Práctica 5: Music Mood Classification

1 Files included

TrainSet.csv – Song descriptors data for training classifiers
TestSet.csv – Song descriptors data for testing the models
Songs – directory with songs mp3s

2 The assignment

Automatic recognition of emotions in musical audio has gained increasing attention in the field of music information retrieval (MIR) during the past few years. The development in the field has coincided with the need for managing large collections of digital audio for the public via web services such as Spotify and Last.fm. This is reflected, for example, in the increasing number of submitted systems in the annual Audio Music Mood Classification (AMC) contest part of the Music Information Retrieval Evaluation eXchange3 (MIREX). The substantial variance in the submitted systems in the contest and in the approaches in the MIR field in general indicates a lack of consensus concerning the choice of an underlying psychological model for emotions or moods in music and the establishment of precise machine learning conventions.

Despite research in musicology studying the influence of specific cues in the musical structure on emotional expressions, there is no complete analytical consensus about the required "ingredients"—i.e., acoustical features extracted from music—to build the optimal models for emotion recognition, in the limits imposed by the subjectivity of emotions. The descriptors for each music track provided for this práctica are the state-of-the-art descriptors used in this area (see table in next page for details).
Your task is to determine which sets of features are most useful for learning the accurate classifiers. In particular your task is to explore different feature sets (obtained by applying filter and wrapper selection methods) and machine learning algorithms with the aim to obtain the most accurate classifier. As part of your exploration you are supposed to fill the following tables with the corresponding accuracies. What kind of features (timbre, rhythm, pitch, dynamics, structure or harmony) are more relevant for predicting emotion in music in the data set provided?

Algorithm	C.C.I.% Subset 1 (5 features)	C.C.I.% Subset 2 (10 features)	C.C.I.% Subset 3 (15 features)	C.C.I.% Subset 4 (20 features)
DT				
SVM				
ANN				
k-NN				
Ensemble				

Accuracies in C.C.I.% for **Training Set** using training set evaluation. Feature subsets obtained by filter method

Algorithm	C.C.I.% Subset 1 (5 features)	C.C.I.% Subset 2 (10 features)	C.C.I.% Subset 3 (15 features)	C.C.I.% Subset 4 (20 features)
DT				
SVM				
ANN				
k-NN				
Ensemble				

Accuracies in C.C.I.% for **Training Set** using 10-fold cross validation. Feature subsets obtained by filter method

Algorithm	C.C.I.% Subset 1 (5 features)	C.C.I.% Subset 2 (10 features)	C.C.I.% Subset 3 (15 features)	C.C.I.% Subset 4 (20 features)
DT				
SVM				
ANN				
k-NN				
Ensemble				

Accuracies in C.C.I.% for **Test Set**. Feature subsets obtained by filter method

Algorithm	C.C.I.%	Features
DT		
SVM		
ANN		
k-NN		
Ensemble		

Accuracies in C.C.I.% for **Training Set** using 10-fold cross validation. Feature subsets obtained by wrapper method

Algorithm	C.C.I.%	Features
DT		
SVM		
ANN		
k-NN		
Ensemble		

Accuracies in C.C.I.% for **Test Set** using 10-fold cross validation. Feature subsets obtained by wrapper method

Category	No.	Feature	Acronyms
Dynamics	1-3	RMS energy	Em, Ed, El
	4	Low-energy ratio	LEm
	5	Attack time	ATm
	6-7	Attack slope	ASm, ASd
Rhythm	8	Event density	EDm
	9-10	Fluctuation peak (pos., mag.)	FPm, FMm
	11	Fluctuation centroid	FCm
	12-13	Tempo	Tm, Td
	14-15	Pulse clarity	PCm, PCd
Pitch	16-17	Pitch	Pm, Pd
	18-21	Chromagram (unwrapped) centr.	Cm, Cd, Cl, Ch
Harmony	22-23	Key clarity	KCm, KCd
	24-25	Key mode (majorness)	Mm, Md
	26	HCDF	Hm
	27	Entropy (oct. collapsed spectr.)	ESm
	28	Roughness	Rm
	29-30	Inharmonicity	Im, Id
Timbre	31-32	Brightness (cut-off 110 Hz)	Bm, Bd
	33-34	Spectral centroid	SCm, SCd
	35-36	Zerocross	Zm, Zd
	37	Spread	Sm
	38	Skewness	Km
	39-40	Spectral entropy	SEm, SEd
	41	Spectral flux	SFm
	42	Flatness	Fm
	43-44	Regularity	REm, REd
	45-46	1st MFCC + delta	M1m, D1m
	⋮	⋮	⋮ ⋮
	57-58	7th MFCC + delta	M7m, D7m
Structure	59-60	Repetition (spectrum)	RSm, RSd
	61-62	Repetition (rhythm)	RRm, RRd
	63-64	Repetition (tonality)	RTm, RTd
	65-66	Repetition (register)	RGm, RGd

Submitting your answer

The práctica can be solved in teams of two people (1 submission per team). Submission is through the Aula Global. Submissions should contain the code of the files you modified and the plots your programs generated. Deadline is the beginning of the next práctica. Late submissions will be penalized. Deadline is June 15 2016. Marks will be allocated taking into account the report and the final model accuracy.