

# ADVANCED OPINION ANALYSIS

Submitted in partial fulfillment of the requirements for the award of  
Bachelor of Engineering Degree in Computer Science and Engineering

By

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**APRIL 2022**

# ADVANCED OPINION ANALYSIS



## SATHYABAMA

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## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

### BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **SURYA B REG NO 39290106 SRINIVASAN R REG NO 3929010** who carried out the project entitled "**ADVANCED OPINION ANALYSIS**" under my supervision from November 2020 to April 2021.

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Submitted for Viva voce Examination held on \_\_\_\_\_

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# ADVANCED OPINION ANALYSIS

## DECLARATION

I, **SURYA B (REG NO 39290106)** hereby declare that the Project Report entitled "**MUSIC GENRE CLASSIFICATION USING MACHINE LEARNING**" done by me under the guidance of **Dr. MOHANAPRASAD** is submitted in partial fulfillment of the requirements for the award of Bachelor of Science degree in Computer Science.

**DATE:**

**PLACE: CHENNAI**

**SIGNATURE OF THE CANDIDATE**

# ADVANCED OPINION ANALYSIS

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I would like to express my sincere and deep sense of gratitude to my Project Guide **Dr. MOHANAPRASAD, M.E., Ph.D.**, for his valuable guidance, suggestions and constant encouragement paved way for the successful completion of my projectwork.

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## **ABSTRACT**

Opinion mining is the computational study of people's opinions, sentiments, attitudes, and emotions expressed in written language. It is one of the most active research areas and text mining in recent years.

Its popularity is mainly due to two reasons. First, it has a wide range of applications because opinions are central to almost all human activities and are key influencers of our behaviors.

This work presents a comprehensive machine learning approach to the problem of automatic musical genre classification using the audio signal. The system is developed using a HAC and MOS to recognize the REVIEW.

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## CHAPTER 1

### 1. INTRODUCTION

#### 1.1 OVERVIEW OF PROJECT

Since the evolution of social networks, people have started to express their opinions in the form of the blogs or facebook posts or tweets starting from the products people buy to the presidential candidate they support.

When searched for a particular product on the web, the current day search engines show the list of websites which gives the features of the product and their prices. But, the users can be given much more info about the product using the reviews about the searched product.

Thus, a new type of search engine can be designed which will not only retrieve facts, but will also enable the retrieval of opinions of the users about the product.

Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. It focuses on the development of computer programs that can access data and use it learn for themselves. Machine learning algorithms are used to classify and predict the review of the products.

## CHAPTER 2

### 2. LITERATURE SURVEY

#### 1. Advanced Opinion Analysis

**AUTHOR, YEAR OF PUBLICATION, DESCRIPTION, PRONS, CONS.**

**Dr. Babasaheb, Assistant Professor, Computer Science and Engineering  
2017 Sentiment Analysis, Information Extraction. Allowing businesses to  
improve there products. Not much attention is given to the posts.**

#### 2. Dr V.Jaya Rama Krishnaiah Vemula ,Research Scholar 2014 Text mining.

**Very useful when tracking opinions over time. One term have multiple  
meanings or multiple terms have the same meaning.**

#### 3. J. Soonu Aravindan Research Scholar (Ph.D.) 2015 Opinion mining. Provides the most efficient computation of terms. The incorrect value of the review can lead to inaccurate information abt thecustomers review of the products. Long short-term memory recurrent neural network-based segment features for music genre classification

**Authors: Jia Dai ; Shan Liang ; Wei Xue ; Chongjia Ni ; Wenju Liu, 2016 10th  
International Symposium on Chinese Spoken Language Processing (ISCSLP)**

#### 4. Music Genre Recognition Using Residual Neural Networks

**Authors; Dipjyoti Bisharad ; Rabul Hussain Laskar**

**TENCON 2019 - 2019 IEEE Region 10 Conference (TENCON)**

## CHAPTER 3

### 3. AIM AND SCOPE OF PRESENT INVESTIGATION

#### 3.1 AIM OF THE PROJECT

A search engine is created which, when searched for a product, gives the highlighted features of the product and some of the helpful reviews (instead of the user scrolling through all the reviews to know about the product).

Consider the scenario when the product sellers want to know which of their product features stood it in the market or which of their product features were not liked by majority of their users, this kind of analysis is very helpful.

## 3.2 SCOPE AND OBJECTIVE

The main objective of opinion analysis is to mine the users opinion or reviews about a product and generate valuable information. The opinions or ratings on the Web are users info about the product and available in the form of text and ratings and also pose some polarity, i.e., positive, negative or neutral. Will start with the discussion of the mainstream opinion analysis

1. Developing a machine learning model that classifies reviews and shows that there exists a solution which automatically classifies comments into reviews like positive,negative comments.
2. Another objective is to reach a good accuracy so that the model classifies comments and reviews carefully.
3. This model should be better than at least a few preexisting models.

## 3.3 SYSTEM REQUIREMENTS

### 3.3.1 Hardware Requirements

The most common set of requirements defined by any operating system or software application is the physical computer resources, also known as hardware. The minimal hardware requirements are as follows,

1. Processor : Pentium IV
2. RAM : 8 GB
3. Processor : 2.4 GHz
4. Main Memory : 8GB RAM
5. Hard Disk Drive : 1tb
6. Keyboard : 104 Keys

### 3.3.2 Software Requirements

Software requirements deals with defining resource requirements and prerequisites that needs to be installed on a computer to provide functioning of an application. The minimal software requirements are as follows,

1. Front end : python
2. Dataset : csv
3. IDE : anaconda
4. Operating System : Windows 10

## 3.4 SOFTWARE USED:

### 3.4.1 Python Language

Python is an object-oriented programming language created by Guido Rossum in 1989. It is ideally designed for rapid prototyping of complex applications. It has interfaces to many OS system calls and libraries and is extensible to C or C++. Many large companies use the Python programming language include NASA, Google, YouTube, BitTorrent, etc. Python programming is widely used in Artificial Intelligence, Natural Language Generation, Neural Networks and other advanced fields of Computer Science. Python had deep focus on code readability & this class will teach you python from basics.

### 3.4.2 Python Characteristics

- It provides rich data types and easier to read syntax than any other programming languages
- It is a platform independent scripted language with full access to operating system API's
- Compared to other programming languages, it allows more run-time flexibility
- It includes the basic text manipulation facilities of Perl and Awk
- A module in Python may have one or more classes and free functions
- Libraries in Python are cross-platform compatible with Linux, Macintosh, and Windows
- For building large applications, Python can be compiled to byte-code
- Python supports functional and structured programming as well as OOP
- It supports interactive mode that allows interacting Testing and debugging of snippets of code
- In Python, since there is no compilation step, editing, debugging and testing is fast.

### 3.4.3 Applications of Python Programming

#### Web Applications:

You can create scalable Web Apps using frameworks and CMS (Content Management System) that are built on Python. Some of the popular platforms for

creating Web Apps are: Django, Flask, Pyramid, Plone, Django CMS. Sites like Mozilla, Reddit, Instagram and PBS are written in Python.

## **Scientific and Numeric Computing:**

There are numerous libraries available in Python for scientific and numeric computing. There are libraries like: SciPy and NumPy that are used in general purpose computing. And, there are specific libraries like: Earthy for earth science, Astray for Astronomy and so on. Also, the language is heavily used in machine learning, data mining and deep learning.

## **Creating software Prototypes:**

Python is slow compared to compiled languages like C++ and Java. It might not be a good choice if resources are limited and efficiency is a must. However, Python is a great language for creating prototypes. For example: You can use Pygmy (library for creating games) to create your game's prototype first. If you like the prototype, you can use language like C++ to create the actual game.

## **Good Language to Teach Programming:**

Python is used by many companies to teach programming to kids and newbies. It is a good language with a lot of features and capabilities. Yet, it's one of the easiest languages to learn because of its simple easy-to-use syntax.

### **3.4.4 OpenCV Package**

Python is a general-purpose programming language started by Guido van Rossum, which became very popular in short time mainly because of its simplicity and code readability. It enables the programmer to express his ideas in fewer lines of code without reducing any readability.

Compared to other languages like C/C++, Python is slower. But another important feature of Python is that it can be easily extended with C/C++. This feature helps us to write computationally intensive codes in C/C++ and create a Python

wrapper for it so that we can use these wrappers as Python modules. This gives us two advantages: first, our code is as fast as original C/C++ code (since it is the actual C++ code working in background) and second, it is very easy to code in Python. This is how OpenCV-Python works, it is a Python wrapper around original C++ implementation.

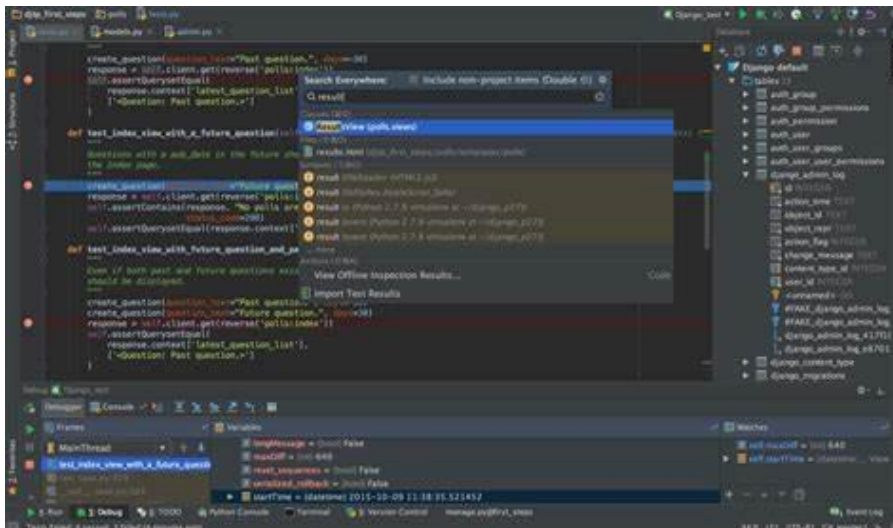
And the support of NumPy makes the task easier. NumPy is a highly optimized library for numerical operations. It gives a MATLAB-style syntax. All the OpenCV array structures are converted to-and-from NumPy arrays. So whatever operations you can do in NumPy, you can combine it with OpenCV, which increases number of weapons in your arsenal. Besides that, several other libraries like SciPy, Matplotlib which supports Numpy can be used with this.

So OpenCV-Python is an appropriate tool for fast prototyping of computer vision problems.

### **3.5.1 pycharm:**

pycharm is a free and open source, easy to install distribution of Python and R programming languages.pycharm provides a working environment which is used for scientific computing, data science, statistical analysis and machine learning.

The latest distribution of pycharm is pycharm 5.3 and is released in October, 2018. It has the ven1 package, environment manager and a collection of 1000+ open source packages long with free community support.



## What is pycharm navigator ?

Pycharm Navigator is a desktop graphical user interface (GUI) included in the Anaconda distribution. It allows us to launch applications provided in the Anaconda distribution and easily manage conda packages, environments and channels without the use of command-line commands. It is available for Windows, macOS and Linux.



*Fig 3.2: Home Page*

### 3.5.2 Applications Of pycharm

The Anaconda distribution comes with the following applications along with Anaconda Navigator.

1. JupyterLab
2. Jupyter Notebook
3. Qt Console
4. Spyder
5. Glueviz
6. Orange3
7. RStudio

## 8. Visual Studio Code

### 3.5.3 VS Code:

VS Code is a free, open source streamlined cross-platform code editor with excellent support for Python code editing, IntelliSense, debugging, linting, version control, and more. Additionally, the Python Extension for Visual Studio Code tailors VS Code into a Python IDE. It is a streamlined code editor with support for development operations like debugging, task running and version control.

VS Code is free for both private and commercial use, runs on Windows, macOS, and Linux, and includes support for linting, debugging, task running, version control and Git integration, IntelliSense code completion, and conda environments. VS Code is openly extensible and many extensions are available.

Visual Studio Code is a streamlined code editor with support for development operations like debugging, task running, and version control. It aims to provide just the tools a developer needs for a quick code-build-debug cycle and leaves more complex workflows to fuller featured IDEs, such as Visual Studio IDE.

### 3.5.4 New Features of Anaconda 5.3

Compiled with Latest Python release: Anaconda 5.3 is compiled with Python 3.7, taking advantage of Python's speed and feature improvements.

- **Better Reliability:**

The reliability of Anaconda has been improved in the latest release by capturing and storing the package metadata for installed packages.

- **Enhanced CPU Performance:**

The Intel Math Kernel Library 2019 for Deep Neural Networks(MKL 2019) has been introduced in Anaconda 5.3 distribution. Users deploying

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TensorFlow can make use of MKL 2019 for Deep Neural Networks. These Python binary packages are provided to achieve high CPU performance.

- **New packages are added:**

There are over 230 packages which has been updated and added in the new release.

- **Work in Progress:**

There is a casting bug in Numpy with Python 3.7 but the team is currently working on patching it until Numpy is updated

## CHAPTER 4

### 4. EXPERIMENTAL OR MATERIAL METHODS

#### 4.1 DESIGN METHODOLOGY

##### 4.1.1 Existing System:

One of the important types of information on the Web is the opinions expressed in the user generated content, eg, customer reviews of products, forum posts, and blogs. In particular, we study the problem of determining the semantic orientations (positive, negative or neutral) of opinions expressed on product features in reviews.

##### 4.1.2 Proposed System:

This process majorly includes opinions, reviews posted on social media. The main objective of opinion mining is to mine these reviews and generate valuable information. The result helps the other users to validate a product whether it is in correct quality or meets the users expectation.

#### 4.2 MODULE DESCRIPTION

##### Module 1: Data Preprocessing

Data Preprocessing is a process of transforming the raw, complex data into systematic understandable knowledge. It involves the process of finding out missing and redundant data in the dataset. Thus, this brings uniformity in the dataset. However, in our dataset, there was no missing values found meaning that every record was constituted its corresponding feature values.

## **Module 2: Feature Extraction**

Feature extraction is a process of dimensionality reduction by which an initial set of raw data is reduced to more manageable groups for processing. A characteristic of these large data sets is a large number of variables that require a lot of computing resources to process. Feature extraction is the name for methods that select and /or combine variables into features, effectively reducing the amount of data that must be processed, while still accurately and completely describing the original data set.

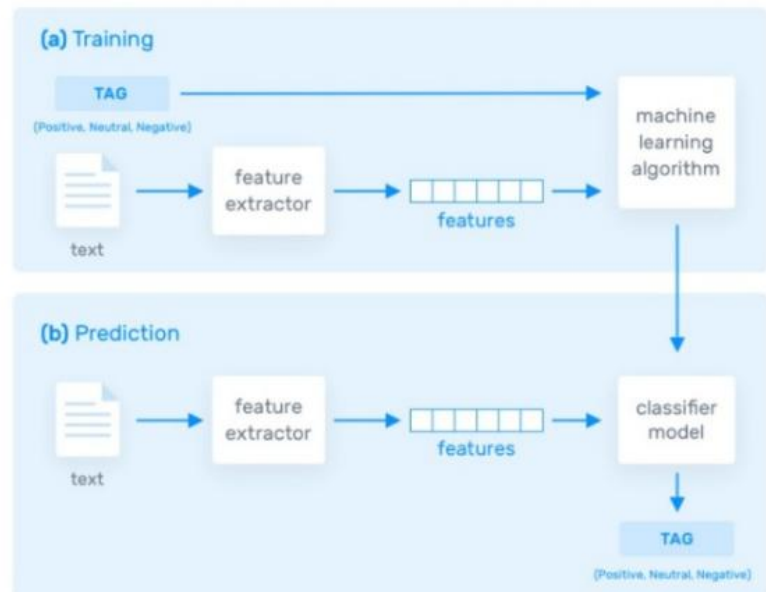
## **Module 3: Model Creation:**

### **Algorithm's Used:**

High Adjective Count High Adjective Count algorithm identifies mostly discussed nouns in the reviews and scores respective opinion score. • Max Opinion Score The MOS is expressed as a single rational number, typically in the range 1–5, where 1 is lowest perceived quality, and 5 is the highest perceived quality

### **4.2.1 Working of HAC:**

An HAC model is basically a representation of different classes in a hyperplane in multidimensional space. The hyperplane will be generated in an iterative manner by HAC so that the error can be minimized. The goal of HAC is to divide the datasets into classes to find a maximum marginal hyperplane (MMH).



**Fig 4.1: ALGORITHM REPRESENTATION**

The followings are important concepts in HAC:

## **Support Vectors:**

Datapoints that are closest to the hyperplane is called support vectors. Separating line will be defined with the help of these data points.

## **Hyperplane:**

As we can see in the above diagram, it is a decision plane or space which is divided between a set of objects having different classes.

## **Margin:**

It may be defined as the gap between two lines on the closet data points of different classes. It can be calculated as the perpendicular distance from the line to the support vectors. Large margin is considered as a good margin and small margin considered as a bad margin.

The main goal of SVM is to divide the datasets into classes to find a maximum marginal hyperplane (MMH) and it can be done in the following two steps:

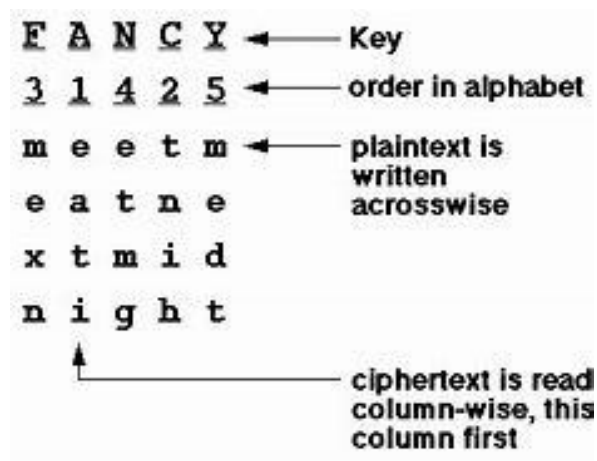
# ADVANCED OPINION ANALYSIS

First, HAC will generate hyperplanes iteratively that segregates the classes in best way.

Then, it will choose the hyperplane that separates the classes correctly.

## 4.2.2 Working of MOS Algorithm:

K-nearest neighbors (KNN) algorithm uses 'feature similarity' to predict the values of new datapoints which further means that the new data point will be assigned a value based on how closely it matches the points in the training set. We can understand its working with the help of following steps:



*Fig 4.2: MOS Representation*

### Step 1:

For implementing any algorithm, we need dataset. So, during the first step of KNN, we must load the training as well as test data.

### Step 2:

Next, we need to choose the value of K i.e., the nearest data points. K can be any integer.

## Step 3:

For each point in the test data do the following

**3.1** – Calculate the distance between test data and each row of training data with the help of any of the method namely: Euclidean, Manhattan or Hamming distance. The most commonly used method to calculate distance is Euclidean.

**3.2** – Now, based on the distance value, sort them in ascending order.

**3.3** – Next, it will choose the top K rows from the sorted array.

**3.4** – Now, it will assign a class to the test point based on most frequent class of these rows.

## Step 4 – End

## 4.3 ARCHITECTURE DIAGRAM

*Fig 4.3: Architecture*



*Diagram*

## **Feature Extraction:**

The process of feature extraction is useful when you need to reduce the number of resources needed for processing without losing important or relevant information. Feature extraction can also reduce the amount of redundant data for a given analysis. Also, the reduction of the data and the machine's efforts in building variable combinations (features) facilitate the speed of learning and generalization steps in the machine learning process.

## **4.4 Model Training:**

A training model is a dataset that is used to train an ML algorithm. It consists of the sample output data and the corresponding sets of input data that have an influence on the output. The training model is used to run the input data through the algorithm to correlate the processed output against the sample output. The result from this correlation is used to modify the model.

This iterative process is called “model fitting”. The accuracy of the training dataset or the validation dataset is critical for the precision of the model.

Model training in machine language is the process of feeding an ML algorithm with data to help identify and learn good values for all attributes involved. There are several types of machine learning models, of which the most common ones are supervised and unsupervised learning.

Supervised learning is possible when the training data contains both the input and output values. Each set of data that has the inputs and the expected output is called a supervisory signal. The training is done based on the deviation of the processed result from the documented result when the inputs are fed into the model.

### **4.4.1 Trained Classifier:**

Classification is the process of predicting the class of given data points. Classes are sometimes called as targets/ labels or categories. Classification predictive modeling is the task of approximating a mapping function ( $f$ ) from input variables ( $X$ ) to discrete output variables ( $y$ ).

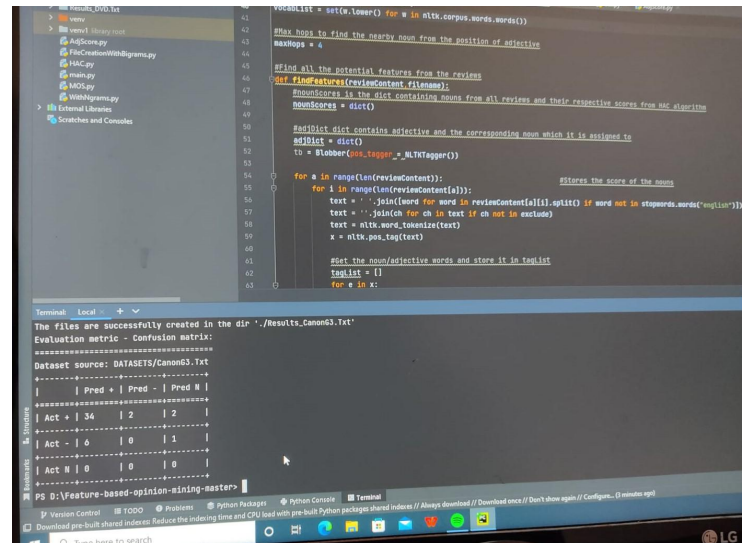
## **4.5 Prediction:**

The song genre is predicted from the input we provided.

## CHAPTER 5

### 5. RESULTS AND PERFORMANCE ANALYSIS

#### 5.1. results:



```

41 vocabList = set(n.lower() for n in nltk.corpus.words.words())
42
43 #Max hops to find the nearby noun from the position of adjective
44 maxhops = 4
45
46 #Find all the potential features from the reviews
47 def findFeatures(reviewContent #filename):
48     #nounScores is the dict containing nouns from all reviews and their respective scores from nltk_classifier
49     nounScores = dict()
50
51     #RadialDict dict contains adjective and the corresponding noun which it is assigned to
52     adDict = dict()
53     to = Blobber(adDict, "MLTNTagger")
54
55     for a in range(len(reviewContent)):
56         #Stores the score of the nouns
57         for i in range(len(reviewContent[a])):
58             text = ". ".join([word for word in reviewContent[a][i].split() if word not in stopwords.words("english")])
59             text = ". ".join([ch in text if ch not in exclude])
60             x = nltk.word_tokenize(text)
61             x = nltk.pos_tag(text)
62
63             #Get the noun/adjective words and store it in tagList
64             tagList = []
65             for e in x:

```

```

Terminal local
The files are successfully created in the dir './Results/CanonM3.txt'
Evaluation metric - Confusion matrix:
=====
Dataset source: DATASETS/CanonM3.txt
=====
|   | Pred + | Pred - | Pred N |
=====
| Act + | 34 | 2 | 2 |
=====
| Act - | 0 | 0 | 1 |
=====
| Act N | 0 | 0 | 0 |
=====
PS D:\Feature-based-opinion-mining-master>

```

**Fig 5.1: Home page -Upload Page**

This is the home page or the main page of our project. It is the web page created using html. Here it provides an option to upload a audio file. The audio file should be in wav format because of its accurate and lossless format. The user can choose a file and easily upload using the upload button.



## CHAPTER 6

### 6. CONCLUSION AND FUTURE ENHANCEMENT

#### 6.1 CONCLUSION:

We would like to address the multi-class problem with an ensemble of Machine Learning methods that could combine to create a confidence vector for each input, such as using our SVM and KNN models together. This would expand our findings to be used for a streaming service that can input several different genres and have some interesting results. In addition, we would like to experiment with different types like svm and knn this expose different implicit features in the dataset

#### 6.2 FUTURE ENHANCEMENTS:

In the future, we hope to experiment with other types of deep learning methods, given they performed the best. Given that this is time series data, some sort of RNN model may work well (GRU, LSTM, for example). We are also curious about generative aspects of this project, including some sort of genre conversion (in the same vein as generative adversarial networks which repaint photos in the style of Van Gogh, but for specifically for music). Additionally, we suspect that we may have opportunities for transfer learning, for example in classifying music by artist or by decade.

## REFERENCES

- [1] Music Genre Classification Using Independent Recurrent Neural Network, Wenli Wu ; Fang Han ; Guangxiao Song ; Zhijie Wang, 2018 Chinese Automation Congress (CAC)
- [2] Music Genre Classification and Recommendation by Using Machine Learning Techniques, Ahmet Elbir ; Hilmi Bilal Çam ; Mehmet Emre Iyican ; Berkay Öztürk ; Nizamettin Aydin, 2018 Innovations in Intelligent Systems and Applications Conference (ASYU)
- [3] Improve Music Genre Classification with Conv Nets, Rafael L. Aguiar ; Yandre M.G. Costa ; Carlos N. Silla, 2018 International Joint Conference on Neural Networks (IJCNN)
- [4] Genre Classification using Word Embeddings and Deep Learning, Akshi Kumar ; Arjun Rajpal ; Dushyant Rathore, 2018 International Conference on Advances in Computing, Communications and Informatics (ICACCI)
- [5] Music Genre Classification: A N-Gram Based Musicological Approach, Eve Zheng ; Melody Moh ; Teng-Sheng Moh, 2017 IEEE 7th International Advance Computing Conference (IACC)
- [6] Long short-term memory recurrent neural network based segment features for music genre classification, Jia Dai ; Shan Liang ; Wei Xue ; Chongjia Ni ; Wenju Liu, 2016 10th International Symposium on Chinese Spoken Language Processing (ISCSLP)
- [7] Music Genre Recognition Using Residual Neural Networks, Dipjyoti Bisharad ; Rabul Hussain Laskar  
TENCON 2019 - 2019 IEEE Region 10 Conference (TENCON)
- [8] Parallel Recurrent Convolutional Neural Networks Based Music Genre Classification Method for Mobile Devices, Rui Yang ; Lin Feng ; Huibing Wang ; Jianing Yao ; Sen Luo IEEE Access Year: 2020

- [9] On Combining Diverse Models for Lyrics-Based Music Genre Classification ,Caio Luiggy Riyoichi Sawada Ueno ; Diego FurtadoSilva, 2019 8th Brazilian Conference on Intelligent Systems (BRACIS)
- [10] Automatic Classification of Music Genre Using Masked Conditional Neural Networks, Fady Medhat ; David Chesmore ; John Robinson, 2017 IEEE International Conference on Data Mining (ICDM)

## APPENDIX

### A. SOURCE CODE

#### *MACHINE TRAINING CODE:*

```
import pickle
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier
from matplotlib import cm
import matplotlib.pyplot as plt
from sklearn.preprocessing import MinMaxScaler
from sklearn.svm import SVC

df = pd.read_csv('data.csv')
df['class_name'] = df['class_name'].astype('category')
df['class_label'] = df['class_name'].cat.codes

lookup_genre_name = dict(zip(df.class_label.unique(),
df.class_name.unique()))

cols = list(df.columns)
cols.remove('label')
cols.remove('class_label')
cols.remove('class_name')

X = df.iloc[:,1:28]
y = df['class_label']
X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=0)
```

# ADVANCED OPINION ANALYSIS

```
scaler = MinMaxScaler()
X_train_scaled = scaler.fit_transform(X_train)
# we must apply the scaling to the test set that we computed for the training
set
X_test_scaled = scaler.transform(X_test)

pickle.dump(scaler, open('scaler.pkl', 'wb'))

knn = KNeighborsClassifier(n_neighbors = 10)
knn.fit(X_train_scaled, y_train)
#print(knn.score(X_test_scaled, y_test))
pickle.dump(knn, open('model_knn.pkl', 'wb'))

svm = SVC(kernel='linear', C = 10).fit(X_train_scaled, y_train)
pickle.dump(knn, open('model_cnn.pkl', 'wb'))
```

## *CODE FOR PREDICTION:*

```
from flask import *
import pickle
import librosa
import numpy as np
from sklearn.preprocessing import MinMaxScaler

app = Flask(__name__, template_folder='template')

model = pickle.load(open('model_cnn.pkl', 'rb'))
scaler = pickle.load(open('scaler.pkl', 'rb'))

def getmetadata(filename):
    y, sr = librosa.load(filename)
    onset_env = librosa.onset.onset_strength(y, sr)
```

# ADVANCED OPINION ANALYSIS

```
tempo = librosa.beat.tempo(onset_envelope=onset_env, sr=sr)

y_harmonic, y_percussive = librosa.effects.hpss(y)
tempo, beat_frames = librosa.beat.beat_track(y=y_percussive, sr=sr)

#chroma_stf
chroma_stft = librosa.feature.chroma_stft(y=y, sr=sr)
#rmse
rmse = librosa.feature.rms(y=y)
#fetching spectral centroid
spec_centroid = librosa.feature.spectral_centroid(y, sr=sr)[0]
#spectral bandwidth
spec_bw = librosa.feature.spectral_bandwidth(y=y, sr=sr)
#fetching spectral rolloff
spec_rolloff = librosa.feature.spectral_rolloff(y+0.01, sr=sr)[0]
#zero crossing rate
zero_crossing = librosa.feature.zero_crossing_rate(y)
#mfcc
mfcc = librosa.feature.mfcc(y=y, sr=sr)
#metadata dictionary
metadata_dict =
{'tempo':tempo,'chroma_stft':np.mean(chroma_stft),'rmse':np.mean(rmse),
'spectral_centroid':np.mean(spec_centroid),'spectral_bandwidth':np.mean(spe
c_bw),
        'rolloff':np.mean(spec_rolloff),
'zero_crossing_rates':np.mean(zero_crossing)}

for i in range(1,21):
    metadata_dict.update({'mfcc'+str(i):np.mean(mfcc[i-1])})

return (metadata_dict)

@app.route('/')
def upload():
```

# ADVANCED OPINION ANALYSIS

```
return render_template("file_upload_form.html")

@app.route('/success', methods = ['POST'])
def success():
    if request.method == 'POST':
        f = request.files["file"]
        f.save(f.filename)
        f_name = f.filename.split('.')

        if(f_name[-1] != 'wav'):
            file_name = 'Upload only wav file'
        else:
            file_name = f.filename

        genre = {0: 'blues', 1: 'classical', 2: 'country', 3: 'disco', 4: 'hiphop', 5: 'jazz',
6: 'metal', 7: 'pop', 8: 'reggae',9: 'rock'}

        mtdt = getmetadata(f.filename)
        mtdt = np.array(list(mtdt.values()))
        mtdt.reshape(-1,1)
        mtdt_scaled = scaler.transform([mtdt])
        pred_genre = model.predict(mtdt_scaled)
        genre_name = genre[pred_genre[0]]
        return render_template("success.html", name = file_name, genre =
genre_name)

if __name__ == '__main__':
    app.run(debug = True)
```

*HTML CODE:*

*FILE UPLOAD PAGE:*

```
<html>
<head>
<title>upload</title>
```

# ADVANCED OPINION ANALYSIS

```
<link rel="preconnect" href="https://fonts.gstatic.com">
<link
href="https://fonts.googleapis.com/css2?family=Akaya+Telivigala&display=swap"
rel="stylesheet">
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">
  <script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.5.1/jquery.min.js"></script>
  <script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js"></script>
>
<style>
  .music{
    position: absolute;
    top:20%; left:20%;
  }
  body{
    /* background:green; */
    background-image: url('/static/1.png');
    background-size: cover;
    background-repeat: no-repeat;
    color:black;
    font-family: 'Akaya Telivigala', cursive;
    text-align:center;
    font-size: 30px;
  }
  .btn:hover{
    background-color: black;
    color:white;
```

```

</style>
</head>
<body>
  <div class="music">
    <div class="form-group">
      <h3> Please only upload wav file only </h3>
      <form action = "/success" method = "post" enctype="multipart/form-data">
        <input type="file" name="file" class="form-control"/><br>
        <input type = "submit" class="btn" value="Upload">
      </form>
    </div>
  </div>

</body>
</html>

```

## *PREDICTION PAGE:*

```

<html>
<head>
<title>success</title>
<link rel="preconnect" href="https://fonts.gstatic.com">
<link
href="https://fonts.googleapis.com/css2?family=Josefin+Sans:wght@100&display=
swap" rel="stylesheet">
<style>
body{
  /* background:green; */
  background-image: url('/static/2.png');
  background-size: cover;
  background-repeat: no-repeat;
  color:black;

```

# ADVANCED OPINION ANALYSIS

```
font-family: 'Akaya Telivigala', cursive;
text-align:center;
font-size: 30px;
}
</style>

</head>
<body>
    <center><h1>Music Genre Classification</h1></center>
    <center><h3>File uploaded successfully</h3></center>
    <center><h2>File Name: {{name}}</h2></center>
    <center><h3>Predicted Genre: {{genre}}</h3></center>
</body>
</html>
```