset




Balanced Dataset

# Python Libraries used

- **`IPython, os, and librosa`**
  (for file handling, and feature extraction)
- **`numpy, pandas, scipy`**
  (for data handling)
- **`matplotlib`**
  (for data visualisation)
- **`sklearn, tensorflow`**
  (for employing machine learning algorithms)

# Results, ranked by accuracy

| # | Algorithm Used | Accuracy (training) | Accuracy (validation) |
|---|---|---|---|
| **1.** | Random Forest Classifier | 1.0 | 0.72 |
| **2.** | Decision Tree Classifier | 1.00 | 0.56 |
| **3.** | KNeighbors Classifier (KNN) | 0.68 | 0.52 |
| **4.** | Neural Network | 0.44 | 0.47 |
| **5.** | Linear Discriminant Analysis | 0.38 | 0.37 |
| **6.** | Logistic Regression | 0.39 | 0.38 |

# Algorithms employed

1. Artificial Neural Networks (ANN) <tensorflow.keras>
2. Logistic Regression Classification <sklearn>
3. Linear Discriminant Analysis (LDA) <sklearn>
4. Decision Tree Classification <sklearn>
5. Random Forests Classifier <sklearn>

# Contribution of Team Members

| | |
|---|---|
| Lyric Khare | Data Pre-processing,<br>Logistic Regression,<br>Compiling the work |
| Pranav Limaye | Exploratory Data Analysis,<br>Feature Extraction,<br>Linear Discriminant Analysis |
| Shivam Ambokar | Feature Extraction and Processing,<br>Random Forest Classifier,<br>K-Nearest Neighbours |
| Sneha Kulkarni | Data Preprocessing,<br>Decision Tree Classifier,<br>Neural Network |

# Sources of Code used

1. https://github.com/krishnaik06/Audio-Classification - Reference used for feature extraction
2. https://machinelearningmastery.com/display-deep-learning-model-training-history-in-keras/ - Displaying the training and validation accuracy for neural networks
3. https://towardsdatascience.com/solving-a-simple-classification-problem-with-python-fruits-lovers-edition-d20ab6b071d2 - Employing various machine learning algorithms

# THANK YOU

Roll Numbers:

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