Spotiflop Algorithm

Introduction to Machine Learning (TI508M)

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# Introduction & Objectives

We are working in a famous music-streaming company and our goal is to determine the type of music the customer is listening to. In the future this could help to create algorithm of recommendations based on the likes of the auditor.  
  
So based on the multiple features such as the popularity, acousticness or tempo, we have to be able to classify any other music in one of the genres.

This is why this project is about classification because we have several genres and it cannot be clustering cause we already know the genres and we do not want to discover knew under-genres. Moreover, this is not regression because genres are not numbers there are categories.

After having the Data Loading and Pre-processing, we now invite you to discover our work and our results through these following pages.

# The Algorithms

## K-nearest Neighbors

The K-nearest Neighbors (KNN) algorithm is based on the proximity of each value to each other, this is why it was important to choose the right distance algorithm. And among all those existing we decided to concentrate on Euclidean distance and Manhattan distance. Here are the respectively calculated errors of each one :

Une image contenant texte, capture d’écran, Tracé, diagramme

Description générée automatiquementUne image contenant texte, capture d’écran, Tracé, ligne

Description générée automatiquement

You can see here how both algorithm are close in error rate but the Manhattan one is lower. This is why we choose it.

Now, let’s go deep into the KNN algorithm by plotting its confusion matrix :

Une image contenant texte, capture d’écran, Parallèle, nombre

Description générée automatiquement

We can clearly see here the True Positive diagonal which is pretty good for Blues, Bollywood, HipHop, Instrumental, Pop and Indie. But we can also observe a big problem which that the indie class is dragging a lot of other genre in its predictions, for example the Alt class as 97 good predictions and 235 predictions in the Indie class which is a pretty bad performance.

So, we decided to remove the indie class temporary to see how the dataset will respond :

Une image contenant texte, capture d’écran, carré, Parallèle

Description générée automatiquement

Now the Alt class as way better results and Rock which was predicted as Indie is now considered as Alt. The main reason for this is that the Indie class as way more values in the dataset and so the training is influenced by this, and moreover Rock, Alt and Indie are very close genre in music.

## Random Forest Classifier

A Random Forest Classifier (RFC) is an ensemble machine learning algorithm that creates multiple decision trees using random subsets of training data and features, with each tree "voting" on the final classification. Here is our confusion matrix with this algorithm :

Une image contenant texte, capture d’écran, Parallèle, carré

Description générée automatiquement

## Support Vector Machines

The Support Vector Machine (SVM) is an algorithm that finds the best boundary to separate different groups of data points. It works by creating the largest possible gap between groups, helping to clearly classify new data into the correct category. Here is our confusion matrix with this algorithm :

Une image contenant texte, capture d’écran, Parallèle, nombre

Description générée automatiquement

# Comparisons

## Precision

Une image contenant texte, capture d’écran, Tracé, diagramme

Description générée automatiquement

## Sensitivity / Recall

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## Specificity

Une image contenant texte, capture d’écran, Tracé, diagramme

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## F1-Score

Une image contenant texte, capture d’écran, Tracé, diagramme

Description générée automatiquement

# Conclusion

All in all, the RFC seems to give the best performances and results for our dataset, especially with the F1-score. But we have to keep in mind that the dataset we choose was not perfect as the Indie class is over represented.

This project has helps us to discover new algorithms and also deepen our knowledge of KNN. The group work was pretty effective as everyone was invested and wanted to learn more about Machine Learning.

Finally, we hope you enjoyed reading our report and discovering more about Spotiflop.