Music Feature

Music Genre Classification

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June 9, 2022

Outline

Motivating Question

- Music

Focus Problem

- classify the music genre

Data Set

- Kaggle
- 1000 audio files
- 28 features
- 10 genres

filename	tempo	beats	chroma_stft	rmse	spectral_centroid	spectral_bandwidth	rolloff	zero_crossing_rate
blues.00081.au	103.35938	50	0.3802602	0.2482623	2116.9430	1956.6111	4196.1080	0.1272725
blues.00022.au	95.70312	44	0.3064509	0.1134754	1156.0705	1497.6682	2170.0535	0.0586134
blues.00031.au	151.99908	75	0.2534871	0.1515708	1331.0740	1973.6434	2900.1741	0.0429672
blues.00012.au	184.57031	91	0.2693200	0.1190717	1361.0455	1567.8046	2739.6251	0.0691239
blues.00056.au	161.49902	74	0.3910586	0.1377283	1811.0761	2052.3326	3927.8096	0.0754795
blues.00058.au	107.66602	51	0.3565882	0.1620276	2068.3711	2033.9300	4231.4994	0.1043716
blues.00066.au	161.49902	80	0.3747097	0.1104963	2340.4329	2256.5381	4972.5033	0.1217752
blues.00060.au	151.99908	74	0.4308941	0.1962216	1946.5657	1979.9099	3955.8677	0.0974537
blues.00025.au	92.28516	45	0.2909484	0.0892223	1109.5696	1463.2881	2243.5698	0.0517249
blues.00014.au	151.99908	70	0.3291627	0.0669805	1172.0657	1705.8175	2344.9525	0.0450458

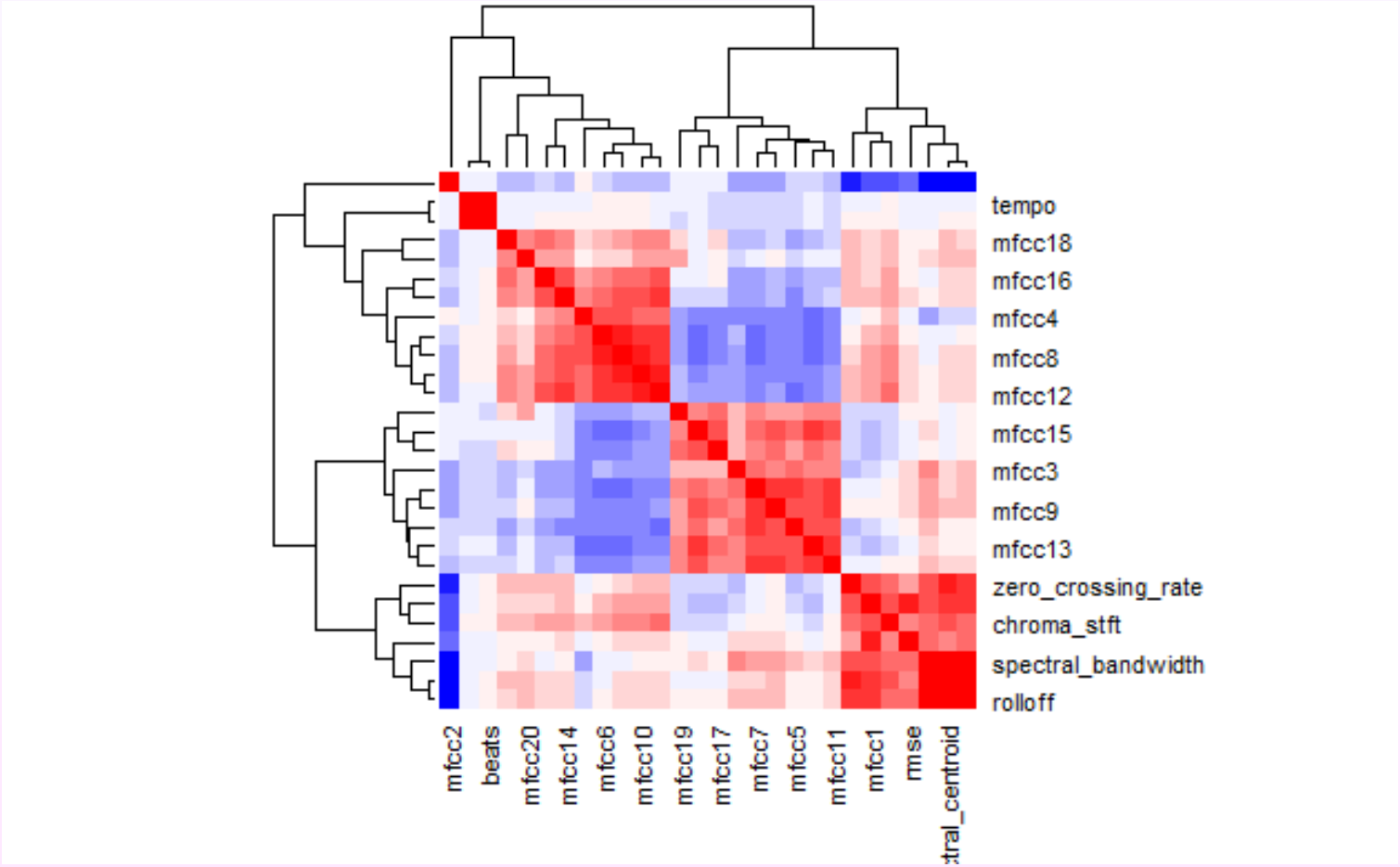
Features(28)

- tempo
- beats
- chroma-stft
- rmse
- spectral-centroid
- spectral-bandwidth
- rolloff
- zero-crossing-rate
- mfcc1-20

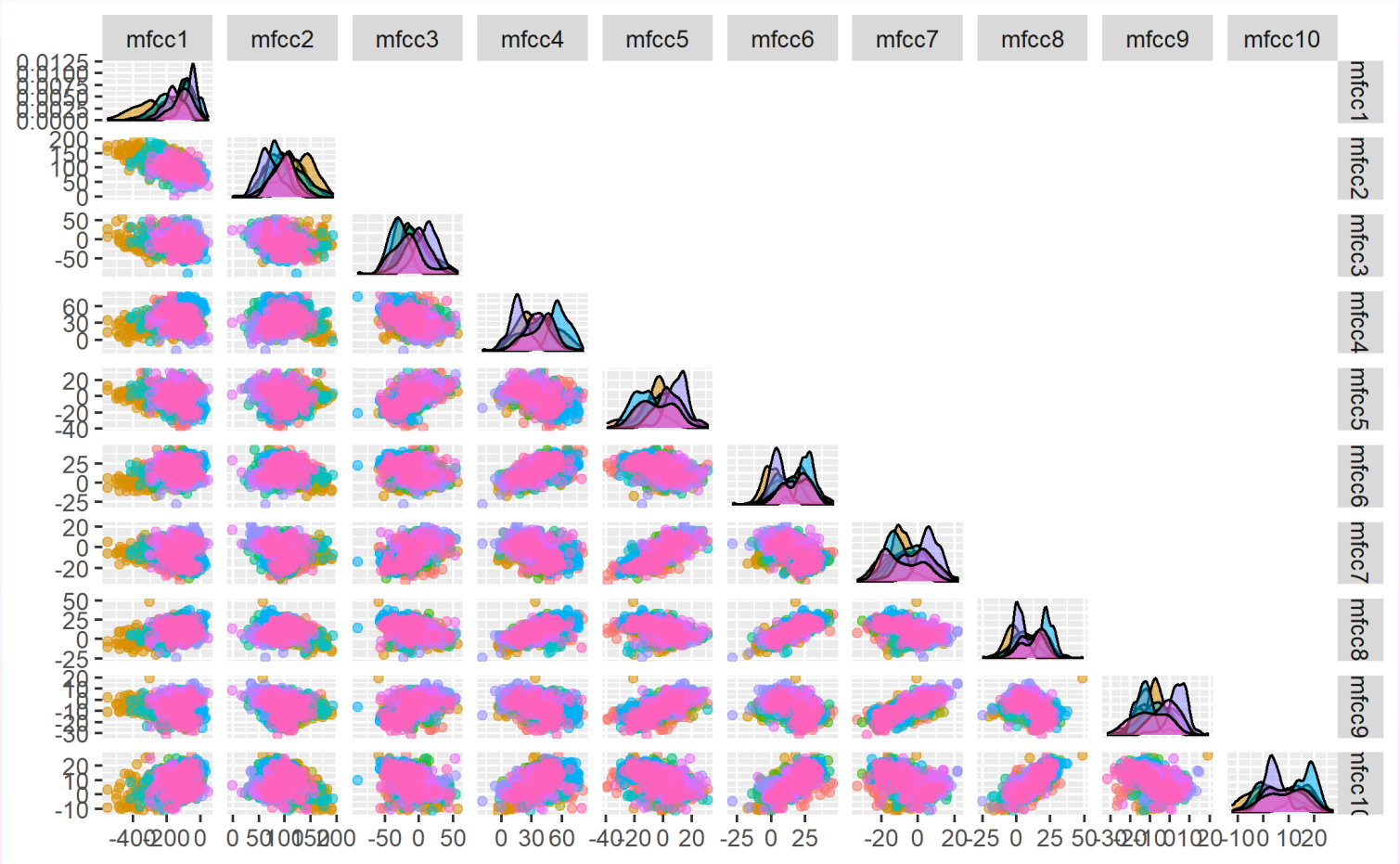
Genre(10)

- blues
- classical
- country
- disco
- hiphop
- jazz
- metal
- pop
- reggae
- rock

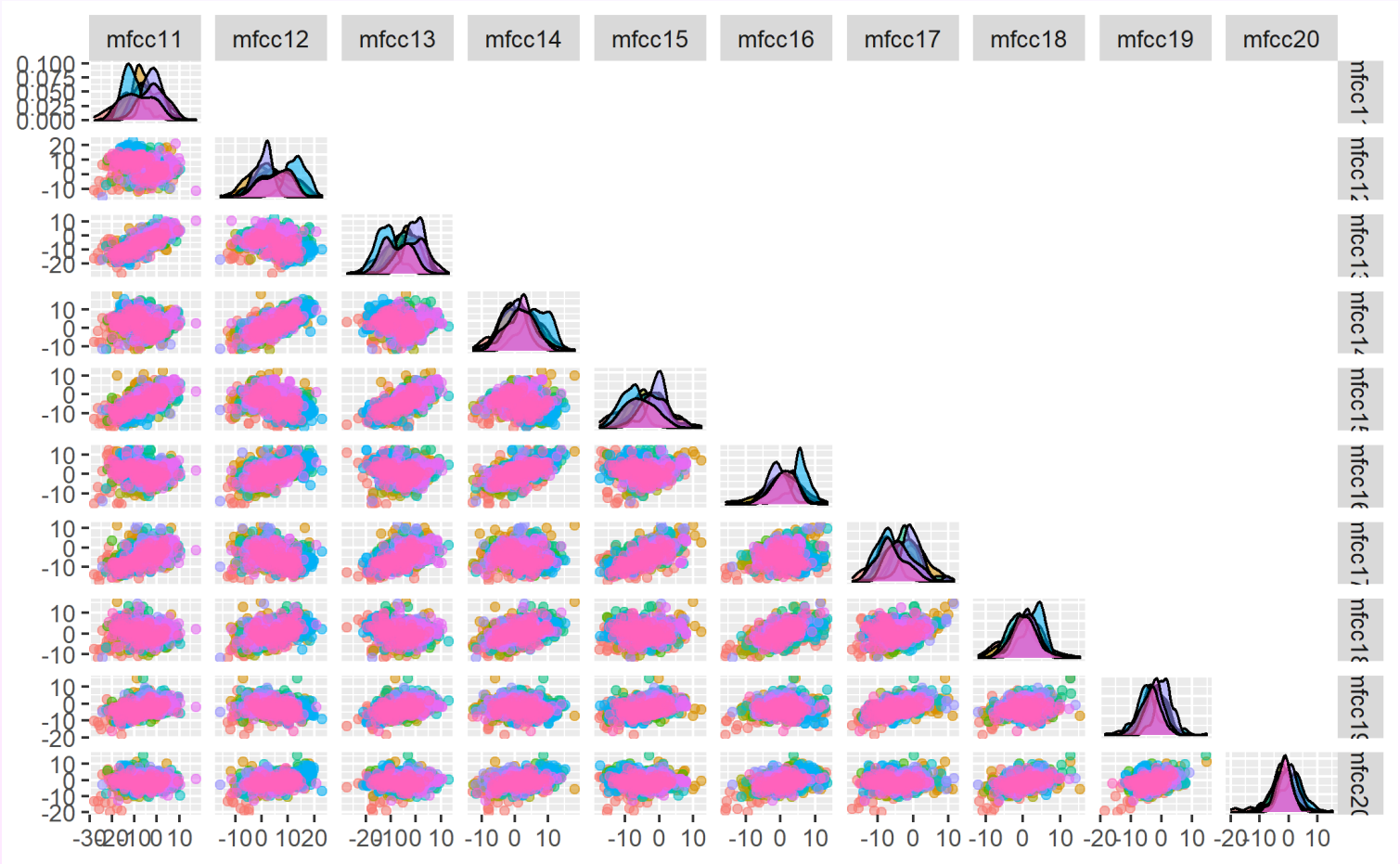
Correlation Matrix



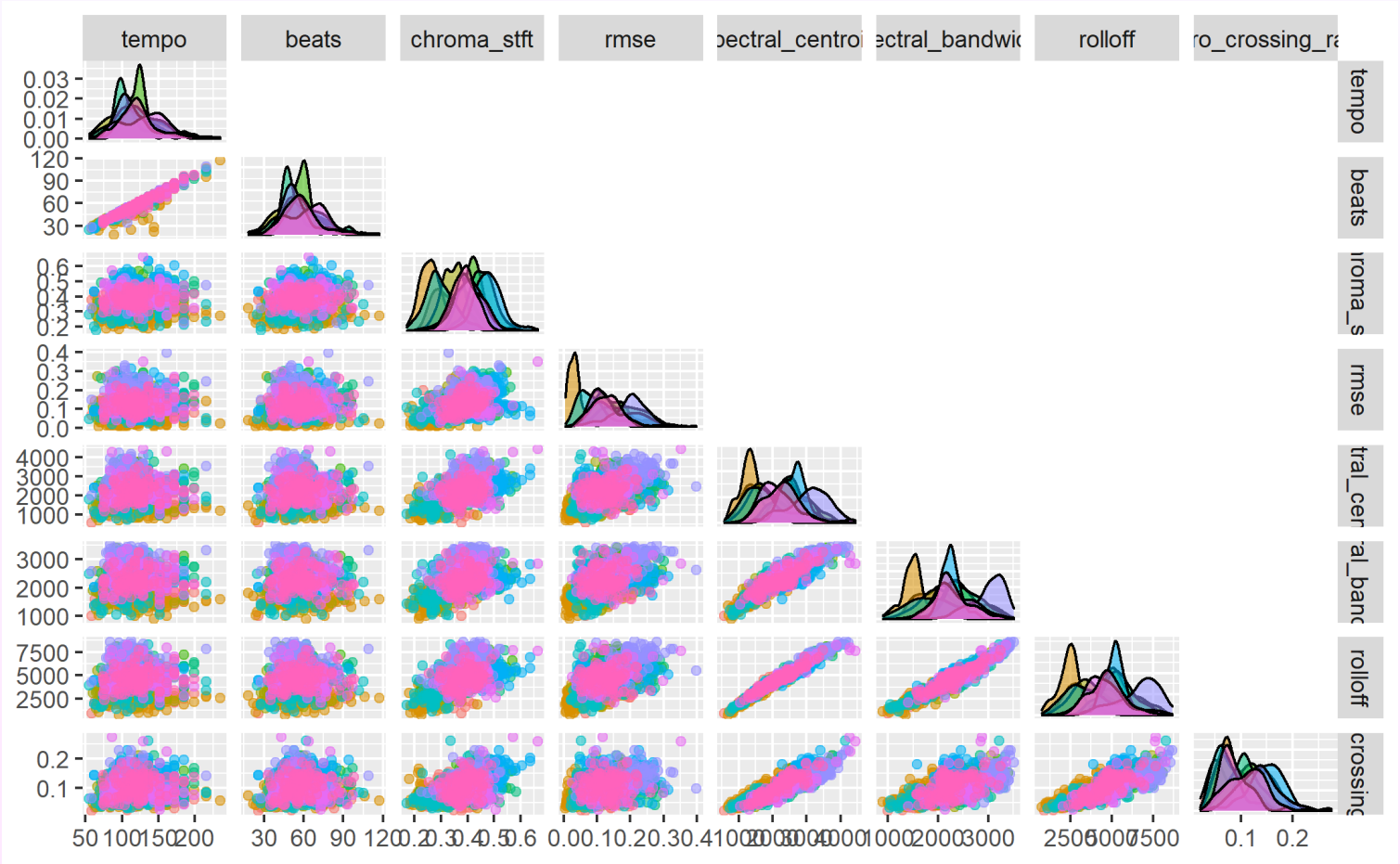
Pair plot


mfcc1
mfcc2
mfcc3
mfcc4
mfcc5
mfcc6
mfcc7
mfcc8
mfcc9
mfcc10

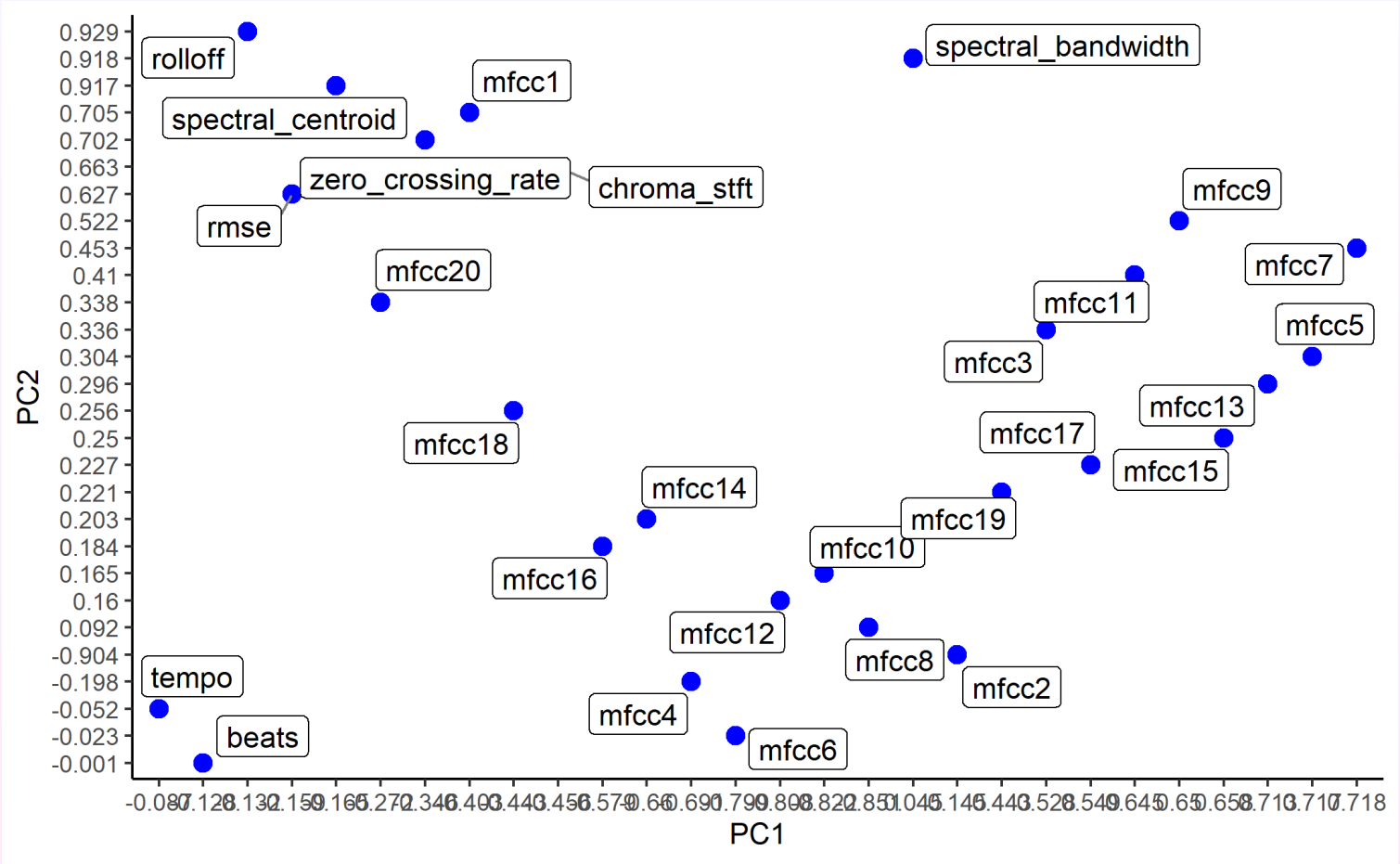
Pair plot


mfcc11
mfcc12
mfcc13
mfcc14
mfcc15
mfcc16
mfcc17
mfcc18
mfcc19
mfcc20

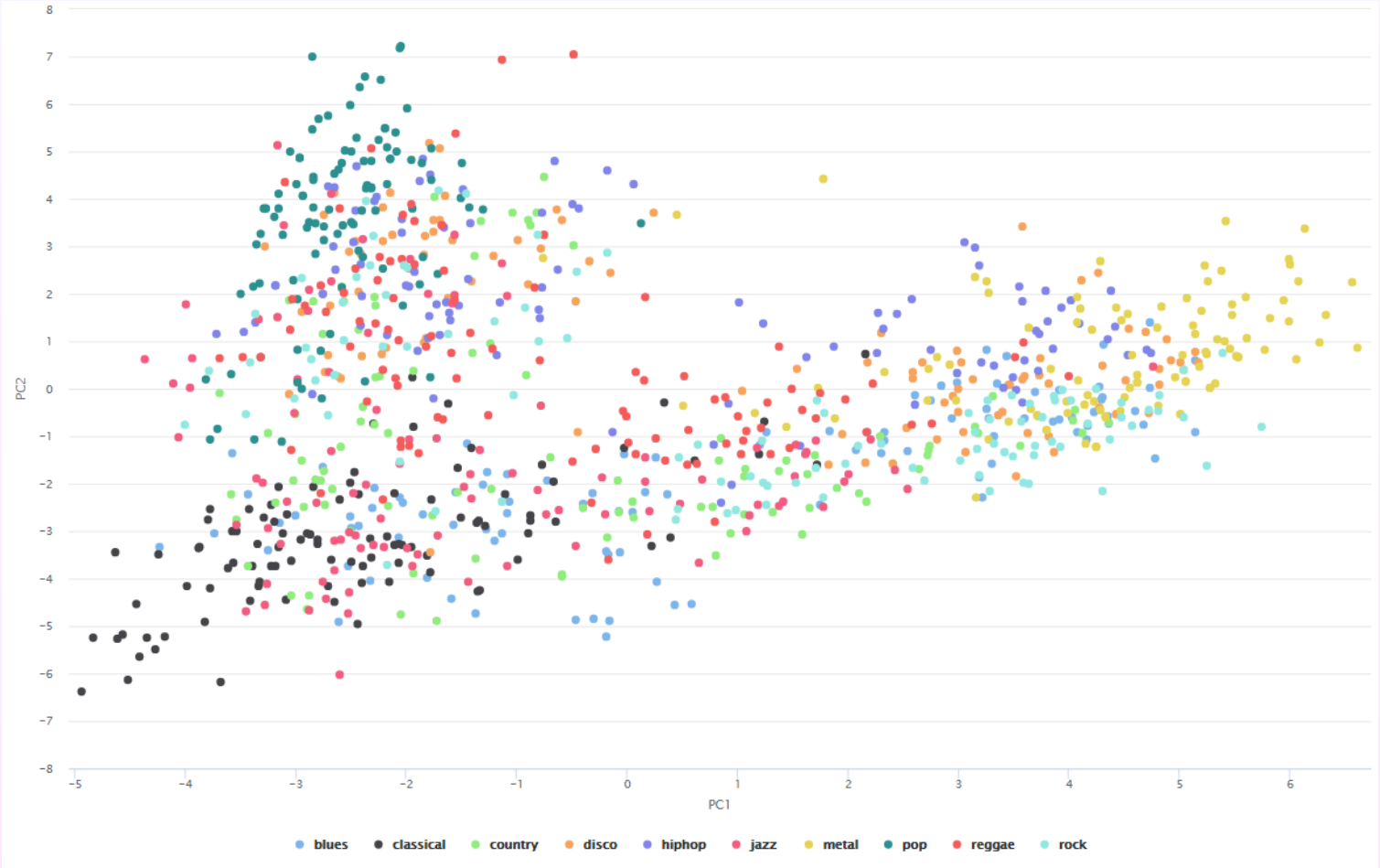
Pair plot


tempo
beats
chroma_stft
rmse
pectral_centroi
ectral_bandwic
rolloff
ro_crossing_ra
tempo
beats
roma_s
rmse
tral_cer
al_banc
rolloff
crossing

PCA(features)



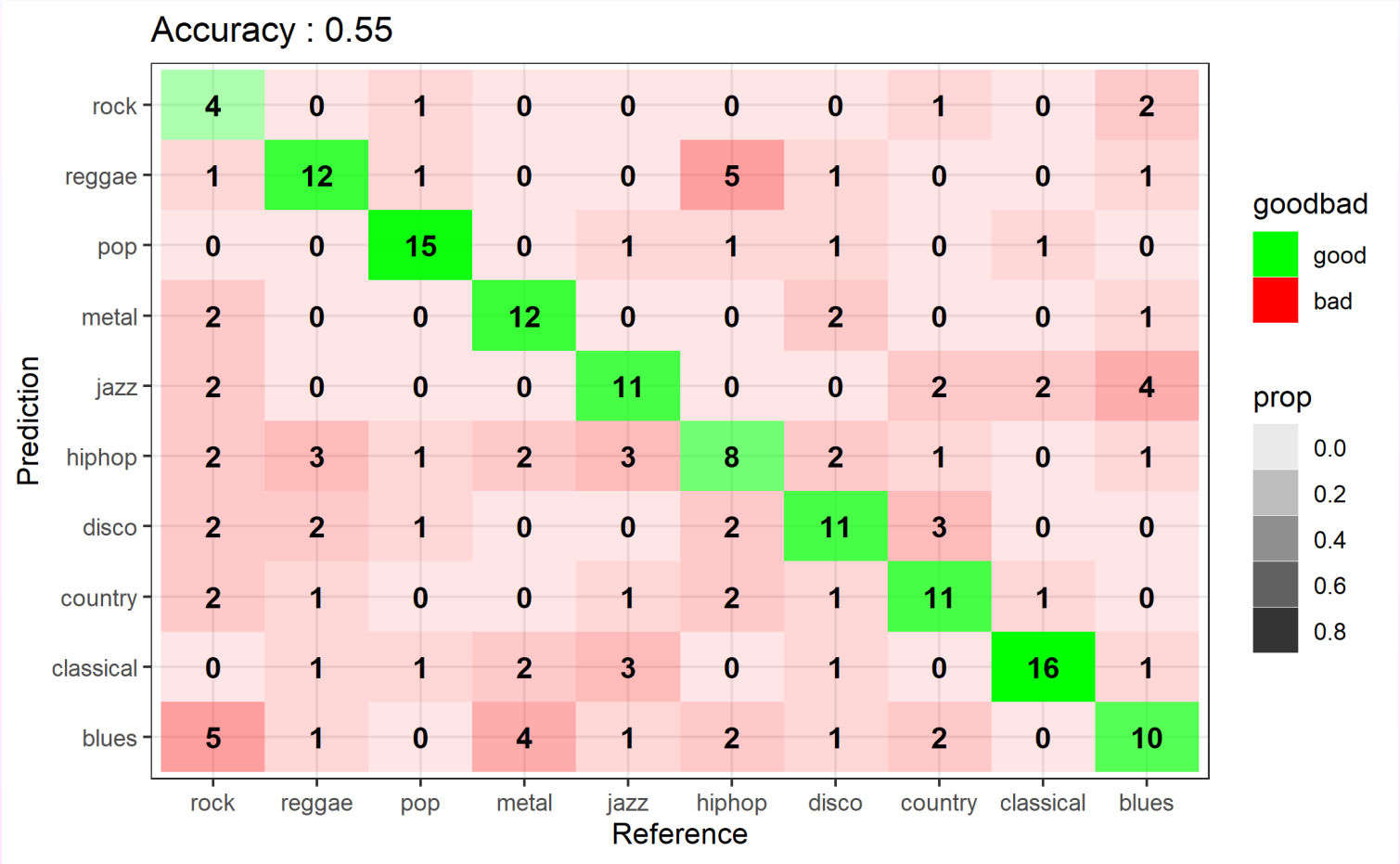
PCA(audio)


PC2
PC1
blues
classical
country
disco
hiphop
jazz
metal
pop
reggae
rock

Training/Testing Data

- Training: 800
- Testing: 200

Logistic Regression



One-hot encoding

label
blues
blues
blues
blues
blues
blues
blues
blues
blues
blues
blues
blues
blues
blues
blues
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blues
blues
blues
blues
blues
blues

$\Longrightarrow$

blues	classical	country	disco	hiphop	jazz	metal	pop	reggae	rock
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
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1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
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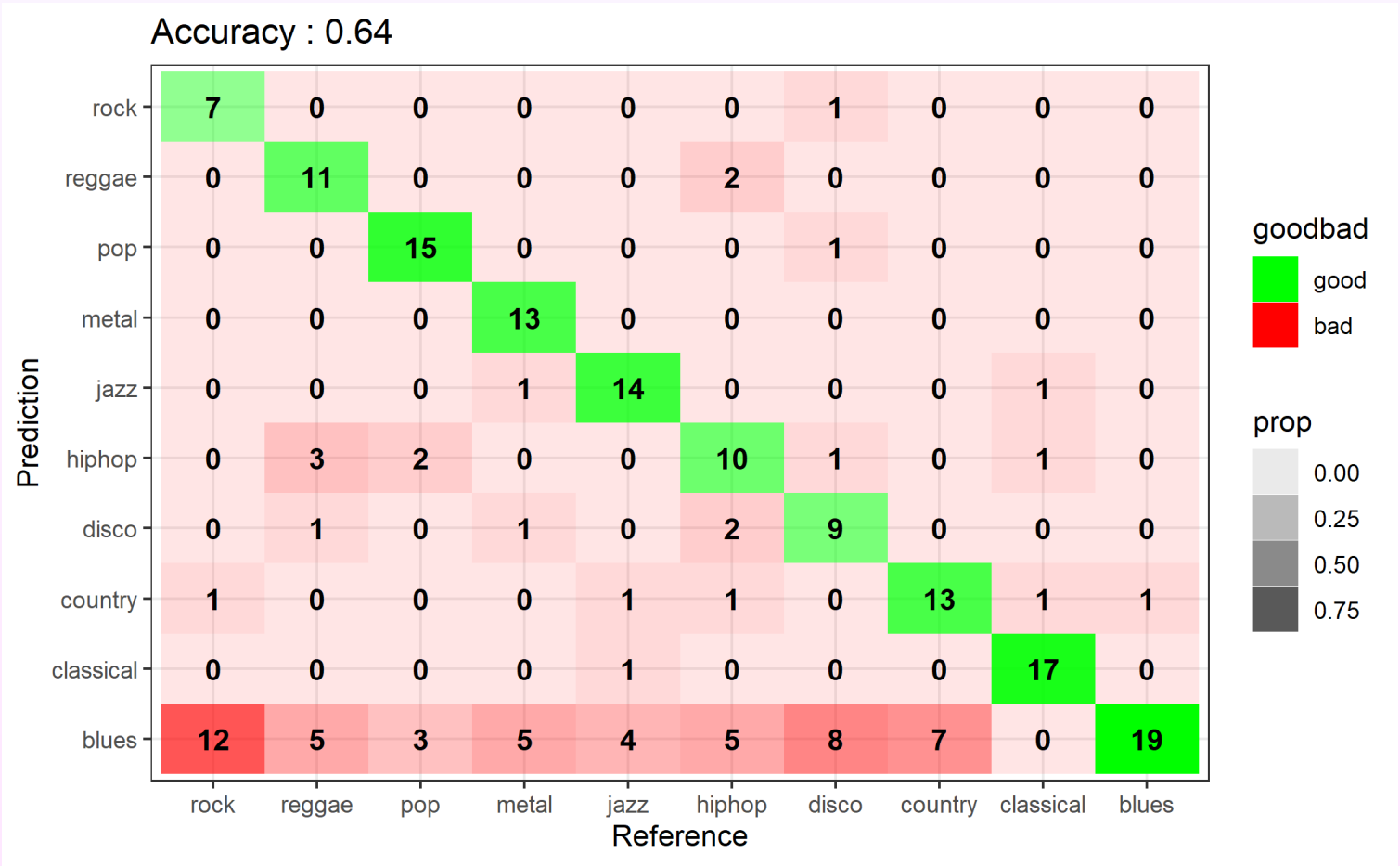
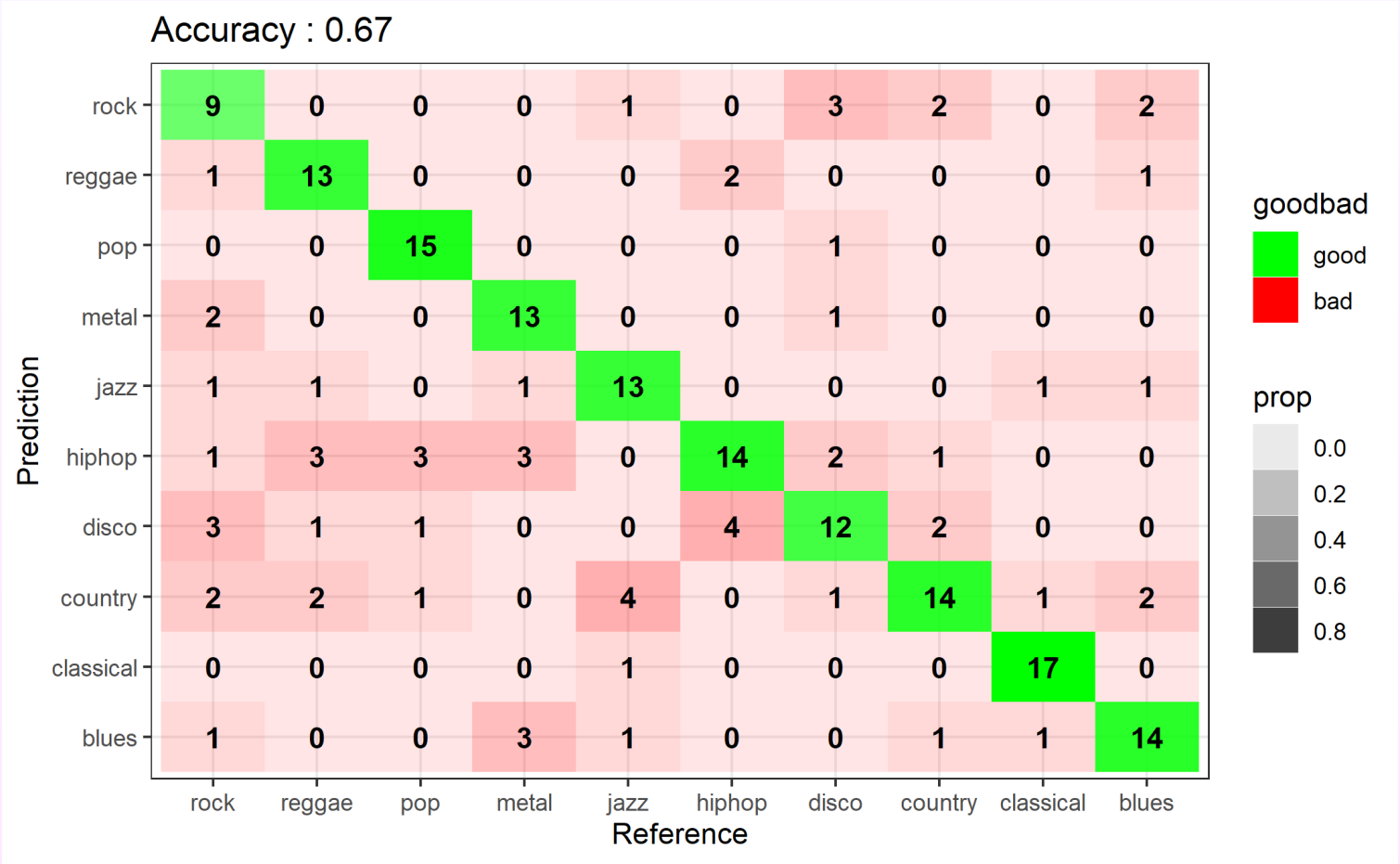
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0

SVM

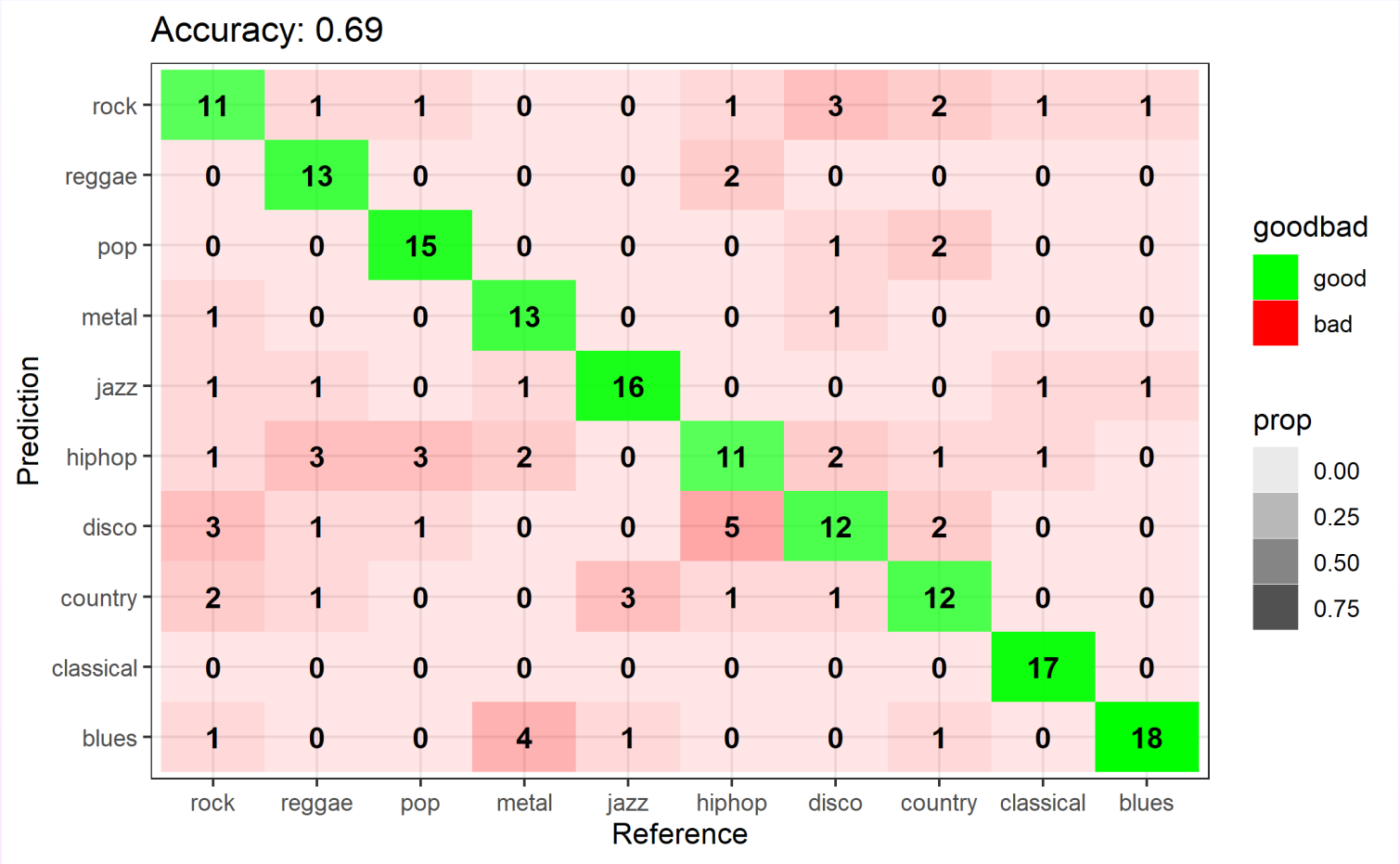
- Predict for each genre



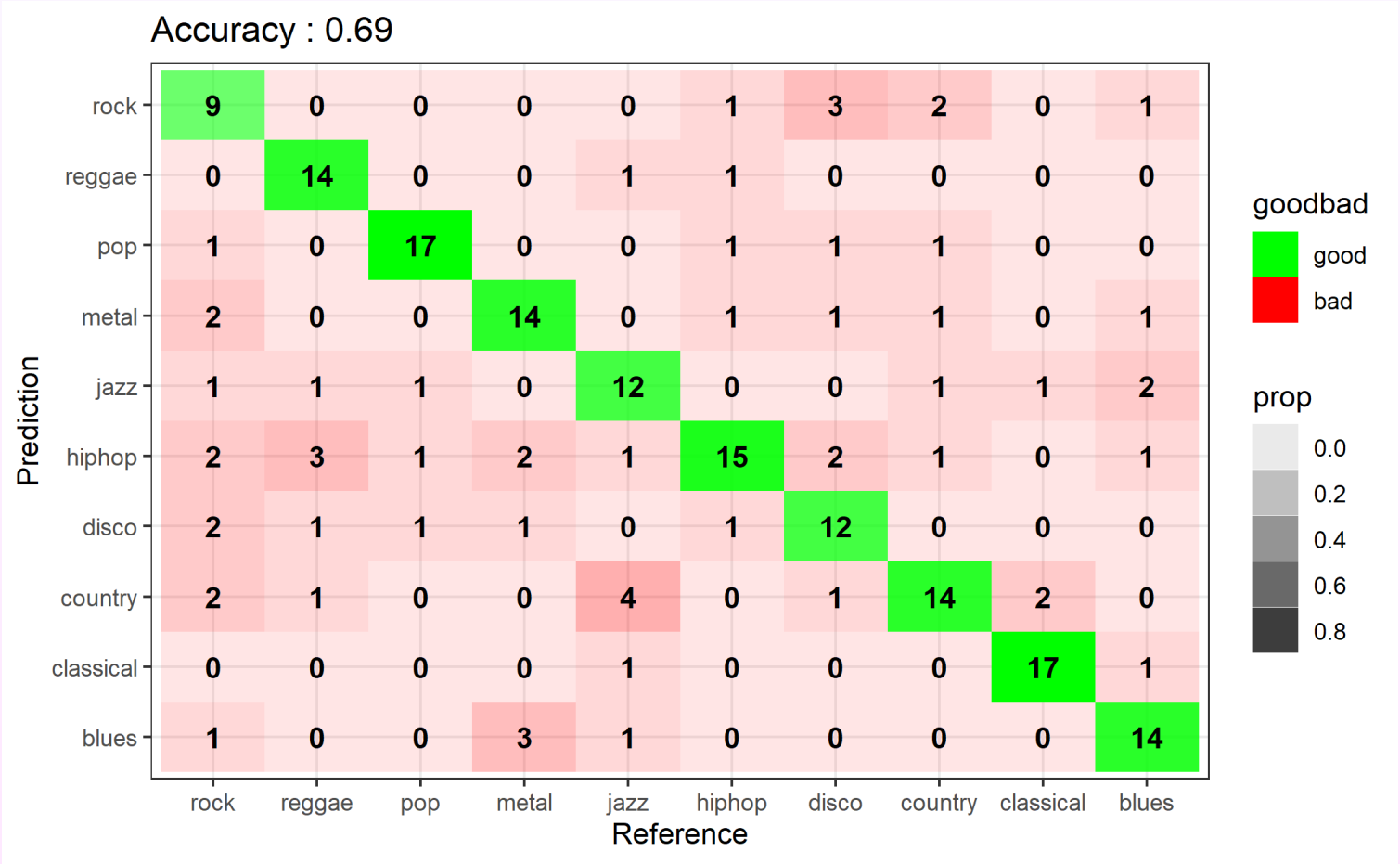
SVM


Accuracy : 0.67
Prediction
rock 9 0 0 0 1 0 3 2 0 2
reggae 1 13 0 0 0 2 0 0 0 1
pop 0 0 15 0 0 0 1 0 0 0
metal 2 0 0 13 0 0 1 0 0 0
jazz 1 1 0 1 13 0 0 0 1 1
hiphop 1 3 3 3 0 14 2 1 0 0
disco 3 1 1 0 0 4 12 2 0 0
country 2 2 1 0 4 0 1 14 1 2
classical 0 0 0 0 1 0 0 0 17 0
blues 1 0 0 3 1 0 0 1 1 14
rock reggae pop metal jazz hiphop disco country classical blues
Reference
goodbad
good
bad
prop
0.0
0.2
0.4
0.6
0.8

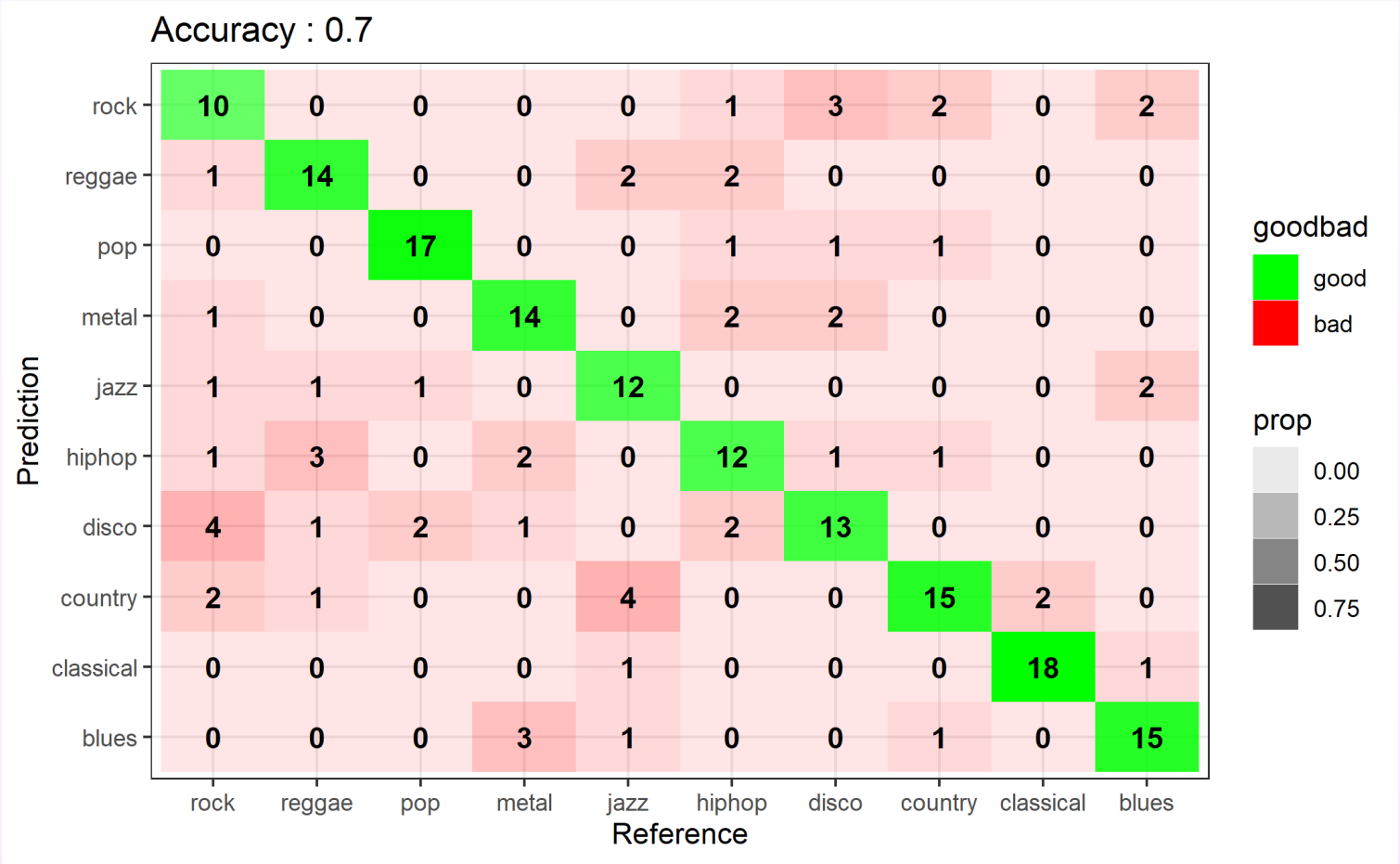
SVM(scaling)


Accuracy: 0.69
Prediction
rock 11 1 1 0 0 1 3 2 1 1
reggae 0 13 0 0 0 2 0 0 0 0
pop 0 0 15 0 0 0 1 2 0 0
metal 1 0 0 13 0 0 1 0 0 0
jazz 1 1 0 1 16 0 0 0 1 1
hiphop 1 3 3 2 0 11 2 1 1 0
disco 3 1 1 0 0 5 12 2 0 0
country 2 1 0 0 3 1 1 12 0 0
classical 0 0 0 0 0 0 0 0 17 0
blues 1 0 0 4 1 0 0 1 0 18
rock reggae pop metal jazz hiphop disco country classical blues
Reference
goodbad
good
bad
prop
0.00
0.25
0.50
0.75

Random Forest



Random Forest(scaling)



Conclusion

- Genre is classified.
- SVM and Random Forest are brilliant classifier.

Reference

- (TextBook)Hastie, Tibshirani and Friedman (2009). The Elements of Statistical Learning: Data Mining, Inference and Prediction. 2nd Edition.
- (TextBook)Hardle and Simar (2015). Applied Multivariate Statistical Analysis, 4th Edition.
- (Paper)Chih-Wei Hsu, Chih-Chung Chang, and Chih-Jen Lin (2016). A Practical Guide to Support Vector Classification.
- Meinard Muller, Stefan Balke (2015). Short-Time Fourier Transform and Chroma Features.
- (Website)Librosa
- (Website)Tempo vs Rhythm