CS 4811 : Artificial Intelligence
Group number : 13

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Emotion Based Music System

BACKGROUND

- Music plays an important role in everyone life at every part of our life.
- Selecting Music every time based our mood and emotions can be very lethargic or can break momentum of a individual or a group.
- For example if we are in a party, it is quite boring to select a song to play instead we can just tell computer what we are feeling and it will select a song for us
- This is where **Artificial Intelligence** plays an important role
- Hence, we tried to build a music recommendation system based on one's feeling.

PROBLEM STATEMENT

- WHAT ?

  Emotion based music recommendations system for a given text

- WHY ?

  It is a fun game to play. We give a text and it predicts your emotion and from that emotion, it suggest a song

- WHOM ?

  One individual or a group of people can be benefitted by this technology/ machine/model

- HOW ?

  Stay tuned…

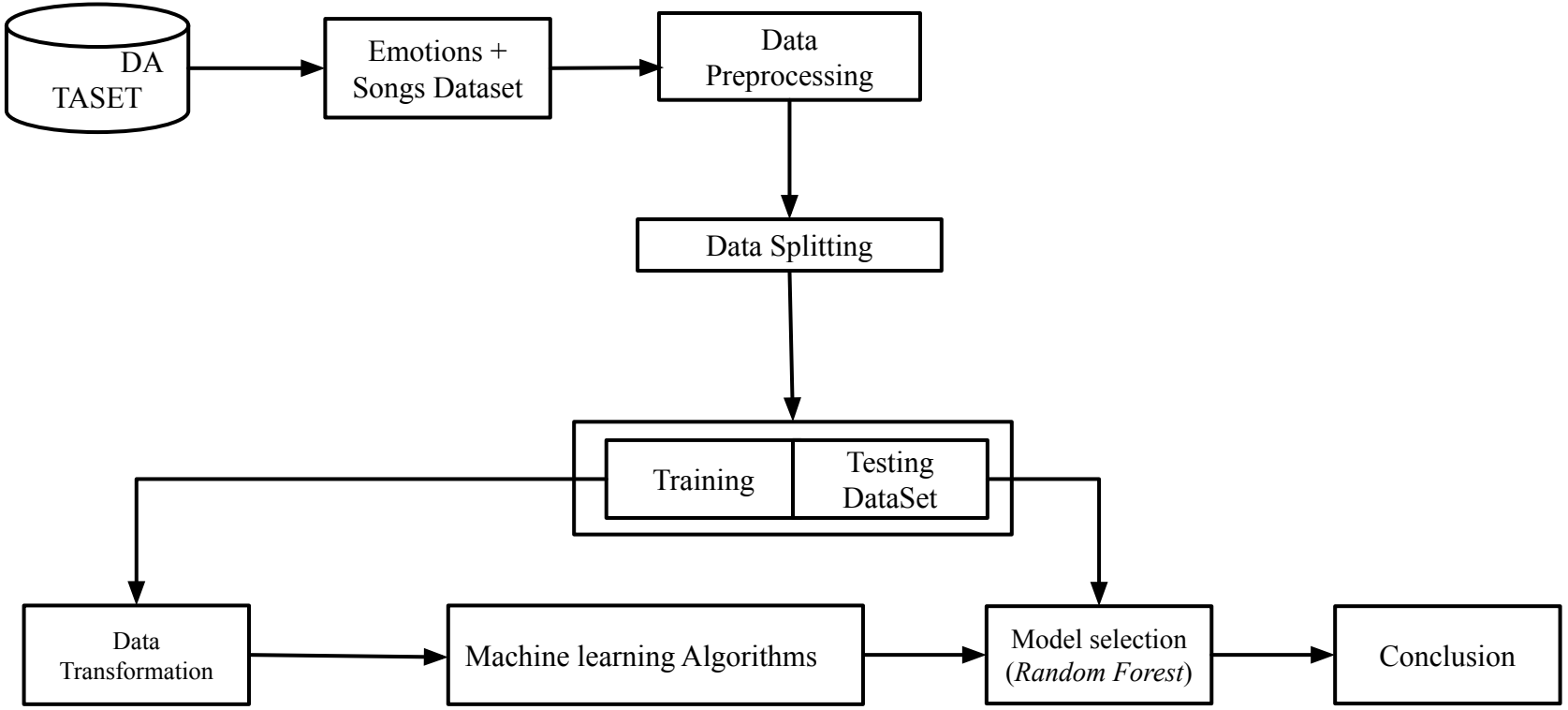
OBJECTIVE

The main objective of our project is to play a song according to a person's message.

EXPECTED OUTCOME

- ➔ The system is proposed to suggest a song , based on the emotion of a particular text
- ➔ The concept of Artificial intelligence and machine learning models were used to build a robust model with acceptable accuracy.

Block Diagram



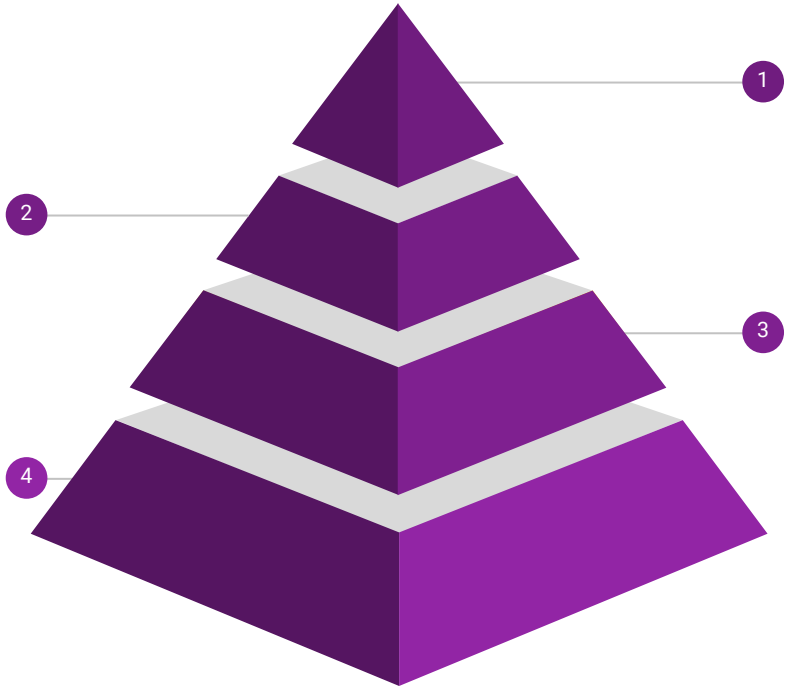
Steps

Data Pre-processing
Involves Add/remove columns, Null values, Duplicates, Punctuation, Stop words, Stemming and Lemmatization

Data Transformation
Count Vectorizer, TFIDF Transformer.

Data Splitting
Cross validation, Percentage of split, Random state

Model Selection and Conclusion
Identifying which one is best and then using that model to conclude results and then use it in future scope.



DATA PREPROCESSING

About the data set:

Name: “Emotion Detection Sentiment Analysis”
Number of Instances*:*40,000
Number of Attributes: *3*
Target (Diagnosis): emotion
Predictor Attributes: Content, tweet_id

Name: “Music”
Number of Instances*:*12
Number of Attributes: *3*
Attributes: emotion, genre, songs

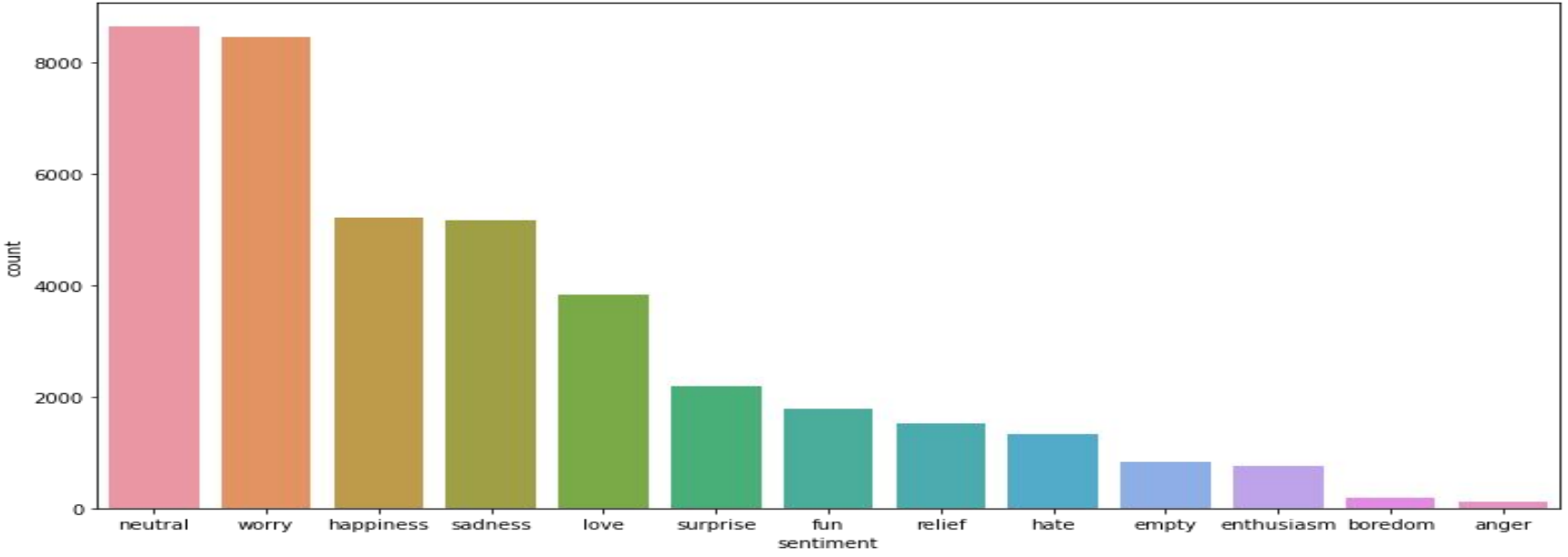
DATA PREPROCESSING

Music data set:

	sr_number	emotion	genres	songs
0	1	sadness	['Worship']	['God is Able', 'You are good' , 'Thank you Lo...
1	2	enthusiasm	['Rock']	['Don't stop dancing' ,'More than words' ,'Alw...
2	3	neutral	['Country music']	['The Wolves','Heading South','Never Leave']
3	4	worry	['Calm']	['Ocean eyes','July','Anchor']
4	5	surprise	['Celtic music']	['The Skye boat song','Mary queen of scots','L...
5	6	love	['Salsa Music']	['Shape of you','Shivers','Please dont go']
6	7	fun	['Disco']	['Dancing queen','celebrations','You should be...
7	8	hate	['Classical']	['Experience','Ala','On the nature of daylight']
8	9	happiness	['Jazz']	['Co-motion','Forever yours','Keep holding on']
9	10	boredom	['Opera']	['Handel','Norma','Turandot']
10	11	relief	['Meditative']	['Moving','Opening','Stay']
11	12	anger	['Soothing']	['River flows in you','Love yourself','I wont ...

DATA PREPROCESSING

Emotion Target Variable:



DATA PREPROCESSING

1. Drop column: ‘tweet_id’ is dropped
2. Add column: ‘new_content’ is added with all the null values
3. No duplicate and null values values

DATA PREPROCESSING

Example: “@tiffanylue i know i was listenin to bad habit earlier and i started freakin at his part =[“

Noisy data: Removed tagged names such as ‘@youknowho’, ‘@Johnydeep’

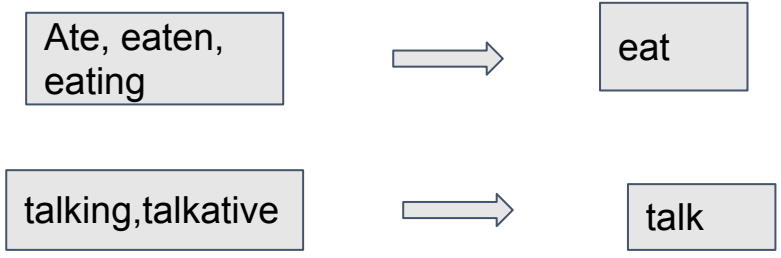
Stop words: Removed stop words like ‘the’, that’, ‘we’, ‘they’ etc.,

Punctuations: Punctuations(‘!’,’+’,’-’,’=’,’_’) are removed

DATA PREPROCESSING

Stemming and lemmatization:

This help to find the base word of a particular word.



AFTER DATA CLEANING

- 288 null values are removed
- No.of instance(39712, 2)

LET'S PROCEED TOWARDS DATA TRANSFORMATION

DATA TRANSFORMATION

COUNT VECTORIZER - BAG OF WORDS MODEL

- However we cannot directly feed the raw data to the algorithms so we need to vectorize it.
- Nothing but breaking down sentence or any text into words by preprocessing tasks like converting everything to lowercase characters or removing spaces.
- As NLP models only accepts numbers so this textual data needs to be vectorized.
- The steps means each data is preprocessed and then the each word is considered as separate token and this is represented as sparse matrix.

DATA TRANSFORMATION

TFIDF VECTORIZER:

- To give higher ranking to the most frequently used words
- Higher ranking,
- TF-IDF stands for ***term frequency-inverse document frequency***.
- Quantifies the importance or relevance of string representations (words, phrases, lemmas, etc) in a document amongst a collection of documents.

DATA SPLITTING

- Before applying any machine learning algorithm to the dataset, one need to define feature matrix and response variable
- i.e X and y assume
- features- input
- response- target
- observations- instances

  so we took it from dataframe

DATA SPLITTING

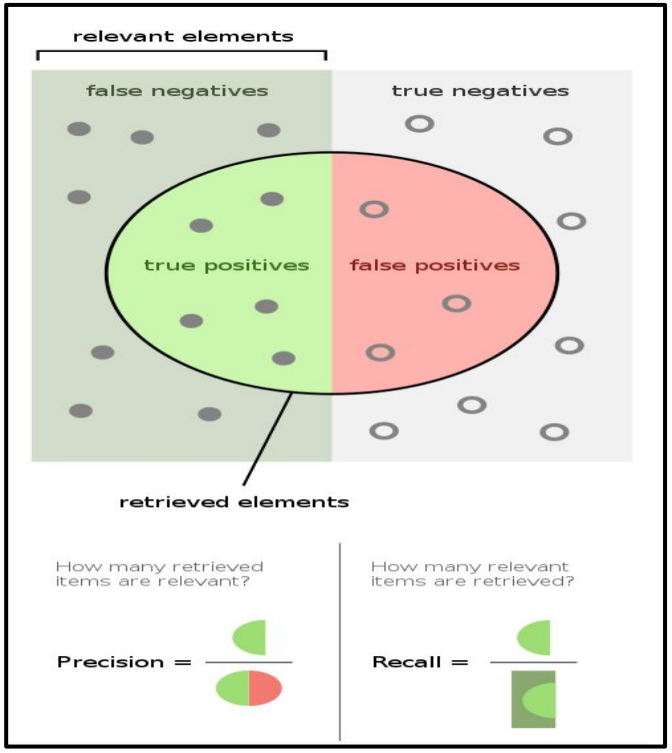
Percentage of Splitting:

- Any machine learning algorithms when we work on to classify or cluster or organize the data to find accuracy we need two things:
- Train Data: Subset of original data that can be used to train these machine learning algorithms.
- Test Data: Remaining subset of original data that is used to test the accuracy of the trained model.
- Default test data split if 25%
- Most popular ones are train data between 70-80% and test data between 20-30%

Cross Validation and Random State

- Cross Validation - Number of folds mention are the number of possible combination of subsets of original data working with its complementary.
- Random State - The integer number provided shuffles that many time the train and test data with randomness and due to which we may get every time different percentage of accuracy.

PERFORMANCE METRICS



PERFORMANCE METRICS

- F1 score = (2*precision*recall)/(precision + recall)
- Accuracy = TP + TN / TN + TP + FN + FP

MODEL SELECTION AND CONCLUSION

1. Multinomial Naive Bayes

- Always observed to be a baseline solution.
- Pipeline class was used to make the vectorizer => transformer => classifier.

	precision	recall	f1-score	support
anger	0.00	0.00	0.00	27
boredom	0.00	0.00	0.00	47
empty	0.14	0.00	0.01	258
enthusiasm	0.00	0.00	0.00	215
fun	0.00	0.00	0.00	509
happiness	0.32	0.31	0.32	1576
hate	0.36	0.01	0.02	408
love	0.48	0.31	0.38	1158
neutral	0.32	0.41	0.36	2578
relief	0.33	0.00	0.01	444
sadness	0.29	0.17	0.21	1504
surprise	0.03	0.00	0.00	660
worry	0.30	0.64	0.41	2616
accuracy			0.32	12000
macro avg	0.20	0.14	0.13	12000
weighted avg	0.29	0.32	0.27	12000

2. Logistic Regression

- Logistic regression (LR) is the most famous machine learning algorithm after linear regression.

C here instructs the model of how to choose the parameters. Default value is 1

	precision	recall	f1-score	support
anger	0.00	0.00	0.00	27
boredom	0.00	0.00	0.00	47
empty	0.00	0.00	0.00	258
enthusiasm	0.00	0.00	0.00	215
fun	0.15	0.02	0.03	509
happiness	0.35	0.36	0.35	1576
hate	0.44	0.13	0.21	408
love	0.50	0.38	0.43	1158
neutral	0.33	0.58	0.42	2578
relief	0.42	0.05	0.08	444
sadness	0.36	0.24	0.29	1504
surprise	0.20	0.03	0.05	660
worry	0.34	0.46	0.39	2616
accuracy			0.35	12000
macro avg	0.24	0.17	0.17	12000
weighted avg	0.33	0.35	0.32	12000

3. Random Forest

- Random forest is a type of supervised machine learning algorithm based on ensemble learning.
- Ensemble learning is a type of learning where the join different types of algorithms or same algorithm multiple times form a more powerful prediction model.

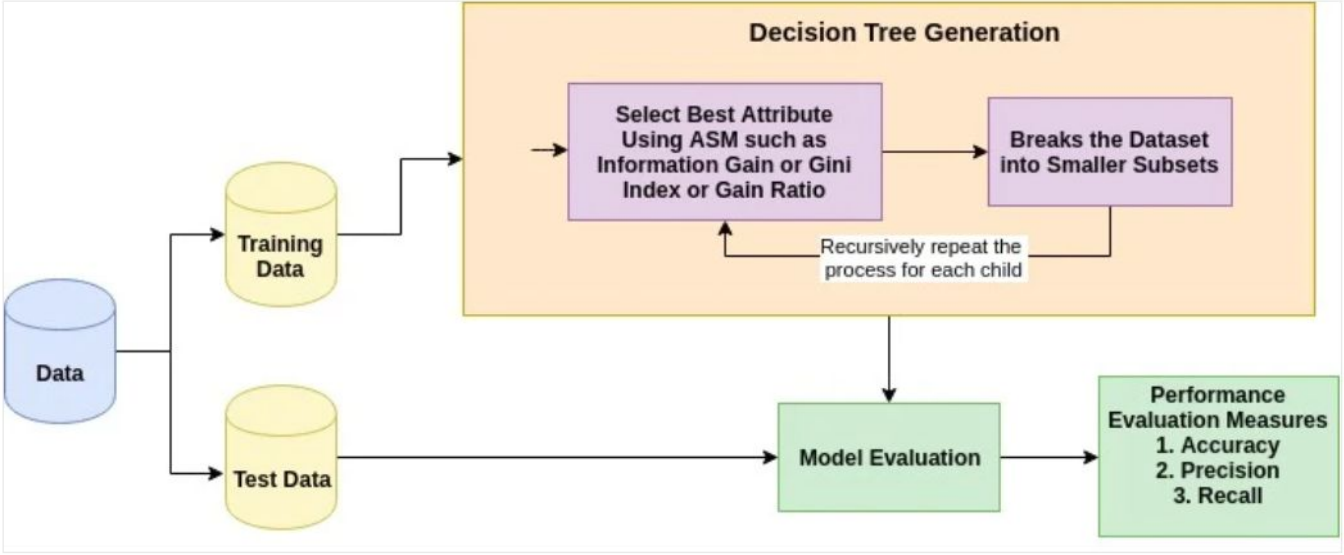
```
Fitting 3 folds for each of 4 candidates, totalling 12 fits
{'n_estimators': 50}
              precision    recall  f1-score   support

       anger       1.00      1.00      1.00        27
     boredom       1.00      1.00      1.00        47
       empty       0.91      0.98      0.94       242
  enthusiasm       0.99      1.00      0.99       213
         fun       0.99      0.99      0.99       505
   happiness       0.98      0.99      0.98      1560
        hate       0.99      0.99      0.99       409
        love       0.98      0.97      0.97      1181
     neutral       0.98      0.96      0.97      2653
      relief       0.95      0.99      0.97       428
     sadness       0.98      0.99      0.98      1488
    surprise       0.97      1.00      0.98       640
       worry       0.98      0.99      0.98      2607

    accuracy                           0.98     12000
   macro avg       0.98      0.99      0.98     12000
weighted avg       0.98      0.98      0.98     12000
```

4. SVM

- SVC function i.e Support Vector Classification used for the same.
- Support Vector Machine for Regression implemented using libsvm.
- Fit() function is used to fit the svm model according to given training model

	precision	recall	f1-score	support
anger	0.00	0.00	0.00	0
boredom	0.00	0.00	0.00	3
empty	0.00	0.00	0.00	11
enthusiasm	0.00	0.00	0.00	12
fun	0.03	0.12	0.05	146
happiness	0.32	0.32	0.32	1542
hate	0.17	0.37	0.23	186
love	0.39	0.45	0.42	997
neutral	0.59	0.34	0.43	4476
relief	0.06	0.20	0.09	132
sadness	0.27	0.31	0.29	1289
surprise	0.05	0.15	0.07	204
worry	0.40	0.35	0.37	3002
accuracy			0.34	12000
macro avg	0.17	0.20	0.18	12000
weighted avg	0.43	0.34	0.37	12000

5. Decision Tree Classifier



	precision	recall	f1-score	support
anger	0.00	0.00	0.00	7
boredom	0.02	0.04	0.03	28
empty	0.04	0.05	0.04	217
enthusiasm	0.02	0.03	0.02	144
fun	0.08	0.11	0.10	394
happiness	0.25	0.25	0.25	1582
hate	0.22	0.23	0.23	386
love	0.34	0.33	0.33	1191
neutral	0.44	0.32	0.37	3518
relief	0.08	0.11	0.10	322
sadness	0.23	0.25	0.24	1387
surprise	0.07	0.12	0.09	400
worry	0.29	0.32	0.31	2424
accuracy			0.27	12000
macro avg	0.16	0.17	0.16	12000
weighted avg	0.30	0.27	0.28	12000

6. XGB Classifier

- XGBoost is short for “eXtreme Gradient Boosting.”
- XGBoost includes a unique split-finding algorithm to optimize trees, along with built-in regularization that reduces overfitting.

	precision	recall	f1-score	support
anger	0.00	0.00	0.00	0
boredom	0.00	0.00	0.00	5
empty	0.00	0.00	0.00	0
enthusiasm	0.00	0.00	0.00	0
fun	0.01	0.18	0.01	17
happiness	0.23	0.35	0.28	1004
hate	0.17	0.44	0.24	154
love	0.37	0.53	0.43	813
neutral	0.77	0.29	0.42	6894
relief	0.04	0.27	0.07	71
sadness	0.18	0.40	0.25	685
surprise	0.01	0.15	0.02	46
worry	0.30	0.34	0.32	2311
accuracy			0.33	12000
macro avg	0.16	0.23	0.16	12000
weighted avg	0.56	0.33	0.37	12000

7. kNN Classification

- In KNN, K is the number of nearest neighbors.
- Suppose you consider one point P1 and then which label needs to be predict.
- Then find k closest point to P1 and then classify which majority of its neighbors.

	precision	recall	f1-score	support
anger	0.00	0.00	0.00	0
boredom	0.00	0.00	0.00	5
empty	0.00	0.00	0.00	0
enthusiasm	0.00	0.00	0.00	0
fun	0.01	0.18	0.01	17
happiness	0.23	0.35	0.28	1004
hate	0.17	0.44	0.24	154
love	0.37	0.53	0.43	813
neutral	0.77	0.29	0.42	6894
relief	0.04	0.27	0.07	71
sadness	0.18	0.40	0.25	685
surprise	0.01	0.15	0.02	46
worry	0.30	0.34	0.32	2311
accuracy			0.33	12000
macro avg	0.16	0.23	0.16	12000
weighted avg	0.56	0.33	0.37	12000

Results and analysis of implemented model

Models	Accuracy
MultiNomial Naive Bayes(NB)	32 %
Logistic Regression	35 %
Support Vector Machine (SVM)	34 %
K-nearest neighbors	33 %
Decision Tree classifier	27 %
XGB Classifier	33 %
Random Forest	**98 %**

CONCLUSION

RANDOM FOREST GIVES THE HIGHEST ACCURACY, THUS SELECTING ITS PREDICTED RESULTS TO CONCLUDE

	emotion	genres	songs
0	worry	['Calm']	['Ocean eyes','July','Anchor']
1	neutral	['Country music']	['The Wolves','Heading South','Never Leave']
2	neutral	['Country music']	['The Wolves','Heading South','Never Leave']
3	neutral	['Country music']	['The Wolves','Heading South','Never Leave']
4	sadness	['Worship']	['God is Able', 'You are good' , 'Thank you Lo...

REFERENCES

- https://scikit-learn.org/stable/
- Wikipedia
- https://ieeexplore.ieee.org/document/8802550
- https://www.google.com/url?sa=t&source=web&rct=j&url=https://www.ijert.org/research/mood-based-music-recommendation-system-IJERTV10IS060253.pdf&ved=2ahUKEwiW68fvvuj6AhUsl4kEHbbOAH04ChAWegQIFxAB&usg=AOvVaw3_XJG1KLXB7k6kVNmaLAFw
- https://www.kaggle.com/code/rishabh2007/emotion-detection-sentiment-analysis-2-4

THANK YOU