

Automatic Music Mood Classification

Final Year, Major Project

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The problem

Introduction

Music is an integral part of the human experience.

Advances in storage technology and connectivity has enabled individuals to access million of songs for their use.

Motivation

With million of songs at our fingertips how to find the right music to listen to as per our mood.

How to automate the cataloguing and increase discoverability in ever increasing music repositories.

Problem statement

To develop an Automated Smart System for **classifying a song as either Happy or Sad** by applying ML Techniques.

Challenges deep-dive

Data Acquisition

Labels and Features

Crowdsourcing the labels associated with songs to eliminate subjectivity of one's perception.

Calculating features that represent physical nature of song

Feature Selection

Removing attributes

Finding the right subset of features to solve the problem.

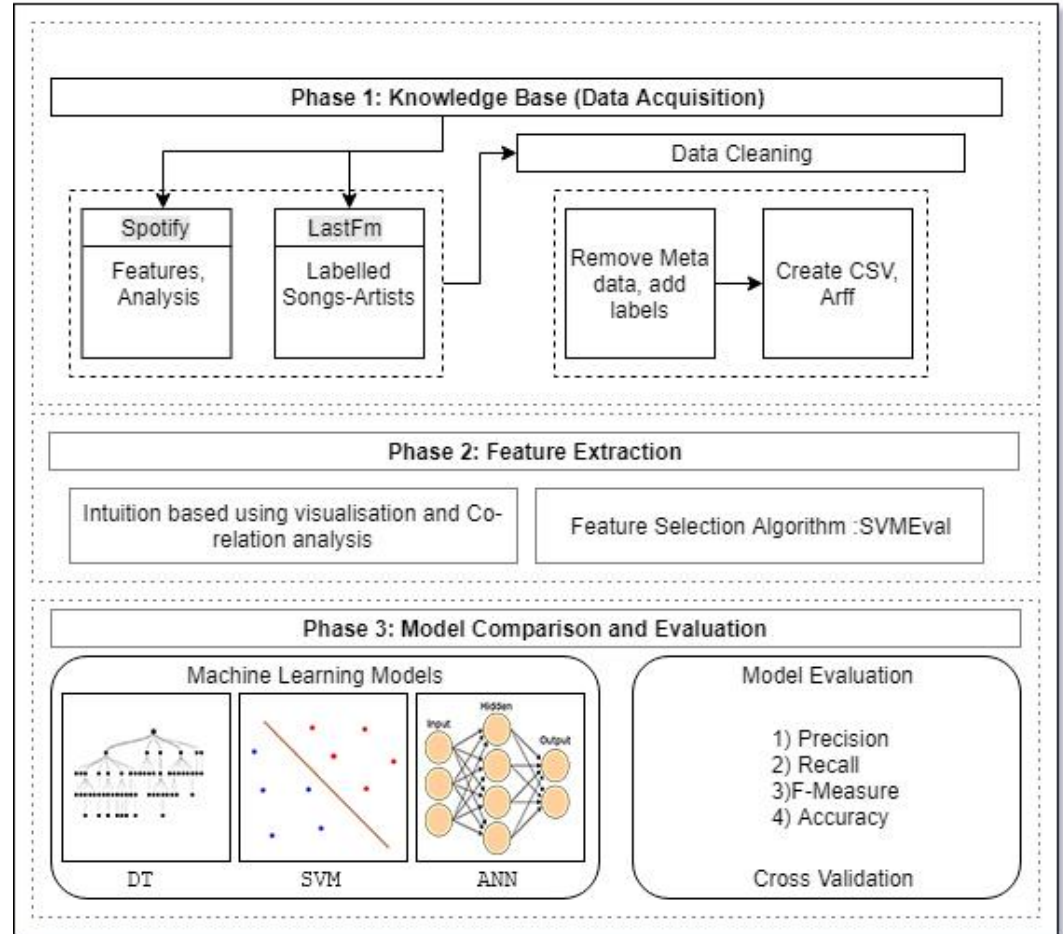
Modeling and Evaluation

Increase accuracy

Finding the right algorithm to solve the problem.

Tuning the hyper-parameters to increase efficiency.

Architecture of the system



Data Acquisition

Sources:

- Spotify, to get features
- LastFm, to get labels

Tools:

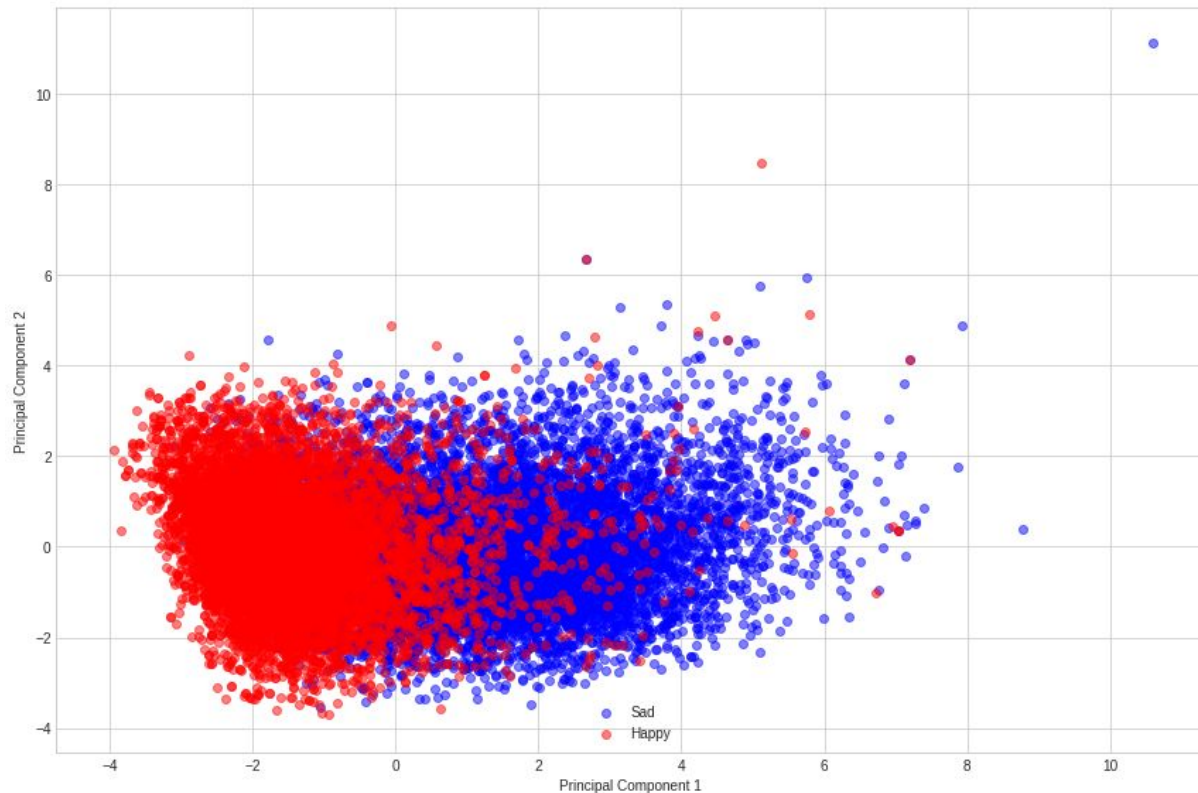
- NodeJS
 - MongoDB
-

Features: 18 in number

- **Time_Signature** - An estimated overall time signature of a track. The time signature(meter) is a notational convention to specify how many beats are in each bar (or measure).
- **Acousticness** - A confidence measure from 0.0 to 1.0 of whether the track is acoustic. 1.0 represents high confidence the track is acoustic.
- **Speechiness** -Speechiness detects the presence of spoken words in a track. The more exclusively speech-like the recording, the closer to 1.0 the attribute value.

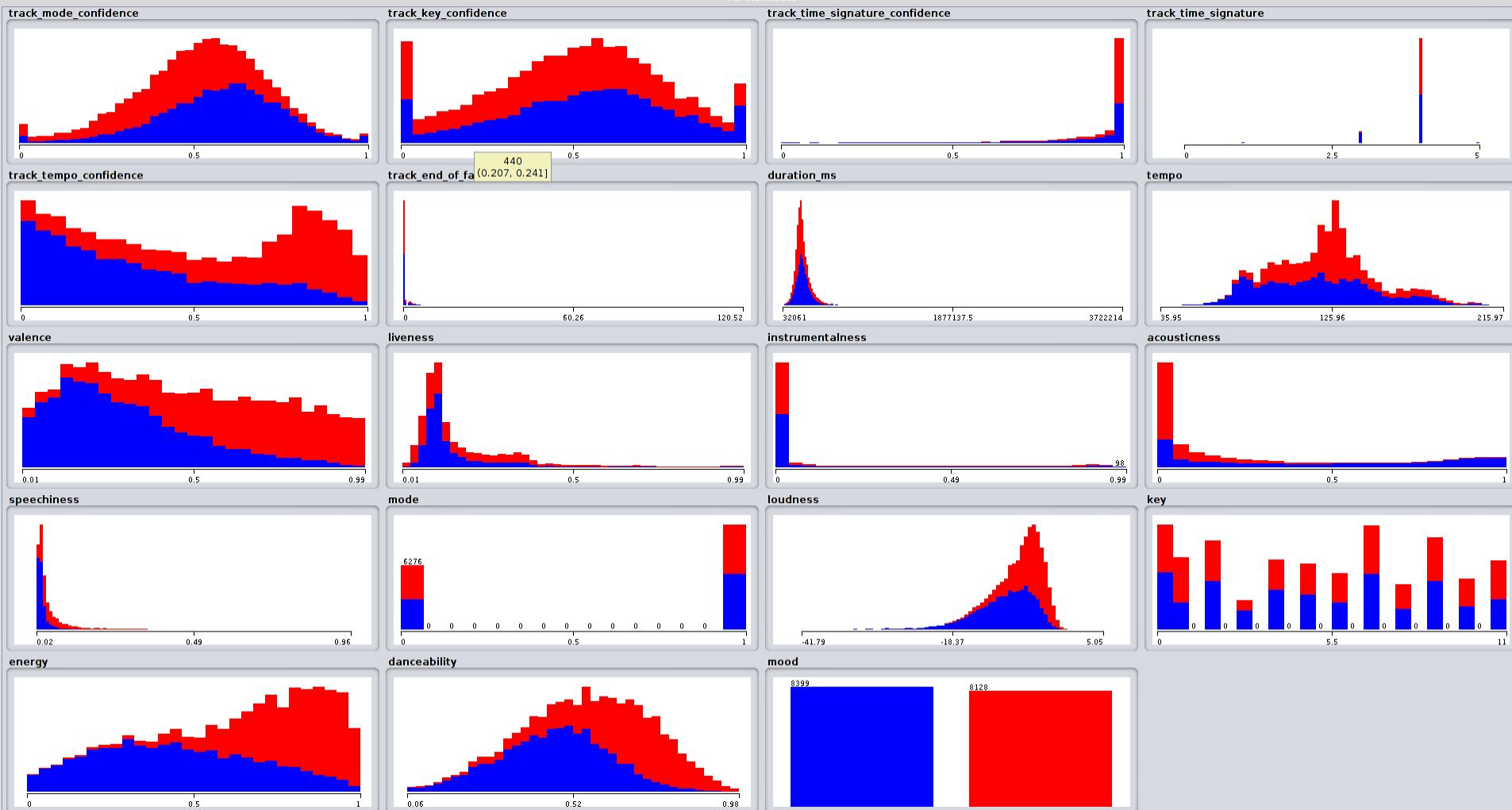
and many more...

Visualization: PCA



Feature Selection

- Intuition Based
- CfsSubsetEval
- SVM-RFE



Intuition Based & CfsSubsetEval

1. Danceability
2. Energy
3. Loudness
4. Speechiness
5. Valence

average merit		average rank		attribute
18	+ - 0	1	+ - 0	13 speechiness
17	+ - 0	2	+ - 0	17 energy
16	+ - 0	3	+ - 0	18 danceability
15	+ - 0	4	+ - 0	15 loudness
14	+ - 0	5	+ - 0	9 valence
13	+ - 0	6	+ - 0	7 duration_ms
11.8	+ - 0.6	7.2	+ - 0.6	12 acousticness
10.4	+ - 0.917	8.6	+ - 0.92	1 track_mode_confidence
9.9	+ - 1.136	9.1	+ - 1.14	11 instrumentalness
9.4	+ - 0.917	9.6	+ - 0.92	2 track_key_confidence
8.1	+ - 1.221	10.9	+ - 1.22	4 track_time_signature
7.3	+ - 0.458	11.7	+ - 0.46	10 liveness
5.9	+ - 0.539	13.1	+ - 0.54	5 track_tempo_confidence
4.9	+ - 0.7	14.1	+ - 0.7	6 track_end_of_fade_in
4.3	+ - 0.458	14.7	+ - 0.46	8 tempo
2.5	+ - 0.671	16.5	+ - 0.67	3 track_time_signature_confidence
2.2	+ - 0.748	16.8	+ - 0.75	16 key
1.3	+ - 0.458	17.7	+ - 0.46	14 mode

SVM-RFE

1. Energy
2. Danceability
3. Speechiness
4. Loudness
5. Acousticness
6. Valence
7. Time_signature

Modeling & Evaluation

- ANN
- SVM
- Decision Tree

Experiments

Total 16527 songs

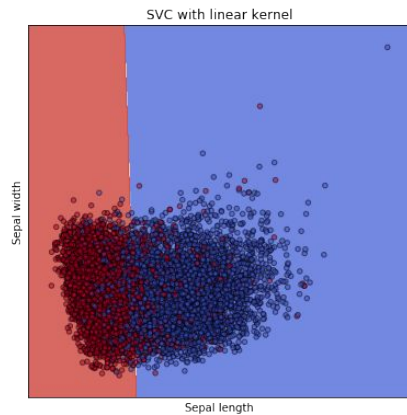
- Train : 9918
- Test: 4960
- Validation : 1649

Tools:

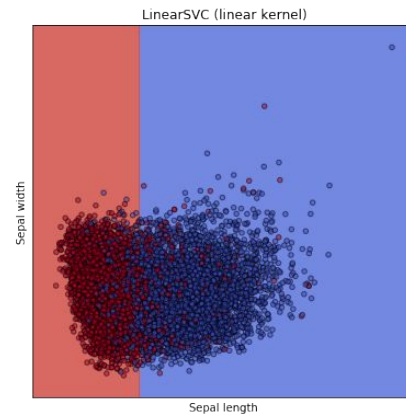
- Weka
- Scikit (Python)

SVM on Principal Components

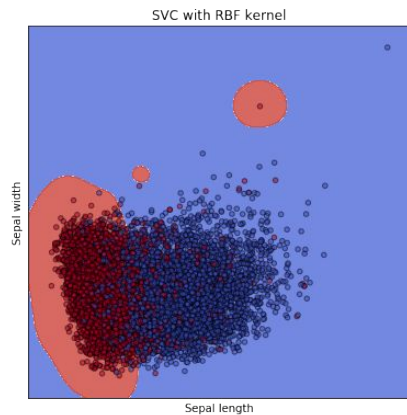
Accuracy: 0.840667400073



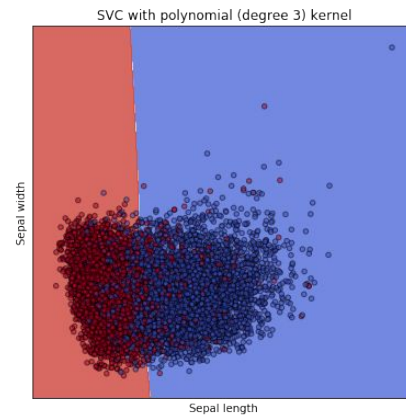
Accuracy: 0.840667400073



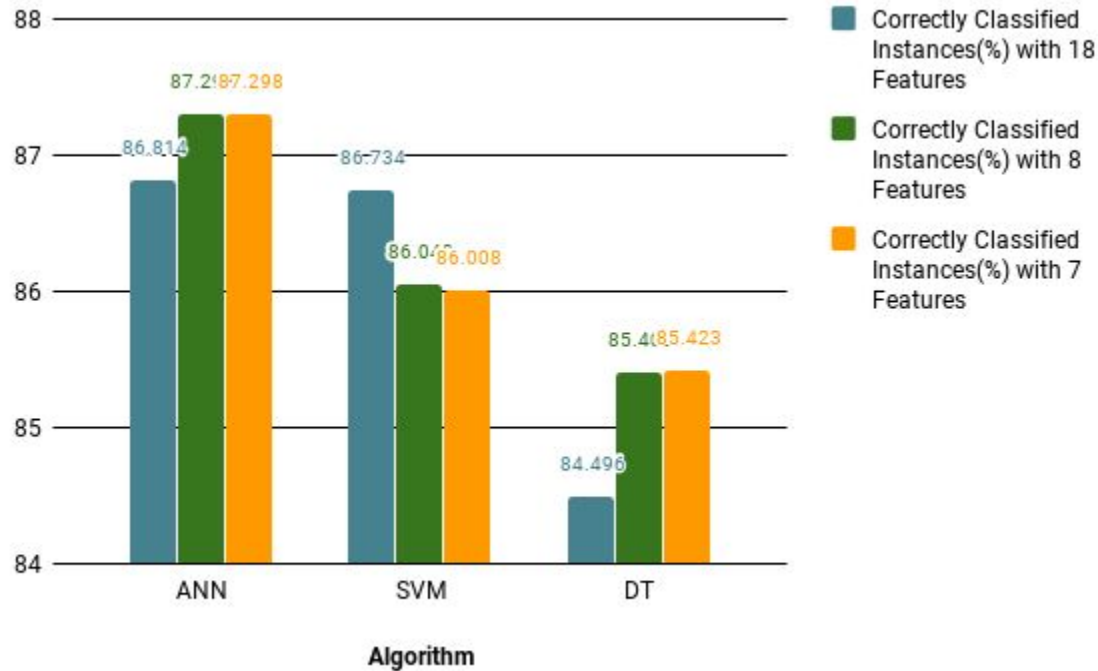
Accuracy: 0.842134213421



Accuracy: 0.828016134947

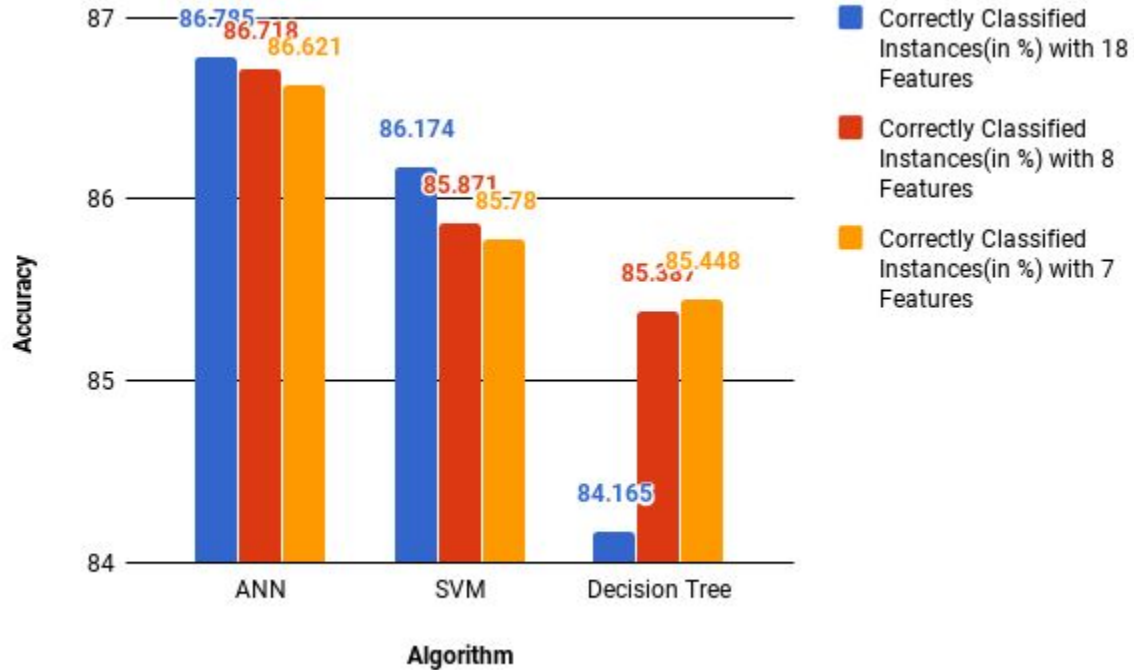


Comparison of Algorithms w.r.t. Feature sets

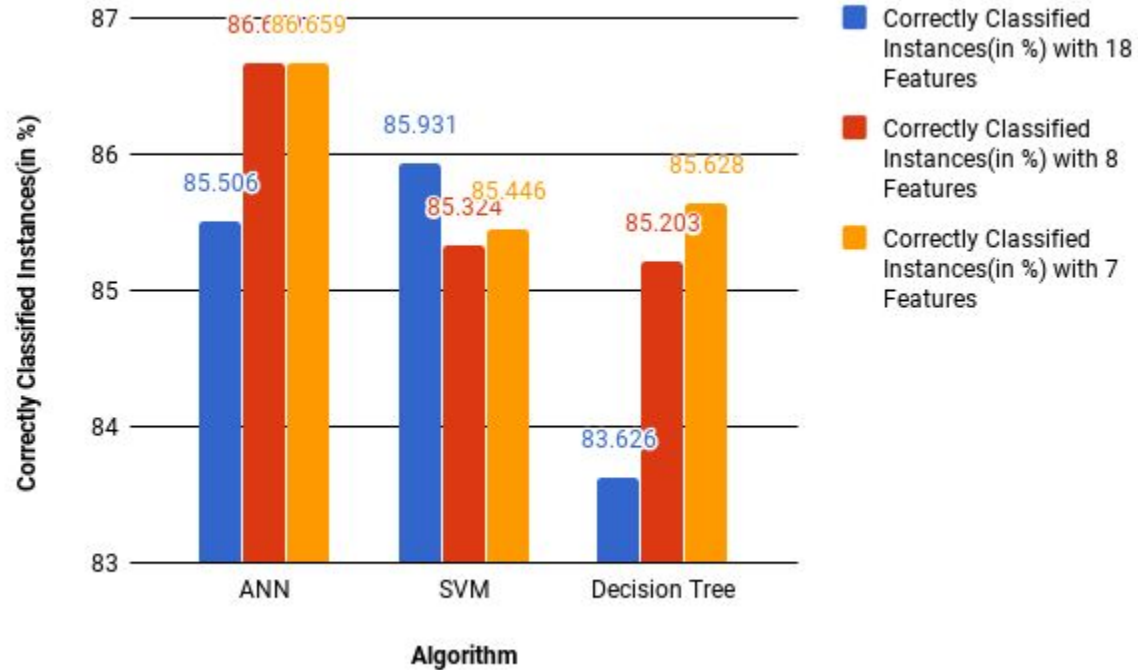


Validation

10-fold Cross Validation



Validation Set

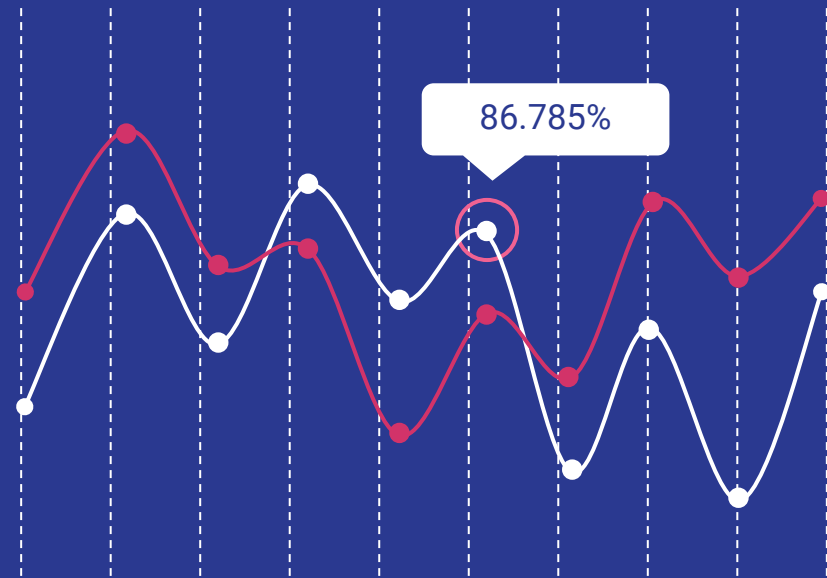




Results and Conclusion

Accuracy

86.785% using ANN



Future Work

- Handling Multiple classes of moods.
- Adding additional crowdsourced labelling platforms.
- Probable Application : playlist generator using proposed algorithms.



Thank You!!