

# The Music Minion: Summary

## Project Design

The Music Minion consisted of two different music genre classifiers:

- **6-Genres classifier:** only very general genres (Experimental, Electronic, Hip-Hop, Folk, Pop and Rock) were considered in this classifier.
- **50- Genres classifier:** more specific music genres were taken into account in this case. Two different approaches were used in this part
  - **Hierarchical classifier:** the music genre hierarchy available in the dataset was employed.
  - **Flat multiclass classifier:** a regular multiclass classifier was also trained for comparison with the hierarchical classifier.

## Data

For the project the [FMA dataset](#) was used. More than 100,000 audio clips are available in the data set although only about 40000 were used for each part of the project. From all available features, only the Mel-frequency cepstral coefficients (MFCC) and the spectral contrast with a total of 189 were taken into account as they capture the [most significant information](#) for music genre classification. The “genre\_top” feature was taken as labels for the flat 6 classes genre classifier. For the hierarchical classifier the genres further away from the root were selected. Tracks with more than one genre with the same hierarchical level were discarded. Only genres with more than 100 tracks were considered giving a total of 39780 tracks divided in 50 genres.

## Tools and Algorithms

Jupyter notebooks for the 6-Genres classification can be found in the folder with the same name. The 50-Genres classifier are collected in the “Hierarchical” folder. A number of programmed utility functions can be found in the `util_kojak.py` and `features_adapted.py` files. Most of the training were carried out using Amazon Web Services. Training and evaluation were carried out with a 90%/10% train/test split was done for all classifiers. SMOTE oversampling method was used where indicated to compensate for the imbalance of the dataset. Accuracies are indicated for each in parentheses (train acc./test acc.)

- **6-Genres classifier:**
  - k-Nearest Neighbors (0.72 / 0.67). With SMOTE (0.80/0.52)
  - Support Vector Machine (0.97/0.75). With SMOTE (0.95/0.74)
  - Random Forest (1.00/0.70)
  - Logistic Regression (0.67/0.68). With SMOTE (0.65/0.64)

- **Hierarchical classifier for 50 genres:** the music genres under consideration were either nodes or leafs of the hierarchy tree and therefore non-mandatory leaf node prediction was employed. The stopping criteria was a fixed probability for all levels within the tree and was treated as a hyperparameter to tune. The local classifier per parent node method was also used. Flat (not hierarchical) accuracies are indicated:
  - Support Vector Machine (0.58/0.45)
  - Random Forest (0.59/0.43)
  - Logistic Regression (0.43/0.43)
- **Flat classifier for 50 Genres:**
  - Support Vector Machine (0.60/0.41)
  - Random Forest (0.51/0.52).With SMOTE (0.97/0.37)
  - Logistic Regression (0.50/0.49)

## Outlook

A more extensive exploration of other available features for both the 6-Genres flat and the 50-Genres hierarchical classifiers would be desirable. Also additional algorithms such as Neural Networks could obtain better results than the ones shown here and deserve to be tried.

For the hierarchical classifier other methods such as local classifier per node with different policies for selection (exclusive, inclusive, siblings...) as well as local classifier per level are worth trying. Also a more accurate hierarchical metric instead of the flat classifier accuracy should be used to evaluate the goodness of the different methods.