

“Genre Classification and Recommendation System for Music on AWS Cloud Platform”

PROJECT REVIEW 1 REPORT

Submitted for the course: Cloud Computing (ITE3007)

By

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ABSTRACT

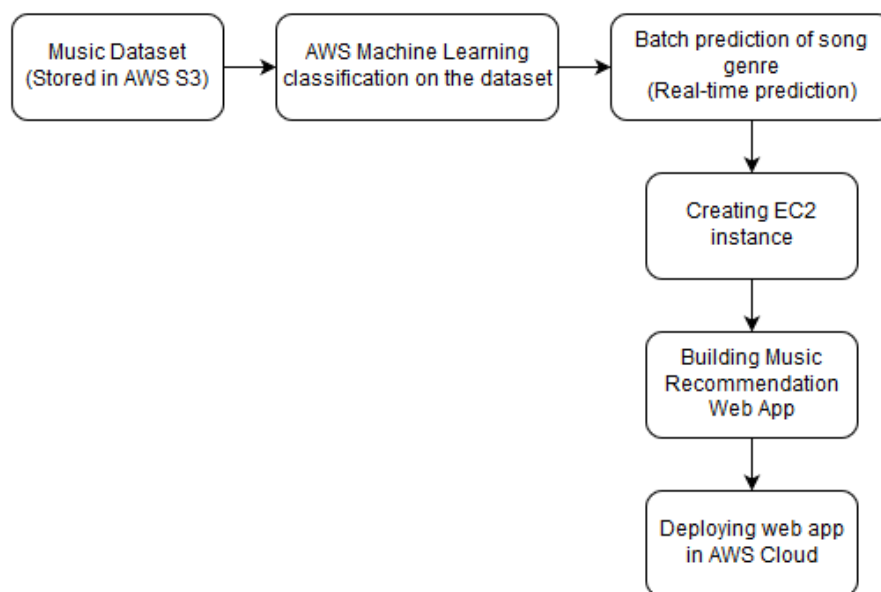
Music genre classification means segregating songs into genres like, Pop, Country, Rock, Jazz, R&B, Classical, etc. Genre classification is a very subjective topic. Based on the approach, songs might get classified differently by different people. It is fairly simple for a human being to identify the genre of a song. One thinks about how fast the beat of the song is, the mood of the song and the ambiance it creates. All these help create a mental picture of the song and thus the genres associated with it are determined.

That makes music genre classification a very controversial topic. Hence, creating an automated system based on a scientific approach is beneficial to the ever-growing music industry. Genre classification is crucial to the music industry as it plays a vital role in song recommendation systems. Song recommendation systems work in a way that help listeners find similar music.

Amazon Web Service (AWS) is a cloud platform that helps create robust and accurate machine learning models without any coding. It allows deployment of apps on cloud platform. This project uses AWS services to deploy a song recommendation web app.

Songs will be classified into genres using the machine learning service of AWS. The dataset we will be using is a subset of the Million Song dataset from the CORGIS dataset project. After a machine learning classification model is built, genre of batches of songs can be predicted using the real-time prediction API created. These songs will then be used in the Music Recommendation web app hosted on AWS cloud platform via an EC2 instance to recommend similar music of the same genre to the users.

PROJECT FLOWCHART



PLATFORMS AND LANGUAGES

The project will be hosted entirely on the AWS Cloud Platform:

AWS Machine Learning

Amazon Machine Learning is a managed service for building ML models and generating predictions, enabling the development of robust, scalable smart applications. Amazon Machine Learning enables you to use powerful machine learning technology without requiring an extensive background in machine learning algorithms and techniques.

The Music Genre Classification System will be built on the Machine learning service of AWS.

AWS EC2

Amazon Elastic Compute Cloud (EC2) forms a central part of AWS by allowing users to rent virtual computers on which to run their own computer applications. EC2 encourages scalable deployment of applications by providing a web service through which a user can boot an Amazon Machine Image (AMI) to configure a virtual machine, which Amazon calls an "instance", containing any software desired. A user can create, launch, and terminate server-instances as needed.

EC2 will be used to host the Music Recommendation System web app. XAMPP and Apache server will be installed within the EC2 instance created. The web app will be built in PHP and MySQL.

AWS S3

Amazon Simple Storage Service (Amazon S3) is an object storage service that offers industry-leading scalability, data availability, security, and performance.

The dataset for music genre classification will be stored in a S3 bucket.

PuTTY and PuTTYgen

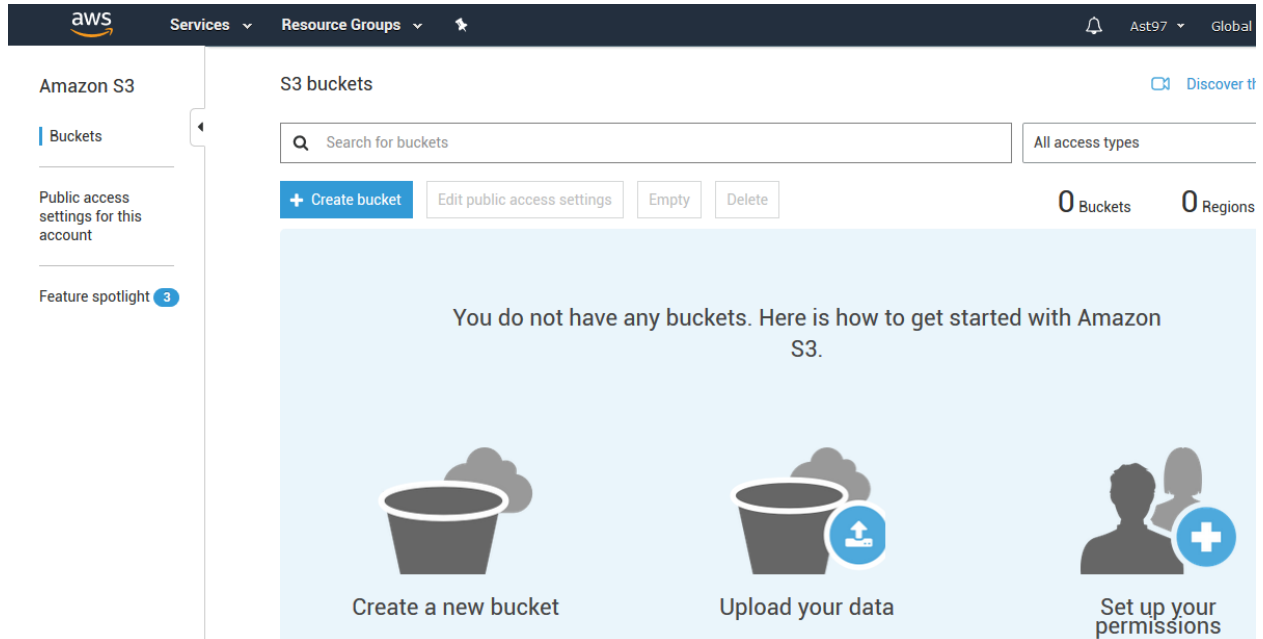
PuTTY is an SSH and telnet client. PuTTYgen is a key generator tool for creating SSH keys for PuTTY. They are used to connect to the EC2 instances created.

PROJECT WORKFLOW

THE AWS ML MODEL

S3 BUCKET

Go to S3 and click on the 'Create bucket' button.



Enter the bucket name 'musiccc' and click on 'Create'

Click on 'Upload' to upload the dataset to cloud

The screenshot displays the AWS S3 console interface. At the top, the navigation bar includes the AWS logo, 'Services', 'Resource Groups', and a user profile 'Ast97' with 'Global' and 'Support' links. Below this, the 'Overview' tab is selected, with 'Properties', 'Permissions', and 'Management' tabs also visible. The main content area shows a bucket in the 'US East (N. Virginia)' region. A message states, 'This bucket is empty. Upload new objects to get started.' Below this message are three icons with labels: 'Upload an object' (a document icon), 'Set object properties' (a person icon with a plus sign), and 'Set object permissions' (a database icon with a plus sign). Each icon has a brief description: 'Buckets are globally unique containers for everything that you store in Amazon S3.', 'After you create a bucket, you can upload your objects (for example, your photo or video files).', and 'By default, the permissions on an object are private, but you can set up access control policies to grant permissions to others.' A large blue 'Upload' button is prominently displayed. Below the button, a progress bar shows the steps: 'Select files' (active), 'Set permissions', 'Set properties', and 'Review'. The 'Select files' section shows '1 Files', 'Size: 1.5 MB', and 'Target path: musicccc'. A note indicates that for files larger than 80 GB, the AWS CLI, AWS SDK, or Amazon S3 REST API should be used, with a 'Learn more' link. Below the note, a file named 'Music_Genre.csv' (1.5 MB) is listed with a close button. At the bottom, there are 'Upload' and 'Next' buttons.

aws Services Resource Groups Ast97 Global Support

Overview Properties Permissions Management

Upload Create folder Download Actions US East (N. Virginia)

This bucket is empty. Upload new objects to get started.

Upload an object
Buckets are globally unique containers for everything that you store in Amazon S3.

Set object properties
After you create a bucket, you can upload your objects (for example, your photo or video files).

Set object permissions
By default, the permissions on an object are private, but you can set up access control policies to grant permissions to others.

Upload

Select files Set permissions Set properties Review

1 Files Size: 1.5 MB Target path: musicccc

To upload a file larger than 80 GB, use the AWS CLI, AWS SDK, or Amazon S3 REST API. [Learn more](#)

+ Add more files

Music_Genre.csv
- 1.5 MB

Upload Next

The file, 'Music_Genre.csv' is uploaded in the music bucket. Now this dataset can be used to build the AWS ML model for music genre classification.

The screenshot shows the AWS Management Console interface for an Amazon S3 bucket named 'musicccc'. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', and user information. The breadcrumb trail shows 'Amazon S3 > musicccc'. Below the navigation tabs (Overview, Properties, Permissions, Management), there is a search bar and action buttons: 'Upload', 'Create folder', 'Download', and 'Actions'. The region is set to 'US East (N. Virginia)'. A table lists the contents of the bucket, showing one file: 'Music_Genre.csv', last modified on 'Apr 3, 2019 6:07:33 PM GMT+0530', with a size of '1.5 MB' and a storage class of 'Standard'.

AWS MACHINE LEARNING

Select the dataset from S3 Bucket 'musi

Where is your data? S3 Amazon Redshift

S3 data access

Tell Amazon ML how to access your data and give it permission to access it.

S3 location *

Enter the path to a single file or folder in Amazon S3. You need to grant Amazon ML permission to read this data. [Learn more.](#)

If you already have a schema for this data, provide it in a file at s3://<path-of-input-data>.schema. If you don't have a schema, Amazon ML will help you create one on the next page. ⓘ

Datasource name

The validation is successful. To go to the next step, choose Continue

Datasource name Music_Genre.csv

Data location s3://musicccc/Music_Genre.csv

Data format CSV

Schema source Auto generated

Number of files 1

Total size 1.5 MB

* Required

ccc'

ACTION: Change type ▾

Search by attribute name Items per page: 10 ▾ 1 - 10 of 22 > >>

<input type="checkbox"/>	▲	Name	Data type	Sample field value 1	Sample field value 2	Sample field value 3
<input type="checkbox"/>	1	Song_popularity	Numeric ▾	0.187895	0.1904	0.190656
<input type="checkbox"/>	2	Artist_popularity	Numeric ▾	0.159717	0.31312	0.259463
<input type="checkbox"/>	3	Duration	Numeric ▾	232.202	153.33831999999998	200.25423999999998
<input type="checkbox"/>	4	Bars_confidence	Numeric ▾	0.37	0.185	0.031
<input type="checkbox"/>	5	Bars_start	Numeric ▾	0.37233	9.92414	1.64265
<input type="checkbox"/>	6	Beats_confidence	Numeric ▾	0.0	0.376	0.425
<input type="checkbox"/>	7	Beats_start	Numeric ▾	0.37233	0.1937	1.64265
<input type="checkbox"/>	8	End_of_fade_in	Numeric ▾	3.5580000000000003	0.166	0.0
<input type="checkbox"/>	9	Familiarity	Numeric ▾	0.39427399999999996	0.5052369999999999	0.433721
<input type="checkbox"/>	10	Key	Numeric ▾	2.0	8.0	7.0

1. Input Data 2. Schema 3. Target 4. Row ID **5. Review**

Review

Review and make any changes, and then click Finish.

Input data Edit

Datasource name	Music_Genre.csv
S3 location	s3://musiccc/Music_Genre.csv
Data format	CSV
Number of files	1
Total size	1.5 MB

Schema Edit

Schema source	Auto generated (Column names are taken from the first row of the CSV file)
Data types	21 Numeric Attributes 1 Categorical Attribute

Target Edit

Target Genre (Multiclass Classification)

Row identifier (optional) Edit

Activate Windows
Go to Settings to activate Windows

For Training and evaluation settings, ensure that Default is selected.

For Name this evaluation, accept the default, Evaluation: ML model: Music_Genre.

Choose Review, review your settings, and then choose Finish.

After you choose Finish, Amazon ML adds your model to the processing queue. When Amazon ML creates your model, it applies the defaults and performs the following actions:

- Splits the training datasource into two sections, one containing 70% of the data and one containing the remaining 30%
- Trains the ML model on the section that contains 70% of the input data
- Evaluates the model using the remaining 30% of the input data

1. Input data **2. ML model settings** 3. Recipe 4. Advanced settings 5. Evaluation 6. Review

ML model settings

You can use the automatically suggested ML model settings, or you can choose to customize.

ML model type MULTICLASS ⓘ

ML model target Genre

ML model name
(Optional) ML model: Music_Genre.csv

Select training and evaluation settings Recipes and training parameters control the ML model training process. You can select these settings for your ML model or use the defaults provided by Amazon ML. In either case, you can choose to have Amazon ML reserve a portion of the input data for evaluation. [Learn more.](#)

☒ **Default (Recommended)**

- Generate a default recipe
- Use default training parameters
- Set aside 30% of your training data to evaluate the training
- Split the evaluation data sequentially ⓘ

☐ **Custom**

- Modify the recipe Amazon ML generates
- Modify training parameters
- Randomly or sequentially split your evaluation data ⓘ

Evaluation Name Evaluation: ML model: Music_Genre.csv

[Cancel](#)

[Previous](#)

[Review](#)

While your model is in the queue, Amazon ML reports the status as Pending. While Amazon ML creates your model, it reports the status as In Progress. When it has completed all actions, it reports the status as Completed. Wait for the evaluation to complete before proceeding.

Browser tabs: Login, wdb - Cloud9, music recomm..., Suggestion: Pro..., Cisco Interview, Amazon Machi..., Amazon Machi..., Amazon Machi..., Deleting Object...

Address bar: <https://console.aws.amazon.com/machinelearning/home?region=us-east-1#/predictor-insight/ml-uSujBMD9b9A>

AWS Services | Resource Groups | ML models > ml-uSujBMD9b9A

ML model report

- Summary
- Settings
- Monitoring

Tools

Try real-time predictions

Evaluations

ML model summary

[Delete this ML model](#)

ID	ml-uSujBMD9b9A
Name	ML model: Music_Genre.csv
Type	Multiclass classification
Creation time	Feb 3, 2019 9:21:33 PM
Completion time	Not available
Compute Time (Approximate)	Not available
Status	Pending
Log	Not available

Datasource (training)

Datasource ID	ds-JvN7qXmeOE8
Target	Not available
Input schema	View input schema

Evaluations

Evaluations created: Not available

Latest evaluation result: Not available

Activate Windows
Go to Settings to activate Windows.

Windows taskbar: Type here to search, AWS, Services, Resource Groups, Ast97, N. Virginia, Support, 9:21 PM 03-Feb-19

AWS Services | Resource Groups | ML models > ml-uSujBMD9b9A

ML model report

- Summary
- Settings
- Monitoring

Tools

Try real-time predictions

Evaluations

> Evaluation: ML mode...

ML model summary

[Delete this ML model](#)

ID	ml-uSujBMD9b9A
Name	ML model: Music_Genre.csv
Type	Multiclass classification
Creation time	Feb 3, 2019 9:21:33 PM
Completion time	3 mins
Compute Time (Approximate)	1 min
Status	Completed
Log	Download log

Datasource (training)

Datasource ID	ds-JvN7qXmeOE8
Target	Genre
Input schema	View input schema

Evaluations

Evaluations created: 1

Latest evaluation result: 0.353 (F1)

[Perform another Evaluation](#)

Predictions

CloudWatch metrics [View in CloudWatch](#)

A single dataset
Generate one-time predictions for a single dataset.

[Generate batch predictions](#)

Try real-time predictions
Generate real-time predictions in your browser.

[Try real-time predictions](#)

Enable real-time predictions
To enable real-time predictions now, create a real-time prediction endpoint.

[Create endpoint](#)

aws Services Resource Groups

Amazon Machine Learning ML models

Create a new ML model Actions Refresh

Q ML model name or ID Items per page: 10 1 - 1 of 1 ML models

Name	ID	Status	Real time predictions	Creation time	Completion time	Datasource ID
ML model: Music_Genre.csv	ml-uSujBMD9b9A	Completed	Not enabled	Feb 3, 2019 9:21:33 PM	3 mins.	ds-JvN7qXme0E8

1 - 1 of 1 ML models

On the ML model summary page, in the ML model report navigation pane, choose Evaluations, choose Evaluation: ML model: Music_Genre, and then choose Summary.

On the Evaluation summary page, review the evaluation summary, including the model's confusion matrix.

aws Services Resource Groups

Amazon Machine Learning ML models ml-uSujBMD9b9A

ML model report

- Summary
- Settings
- Monitoring

Tools

- Try real-time predictions

Evaluations

- ▼ Evaluation: ML mode...
- Summary
- Alerts (1)
- Explore performance

ML model performance

This chart shows the F1 scores and prediction distributions of your ML model. [Learn more.](#)

Download the complete matrix

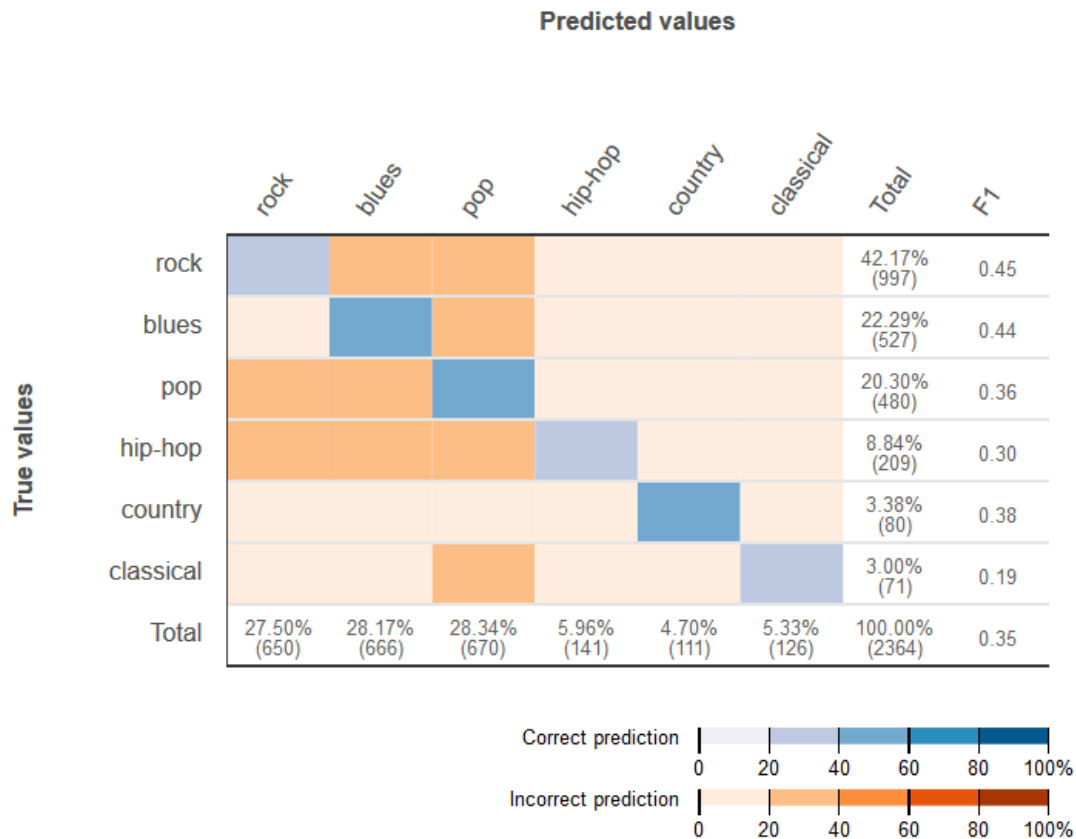
True values

Predicted values

	rock	blues	pop	hip-hop	country	classical	Total	F1
rock	42.17% (997)							0.45
blues		22.29% (527)						0.44
pop			20.30% (480)					0.36
hip-hop				8.84% (209)				0.30
country					3.38% (80)			0.38
classical						3.00% (71)		0.19
Total	27.50% (650)	26.17% (656)	26.34% (670)	5.96% (141)	4.70% (111)	5.33% (126)	100.00% (2384)	0.35

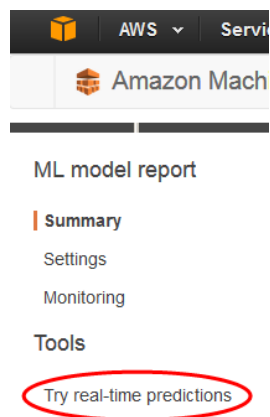
Correct prediction 0 20 40 60 80 100%

Incorrect prediction 0 20 40 60 80 100%



A real-time prediction is a prediction for a single observation that Amazon ML generates on demand.

In the ML model report navigation pane, choose Try real-time predictions.



Choose Paste a record.

In the Paste a record dialog box, paste the following observation:

Paste a data record

To complete the fields in this form, you can paste a data record in CSV format in the text box. The fields in the record must appear in the same order as in your training data, but you can omit the target column. [View your model's input schema](#)

2, 8, 0, -5.688, 1, 0, 260.836, 0.523, 0.08191, 120.464, 0.964477, 4, 0.651|

Cancel

Submit

In the Paste a record dialog box, choose Submit to confirm that you want to generate a prediction for this observation. Amazon ML populates the values in the real-time prediction form. At the bottom of the page, choose Create prediction.

Try real-time predictions

You submitted 21 out of 21 data values for this prediction.

Try generating real-time predictions for free using the web browser on this page. To request a real-time prediction, complete the following form or provide a single data record in CSV format. To provide a data record, choose the **Paste a record** button.

Name	Type	Value
1 Song_popularity	Numeric	0.21508
2 Artist_popularity	Numeric	0.383819
3 Duration	Numeric	278.96118
4 Bars_confidence	Numeric	0.439
5 Bars_start	Numeric	0.329
6 Beats_confidence	Numeric	0.0
7 Beats_start	Numeric	0.329
8 End_of_fade_in	Numeric	1.088
9 Familiarity	Numeric	0.494282
10 Key	Numeric	8.0

Prediction results

Target name: Genre
ML model type: CATEGORICAL
Predicted class: rock

```
{
  "Prediction": {
    "details": {
      "Algorithm": "SGD",
      "PredictiveModelType": "MULTICLASS"
    },
    "predictedLabel": "rock",
    "predictedScores": {
      "blues": 0.018690044060349464,
      "classical": 0.003681511152535677,
      "country": 0.0030308968853205442,
      "hip-hop": 0.013642707839608192,
      "pop": 0.026936806738376617,
      "rock": 0.9340180158615112
    }
  }
}
```

Next steps

To enable real-time predictions for your application, create a real-time endpoint. (Capacity and use charges apply. [Learn more.](#))

Create endpoint

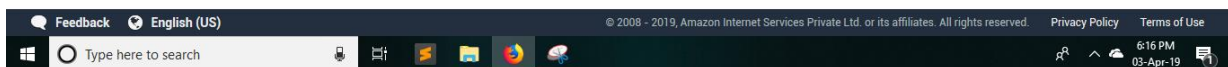
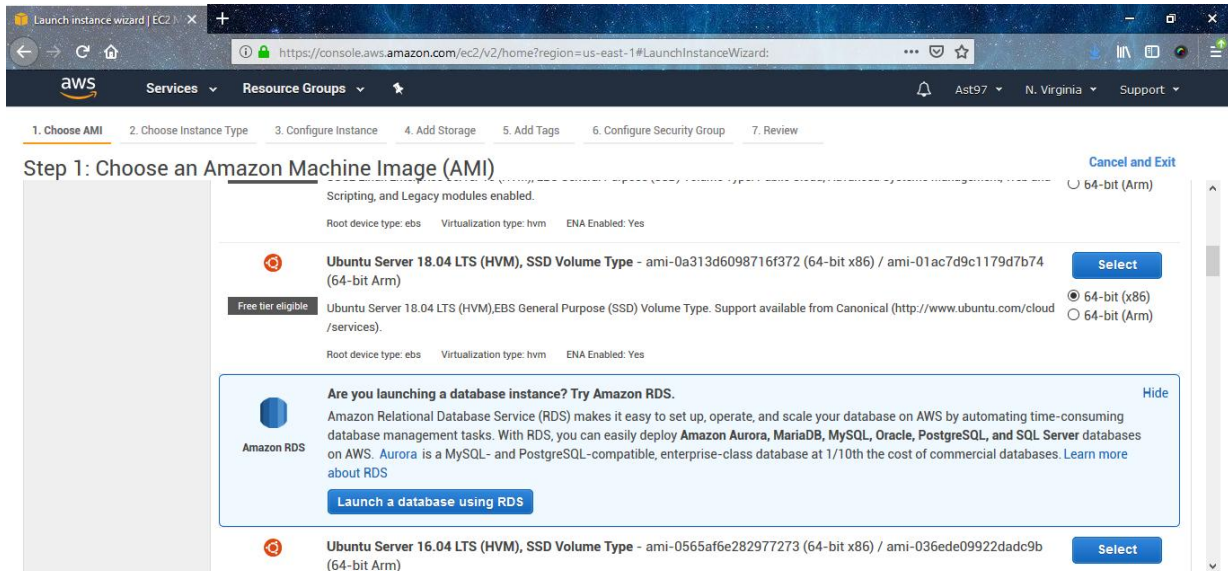
The prediction appears in the Prediction results pane on the right. This prediction has a Predicted label of the genre of the song which was entered for prediction.

Prediction results

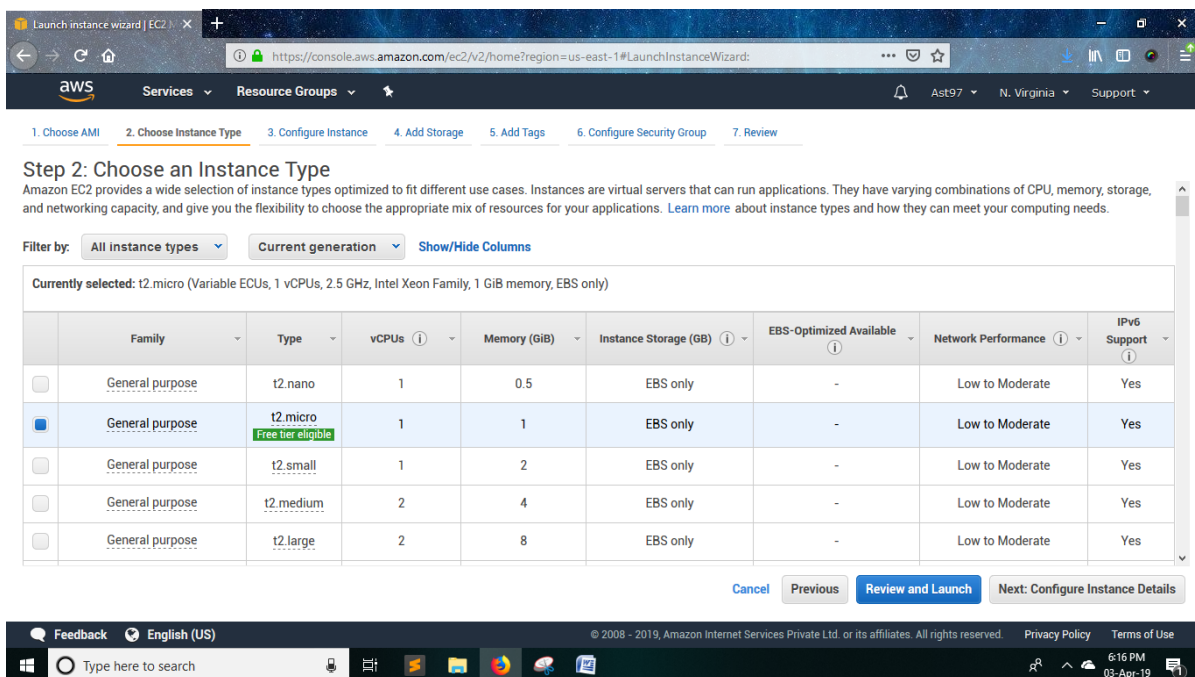
Target name	Genre
ML model type	CATEGORICAL
Predicted class	rock
<pre>{ "Prediction": { "details": { "Algorithm": "SGD", "PredictiveModelType": "MULTICLASS" }, "predictedLabel": "rock", "predictedScores": { "blues": 0.018690044060349464, "classical": 0.003681511152535677, "country": 0.0030308968853205442, "hip-hop": 0.013642707839608192, "pop": 0.026936806738376617, "rock": 0.9340180158615112 } } }</pre>	

THE SONG RECOMMENDATION SYSTEM

Select EC2 from Compute category. Click Launch Instance button. Now choose operating system for your web server, Ubuntu is suggested for more package advantages. Make sure, that should be listed in free tier.



Here you can modify your server type. Free tier t2.micro is selected.



Security groups are modified. HTTP is added and source is set to 'Anywhere'.

Launch instance wizard | EC2

https://console.aws.amazon.com/ec2/v2/home?region=us-east-1#LaunchInstanceWizard:

Services Resource Groups

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. [Learn more](#) about Amazon EC2 security groups.

Assign a security group: ☒ Create a new security group ☐ Select an existing security group

Security group name:

Description:

Type	Protocol	Port Range	Source	Description
SSH	TCP	22	Anywhere	0.0.0.0/0, ::/0
HTTP	TCP	80	Anywhere	0.0.0.0/0, ::/0

Add Rule

Warning
Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

Cancel Previous Review and Launch

Feedback English (US)

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Type here to search

6:16 PM 03-Apr-19

Here choose Create a new pair key. Give valid name and click to Download Key Pair. You will get an .pem file.

Select an existing key pair or create a new key pair

A key pair consists of a **public key** that AWS stores, and a **private key file** that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.

Note: The selected key pair will be added to the set of keys authorized for this instance. [Learn more](#) about [removing existing key pairs from a public AMI](#).

Create a new key pair

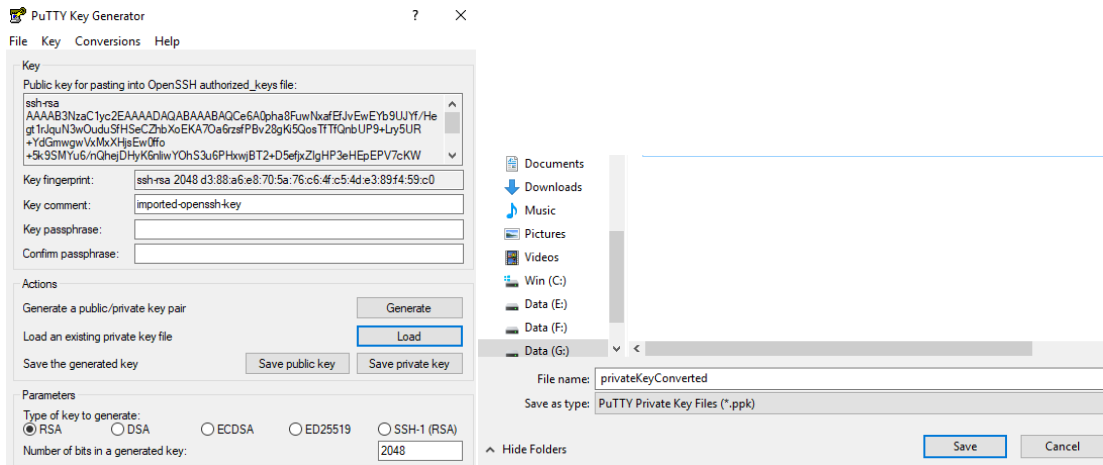
Key pair name

privatekey_pem

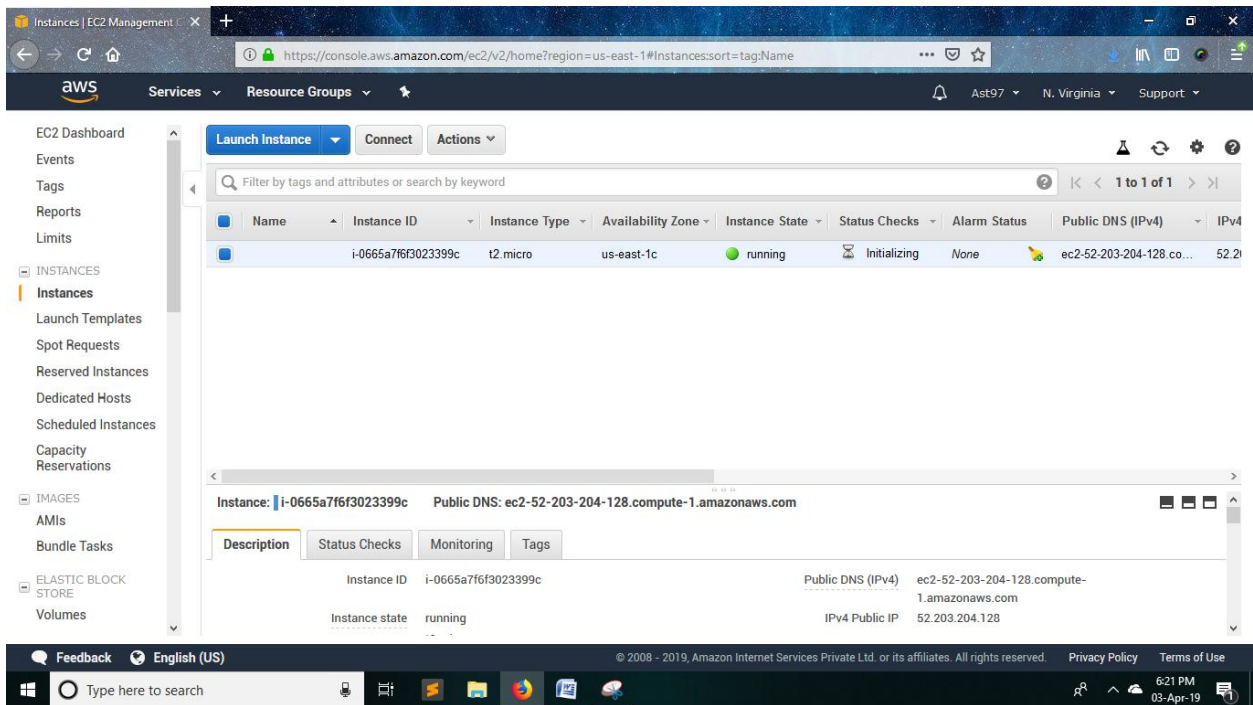
Download Key Pair

You have to download the **private key file** (*.pem file) before you can continue. **Store it in a secure and accessible location.** You will not be able to download the file again after it's created.

Cancel Launch Instances



Instance has been created successfully.



Connect To Your Instance



- I would like to connect with
- ☒ A standalone SSH client
 - ☐ A Java SSH Client directly from my browser (Java required)

To access your instance:

1. Open an SSH client. (find out how to [connect using PuTTY](#))
2. Locate your private key file (privatekey_pem.pem). The wizard automatically detects the key you used to launch the instance.
3. Your key must not be publicly viewable for SSH to work. Use this command if needed:

```
chmod 400 privatekey_pem.pem
```

4. Connect to your instance using its Public DNS:

```
ec2-52-203-204-128.compute-1.amazonaws.com
```

Example:

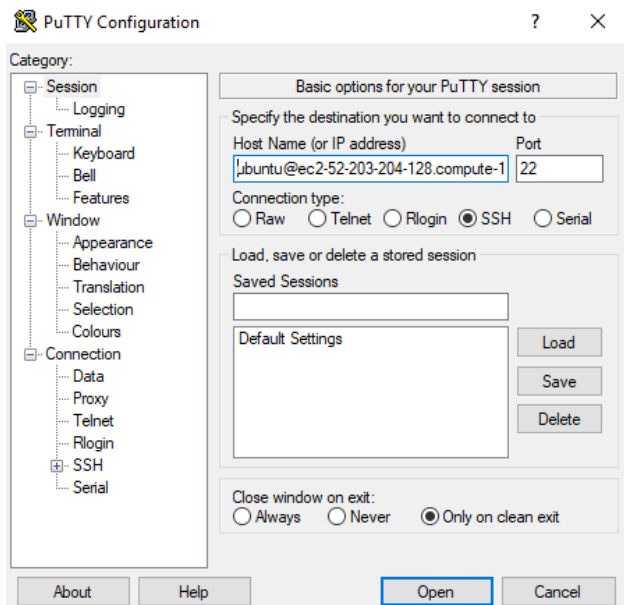
```
ssh -i "privatekey_pem.pem" ubuntu@ec2-52-203-204-128.compute-1.amazonaws.com
```

Please note that in most cases the username above will be correct, however please ensure that you read your AMI usage instructions to ensure that the AMI owner has not changed the default AMI username.

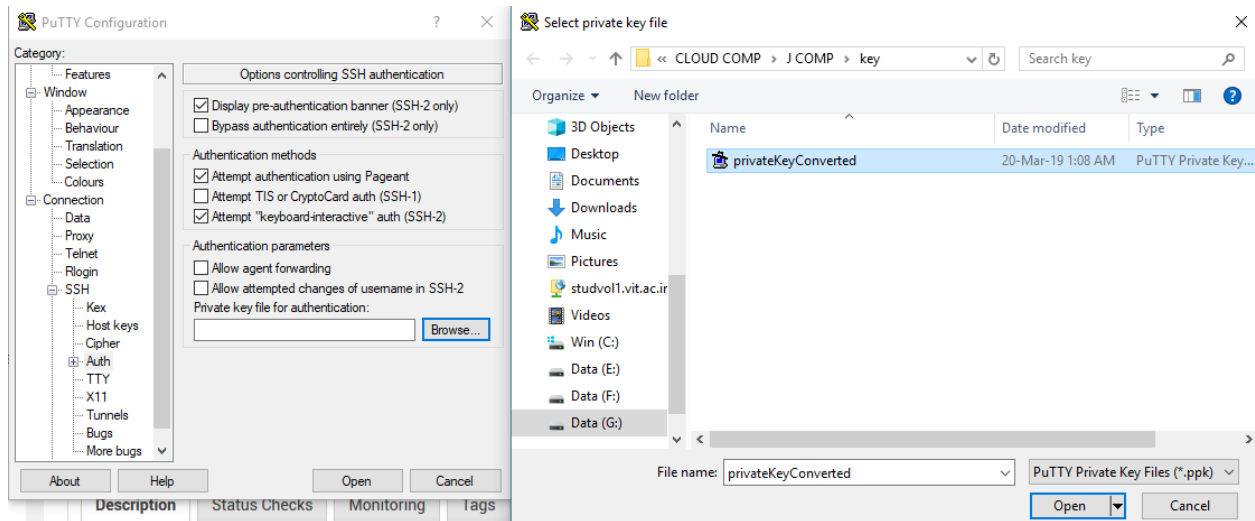
If you need any assistance connecting to your instance, please see our [connection documentation](#).

Close

Copy and paste the IP from the 'Connect To Your Instance' dialog box



Go to SSH-> Auth and select the converted private key (.ppk format)



The connection has been established to the putty telnet client

```
ubuntu@ip-172-31-38-66: ~  
Using username "ubuntu".  
Authenticating with public key "imported-openssh-key"  
Welcome to Ubuntu 16.04.5 LTS (GNU/Linux 4.4.0-1077-aws x86_64)  
  
 * Documentation:  https://help.ubuntu.com  
 * Management:    https://landscape.canonical.com  
 * Support:        https://ubuntu.com/advantage  
  
Get cloud support with Ubuntu Advantage Cloud Guest:  
http://www.ubuntu.com/business/services/cloud  
  
27 packages can be updated.  
0 updates are security updates.  
  
*** System restart required ***  
Last login: Wed Mar 27 06:16:12 2019 from 157.51.83.236  
ubuntu@ip-172-31-38-66:~$
```

Type in the following commands to install XAMPP:

Download XAMPP for 64 bit

```
wget https://www.apachefriends.org/xampp-files/7.0.23/xampp-linux-x64-7.0.23-0-installer.run
```

Make Execute Installation

```
sudo chmod +x xampp-linux-x64-7.0.23-0-installer.run
```

Run Installation

```
sudo ./xampp-linux-x64-7.0.23-0-installer.run
```

XAMPP instructions

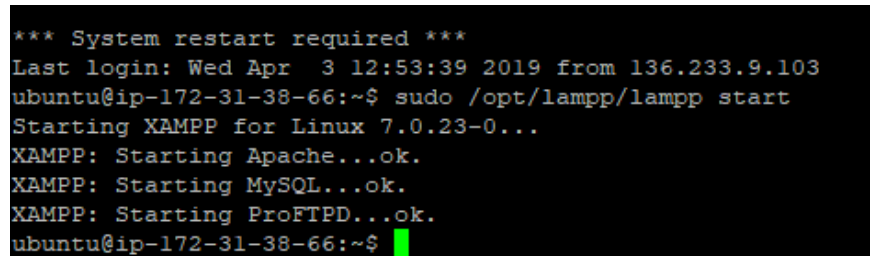
Select the components you want to install; clear the components you do not want to install. Click Next when you are ready to continue.

```
XAMPP Core Files : Y (Cannot be edited)
XAMPP Developer Files [Y/n] : Y
Is the selection above correct? [Y/n]: Y
```

```
Installation Directory
XAMPP will be installed to /opt/lampp
Press [Enter] to continue:
Do you want to continue? [Y/n]:Y
```

Run XAMPP

```
sudo /opt/lampp/lampp start
```



```
*** System restart required ***
Last login: Wed Apr  3 12:53:39 2019 from 136.233.9.103
ubuntu@ip-172-31-38-66:~$ sudo /opt/lampp/lampp start
Starting XAMPP for Linux 7.0.23-0...
XAMPP: Starting Apache...ok.
XAMPP: Starting MySQL...ok.
XAMPP: Starting ProFTPD...ok.
ubuntu@ip-172-31-38-66:~$
```

XAMPP Access Forbidden

Open your browser and access <http://IP-ADDRESS/> you will find this Access forbidden screen.

Access forbidden!

New XAMPP security concept:

Access to the requested object is only available from the local network.

This setting can be configured in the file "httpd-xampp.conf".

If you think this is a server error, please contact the [webmaster](#).

XAMPP Configurations

Edit XAMPP configurations.

```
vi /opt/lampp/etc/extra/httpd-xampp.conf
```

```
<LocationMatch "^/(?:i(?:xampp|security|licenses|phpmyadmin|webalizer|server-
status|server-info))">
Require local
ErrorDocument 403 /error/XAMPP_FORBIDDEN.html.var
</LocationMatch>
```

to

```
<LocationMatch "^/(?:i(?:xampp|security|licenses|phpmyadmin|webalizer|server-
status|server-info))">
Order deny,allow
Allow from all
Allow from ::1 127.0.0.0/8 \
fc00::/7 10.0.0.0/8 172.16.0.0/12 192.168.0.0/16 \
fe80::/10 169.254.0.0/16
ErrorDocument 403 /error/XAMPP_FORBIDDEN.html.var
</LocationMatch>
```

Restart XAMPP

```
sudo /opt/lampp/lampp restart
```



Create a database 'music' on phpmyadmin and import the dataset as msd table

The screenshot shows the phpMyAdmin web interface. The left sidebar displays the database structure with 'music' selected. The main panel shows the 'msd' table structure with columns: id, song, artist, songpop, Artist_popularity, Duration, and Genre. Below the structure, a table of data is displayed, showing rows of song information. The table has 7 columns: id, song, artist, songpop, Artist_popularity, Duration, and Genre. The data includes songs like 'Soul Deep', 'Amor De Cabaret', 'Something Girls', etc.

id	song	artist	songpop	Artist_popularity	Duration	Genre
8574	Soul Deep	The Box Tops	0.187895	0.159717	232.202000	rock
8084	Amor De Cabaret	Sonora Santanera	0.190400	0.313120	153.338320	blues
121	Something Girls	Adam Ant	0.190656	0.259463	200.254240	rock
3477	Face the Ashes	Gob	0.191300	0.300454	138.762000	classical
4220	The Moon And I (Ordinary Day Album Version)	Jeff And Sheri Easter	0.192248	0.406410	220.525260	rock
7205	Keepin It Real (Skit)	Rated R	0.192264	0.315628	234.526890	folk
9407	Drop of Rain	Tweeterfriendly Music	0.192648	0.168202	224.025670	hip-hop
6993	Pink World	Planet P Project	0.192727	0.175956	281.756280	rap
1833	Insatiable (Instrumental Version)	Cip	0.192856	0.327955	277.184850	folk
4257	Young Boy Blues	JennyAnyKind	0.192978	0.366906	75.937510	soundtrack
9682	The Urgency (LP Version)	Wayne Watson	0.193264	0.405597	240.848530	rock
409	La Culpa	Andy Andy	0.193711	0.331637	290.742400	classical
1106	Auguri Cha Cha	Bob Azzam	0.193858	0.378498	239.986490	rock
5315	Tonight Will Be Alright	Lionel Richie	0.193928	0.369084	199.000360	pop
1097	Floating	Blue Rodeo	0.194214	0.405597	263.810160	blues
7331	High Tide	Richard Souther	0.194633	0.256149	196.649340	blues
2004	Alina Nee Sohna Data	Faiz Ali Faiz	0.194735	0.233132	153.207710	rock

```
cd /opt/lampp/htdocs/  
sudo chown -R $(whoami):$(whoami) /var/..  
Use github repository to clone all the files.
```

```
sudo git clone https://github.com/Ast97/Music-Genre-Classification.git  
Use the link http://52.203.204.128/Music-Genre-Classification/ to run the web app.
```

The screenshot shows a web browser displaying the 'Music-Genre-Classification' application. The page features a dark background with a vinyl record and a turntable. A central black box contains the text 'SONG RECOMMENDATION' in white capital letters. The browser's address bar shows the URL 'http://52.203.204.128/Music-Genre-Classification/'.

Instances | EC2 Management

52.203.204.128 / localhost / ml

Song Recommendation

52.203.204.128/Music-Genre-Classification/

TRENDING SONGS

SONG NAME	ARTIST NAME	GENRE	SONG POPULARITY
Then He Said_ "Sing	Ivan Parker	rap	1.000000
Crayon Sharpener	themselves	blues	1.000000
Daybreak	Winterlight	blues	0.997758
Die Romantic [Live]	Aiden	rock	0.984347
Along Comes Mary	Cal Tjader	pop	0.979837
Give U My Heart	Toni Braxton Featuring Babyface	blues	0.972387

TRENDING ARTISTS

ARTIST NAME	ARTIST POPULARITY
Atom	1.082503
Chanta Vielma	1.082503
Esa Pakarinen	1.082503
Jennifer Lopez	1.082503
Plump DJs	1.082503
Rick Snel	1.082503

Type here to search

7:15 PM
03-Apr-19

Type in a song name.

RECOMMENDATION BY SONG GENRE

Setting Fire to Sleeping Giants

Search

10 random song recommendations will appear based on the genre of the song entered.

LIST OF RECOMMENDATIONS

Searched song was of genre: blues

SONG NAME	ARTIST NAME	GENRE	SONG POPULARITY
Stand	Pedro Aznar	blues	0.319566
Biloxi	Kenny Price	blues	0.270776
Out Demons Out (Live) (2004 Digital Remaster)	The Edgar Broughton Band	blues	0.342908
Raha ratkaisee	Irwin Goodman	blues	0.342908
Under The Bayou Moon	Bob Cheevers	blues	0.342908

Challenges Faced

- The biggest caveat of the MSD is that you don't have the actual audio to work with. You only have the metadata and audio features as computed by the Echo Nest. The features they provide are pretty good, but they may not be adequate for every application or classification task. If you decide to use the dataset you are limiting yourself to their method of feature extraction and specific machine learning methods. You would not be able to perform an unsupervised feature learning method like deep learning.
- When creating and training an ML model, the goal is to select the model that makes the best predictions, which means selecting the model with the best settings (ML model settings or hyperparameters). In Amazon Machine Learning, there are four hyperparameters that you can set: number of passes, regularization, model size, and shuffle type. However, if you select model parameter settings that produce the "best" predictive performance on the evaluation data, you might overfit your model. Overfitting occurs when a model has memorized patterns that occur in the training and evaluation datasources, but has failed to generalize the patterns in the data.

This problem can be tackled by splitting the training data into training data and validation data. This avoids the model to have high generalization error and low training error, which signifies model overfitting.

- Managing access to Amazon S3 Resources:
By default, all Amazon S3 resources—buckets, objects, and related subresources (for example, lifecycle configuration and website configuration)—are private: only the resource owner, an AWS account that created it, can access the resource. The resource owner can optionally grant access permissions to others by writing an access policy.

To grant permissions for Amazon ML to access one of your S3 buckets, you must edit the bucket policy. To do so we must grant Amazon ML the following permissions to the S3 location where your input data is stored:

1. GetObject permission on the S3 bucket and prefix.
2. ListBucket permission on the S3 bucket. Unlike other actions, ListBucket must be granted bucket-wide permissions (rather than on the prefix). However, you can scope the permission to a specific prefix by using a Condition clause.

- Cross platform OS -
Developers working on the same project often share resources and communicate to achieve the result. The challenge often faced is the diversity of the environment - underlying Operating System - they individually work on. The issues faced were:
 - XAMPP - Configuration of the PHP files and the PHPmyadmin.
 - MySQL - server connectivity, admin and user privileges were different.

- XAMPP - with the recent releases of XAMPP (irrespective of the OS environment), the functioning is hindered by access grant issues to the localhost. The issues can be resolved by tweaking the conf file of Xampp, as stated above (refer to Pg No. 251).
- Troubleshooting Connecting to Your Instance - refer to <https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/TroubleshootingInstancesConnecting.html>
- SSH configuration with PuTTY – The Host Name/ IP address required in PuTTY configuration can be found in the connect dialog box. The converted private key (.ppk) file is opened for the authentication.