



POLITECNICO
MILANO 1863

POLO TERRITORIALE DI **CREMONA**



Master of Science Music and Acoustic Engineering
Computer Music – Languages and Systems

Homework 1: Musical Genre Classification

GROUP 16

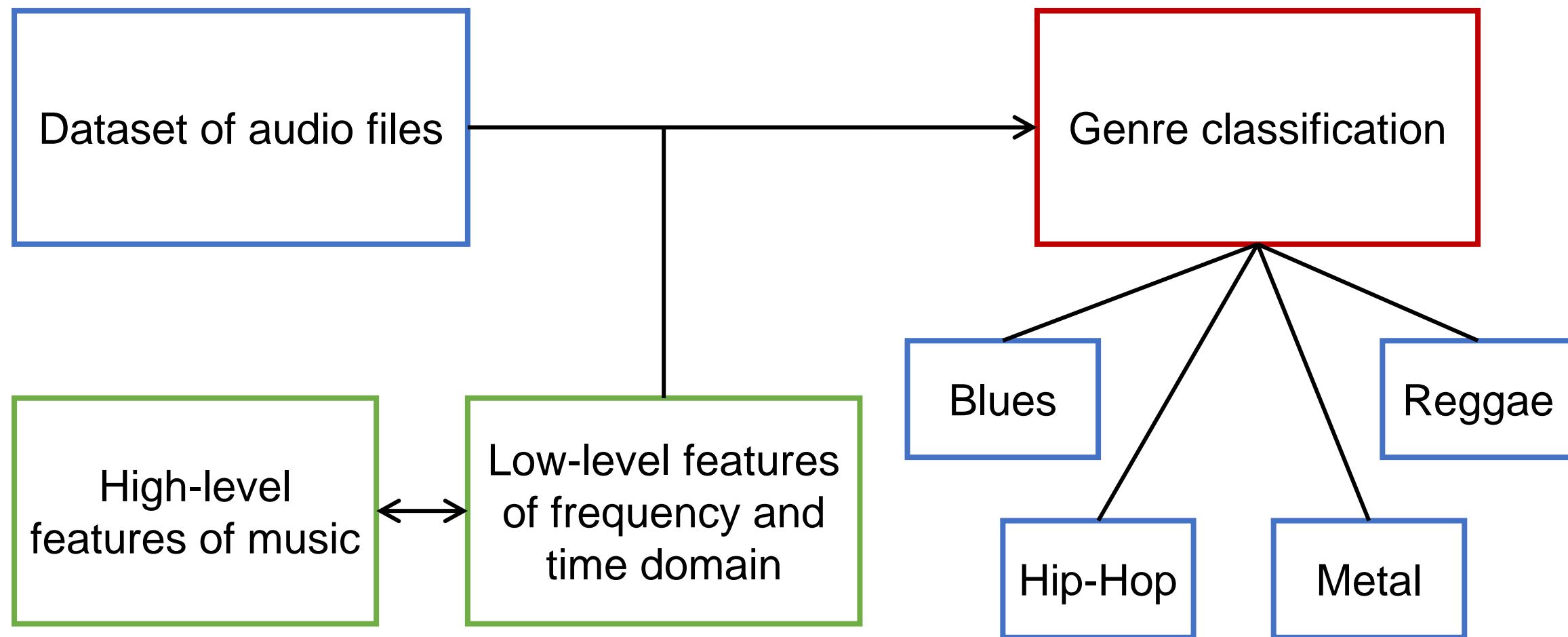
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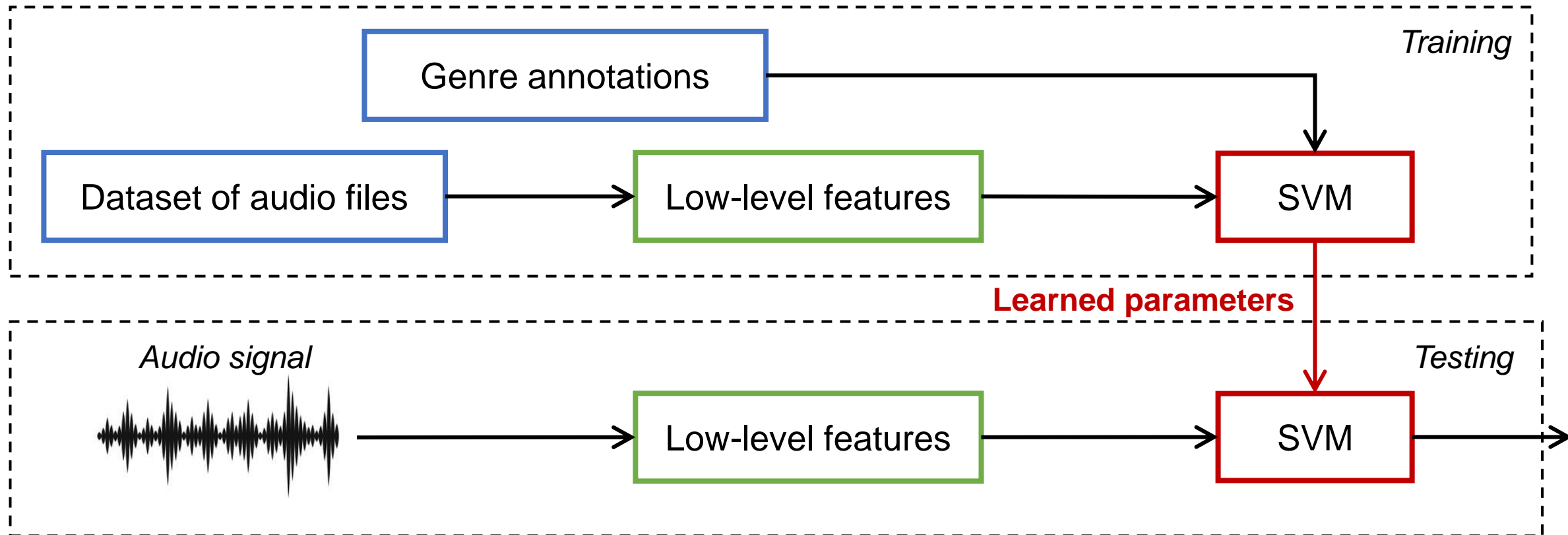
Alessandro Zullo

MUSIC GENRE CLASSIFICATION



2 RELATIONSHIP BETWEEN LOW-LEVEL AND HIGH-LEVEL FEATURES

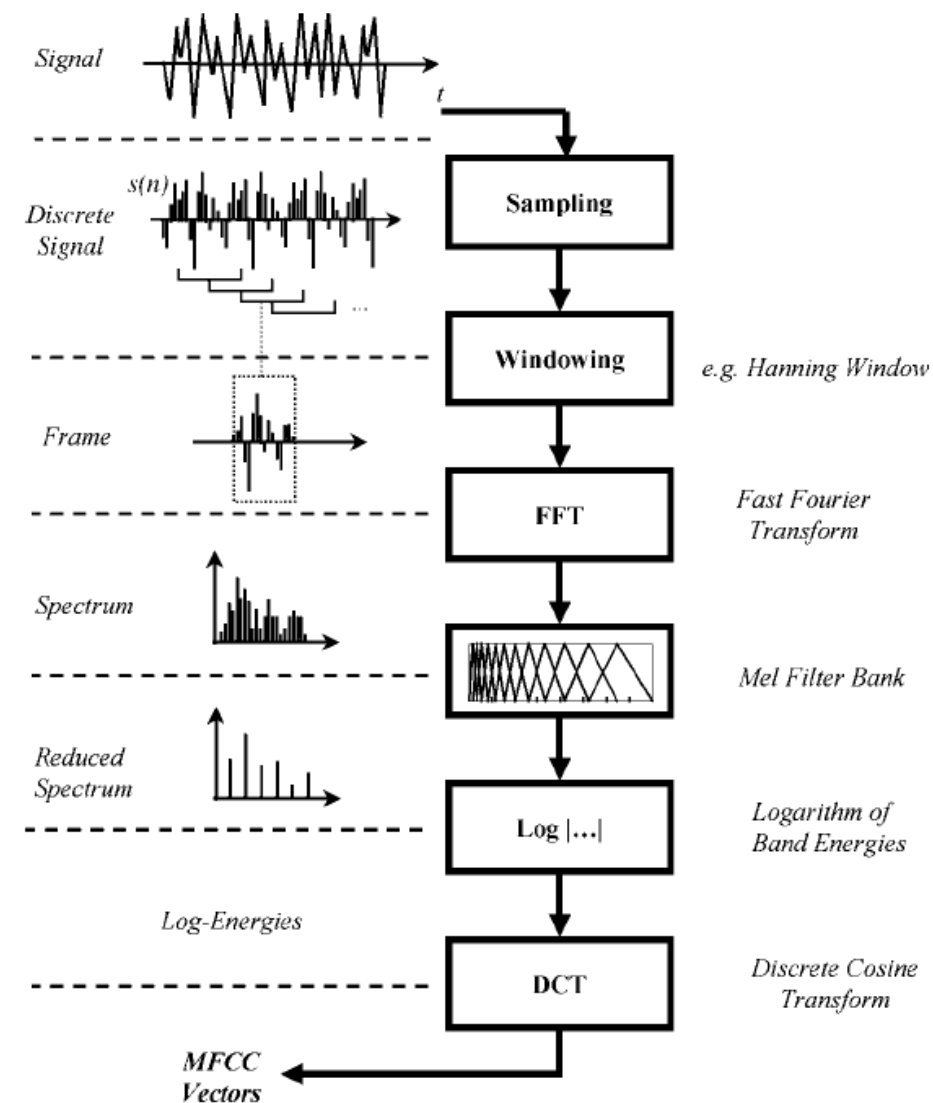
➤ **Support Vector Machine** (SVM) model to fill the semantic gap between the low-level features of frequency and time domain and the high-level features of music



3 FEATURE DESCRIPTION AND MFCCs COMPUTATION

- Our auditory system is non linear
- The best technique to be used as a features vector representation of human hearing is that of the **Mel Frequency Cepstrum Coefficient** (MFCCs)
- allow us a non linear representation of the frequency spectrum in a logarithmic scale called **Mel scale**

$$Mel_{freq} = 1127.0148 \log \left(1 + \frac{f[\text{Hz}]}{700} \right)$$





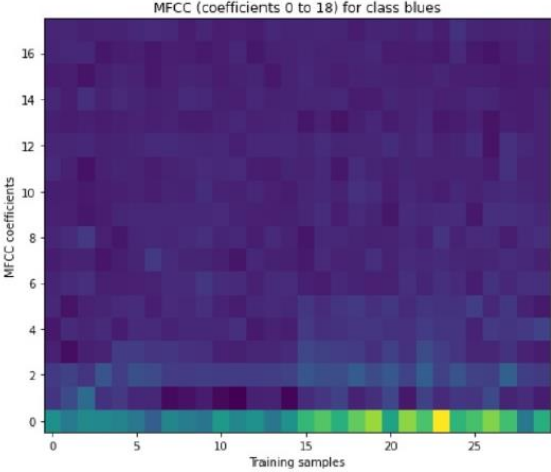
Algorithm implemented to have a viewable feedback from the calculator



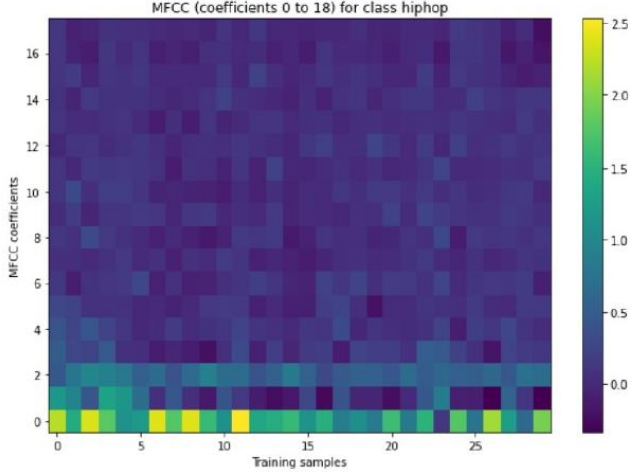
Helpful to the user, not to the machine



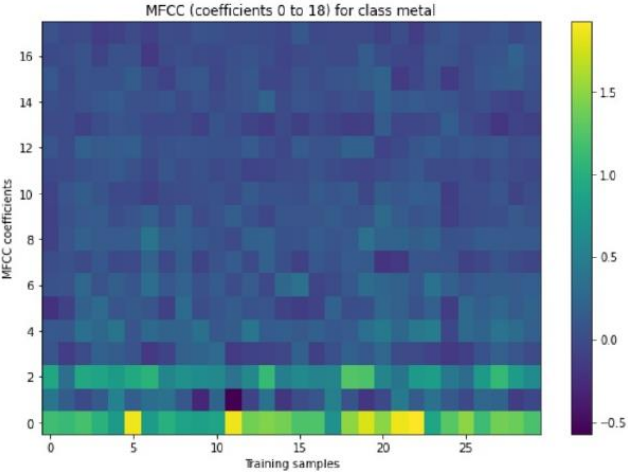
The code plots the distribution of the *cepstrum* for each sample



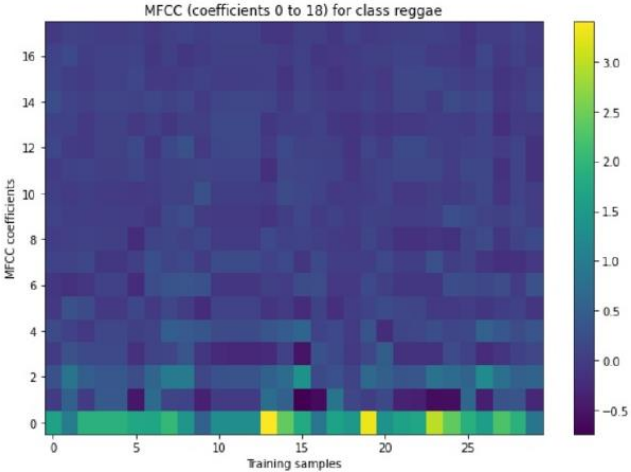
(a) Blues



(b) Hip Hop

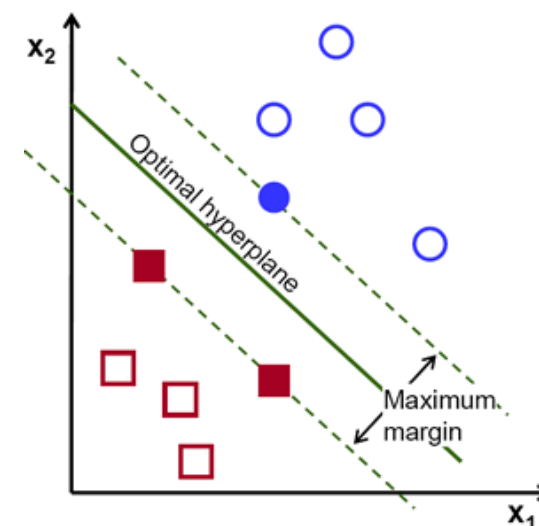
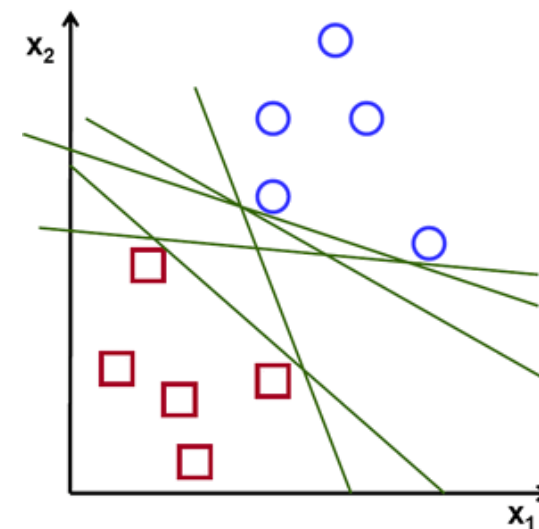


(c) Metal

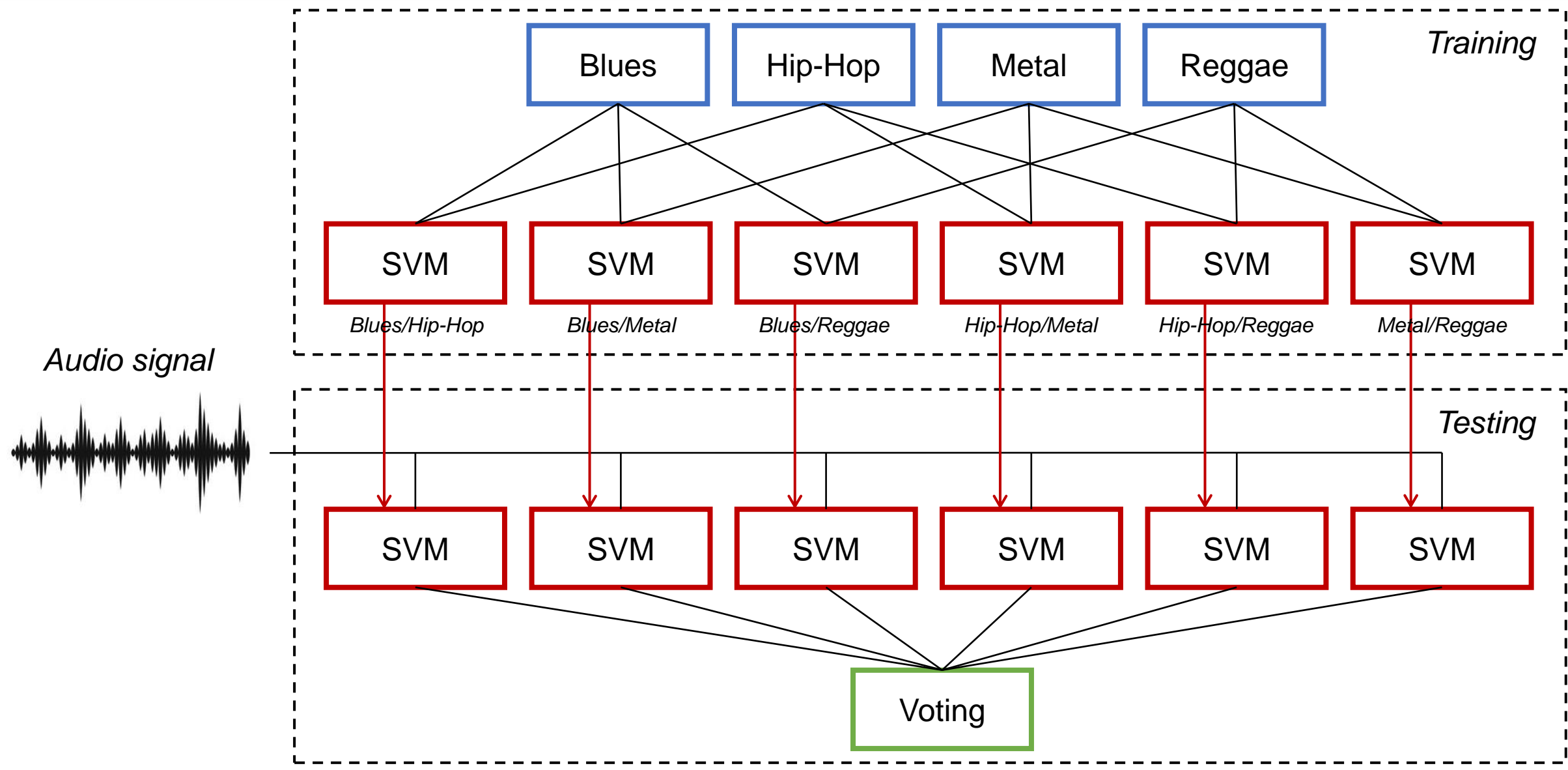


(d) Reggae

- The objective of the SVM algorithm is to find a hyperplane in a N-dimensional space, where N is the number of features, that distinctly classifies the data points
- To separate two classes of data points, there are many hyperplanes that could be chosen
- The objective is to find a plane that has the maximum margin, i.e. the maximum distance between data points of both classes



MAJORITY VOTING



- **Confusion matrix** to understand the performance of the model
- How many times each class is classified as one of the considered classes

	Blues	Hip-Hop	Metal	Reggae	Accuracy
Blues	15	4	1	10	50 %
Hip-Hop	1	24	1	4	80 %
Metal	1	10	15	4	50 %
Reggae	3	17	4	6	20 %

- The evaluation of the results is not as simple as it seems
 - Similarities in the typical instrument used or in their musical origins
 - Subjective nature of genre classification
 - Sometimes artists merge two or multiple known genres



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Thanks for your attention!