Music Moods Classification

Final Year, Major Project

Guided by:
Dr. Satyendra Chauhan
Information Technology

Presented by:
Apurva Maheshwari, 0801IT141014
Ashish Kumar Patel, 0801IT141018
Ekta Raghuwanshi, 0801IT141030

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.

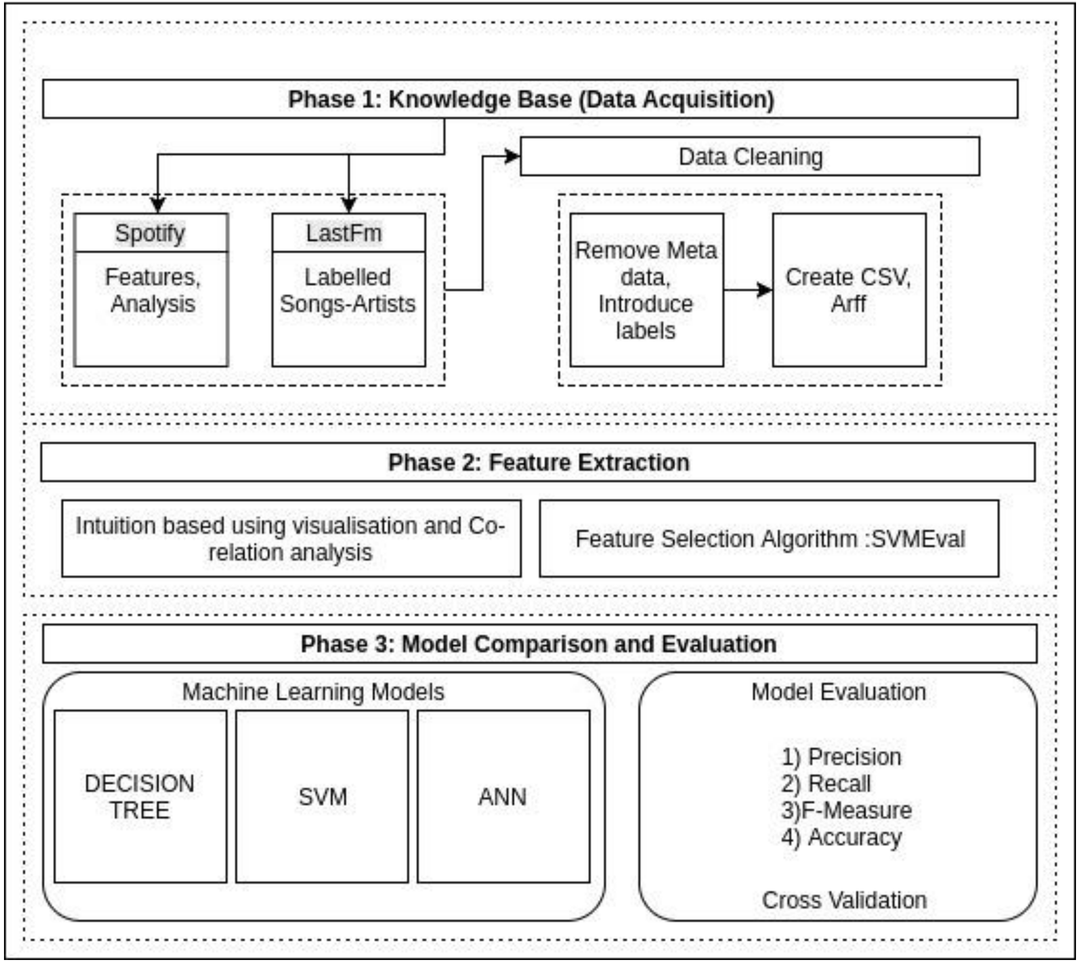
Modeling and Evaluation

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: 26 in number

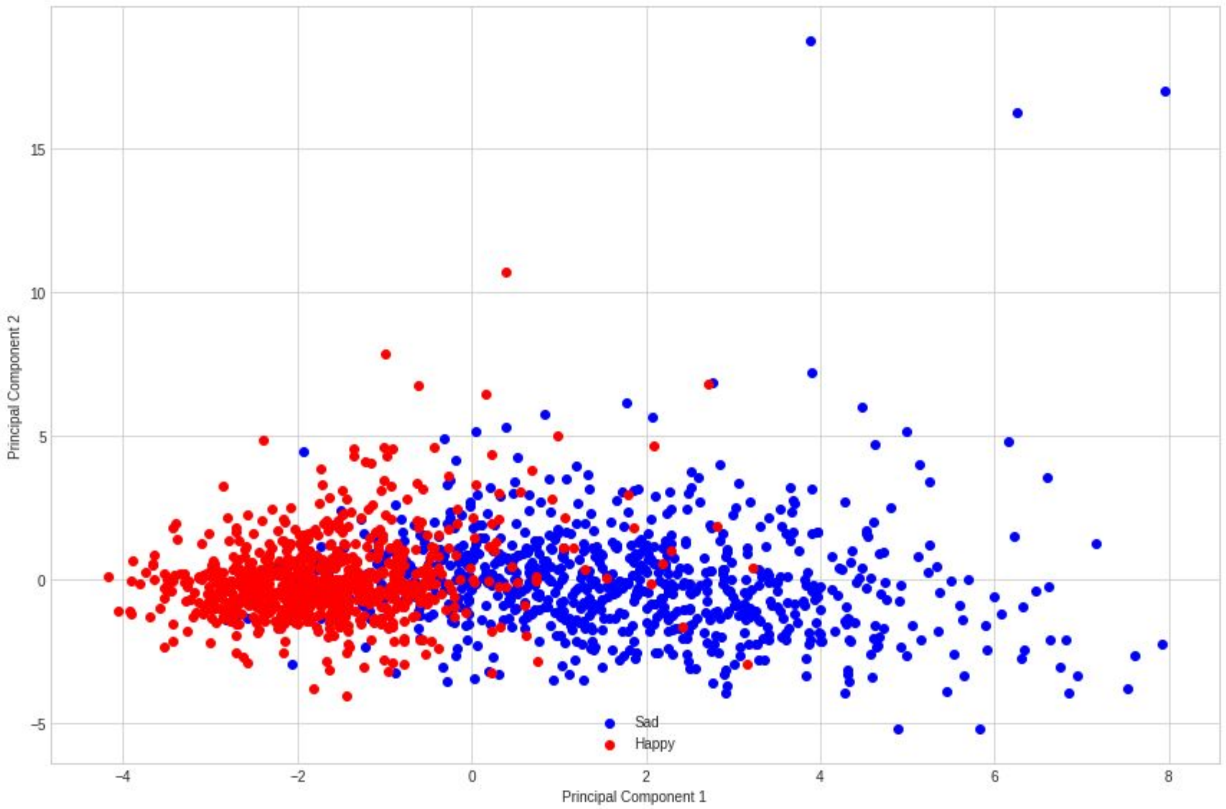
- **Time_Signature** - An estimated overall time signature of a track. The time signature(meter) is a notational convention to specify how many beats are in each bar (or measure).

- **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.

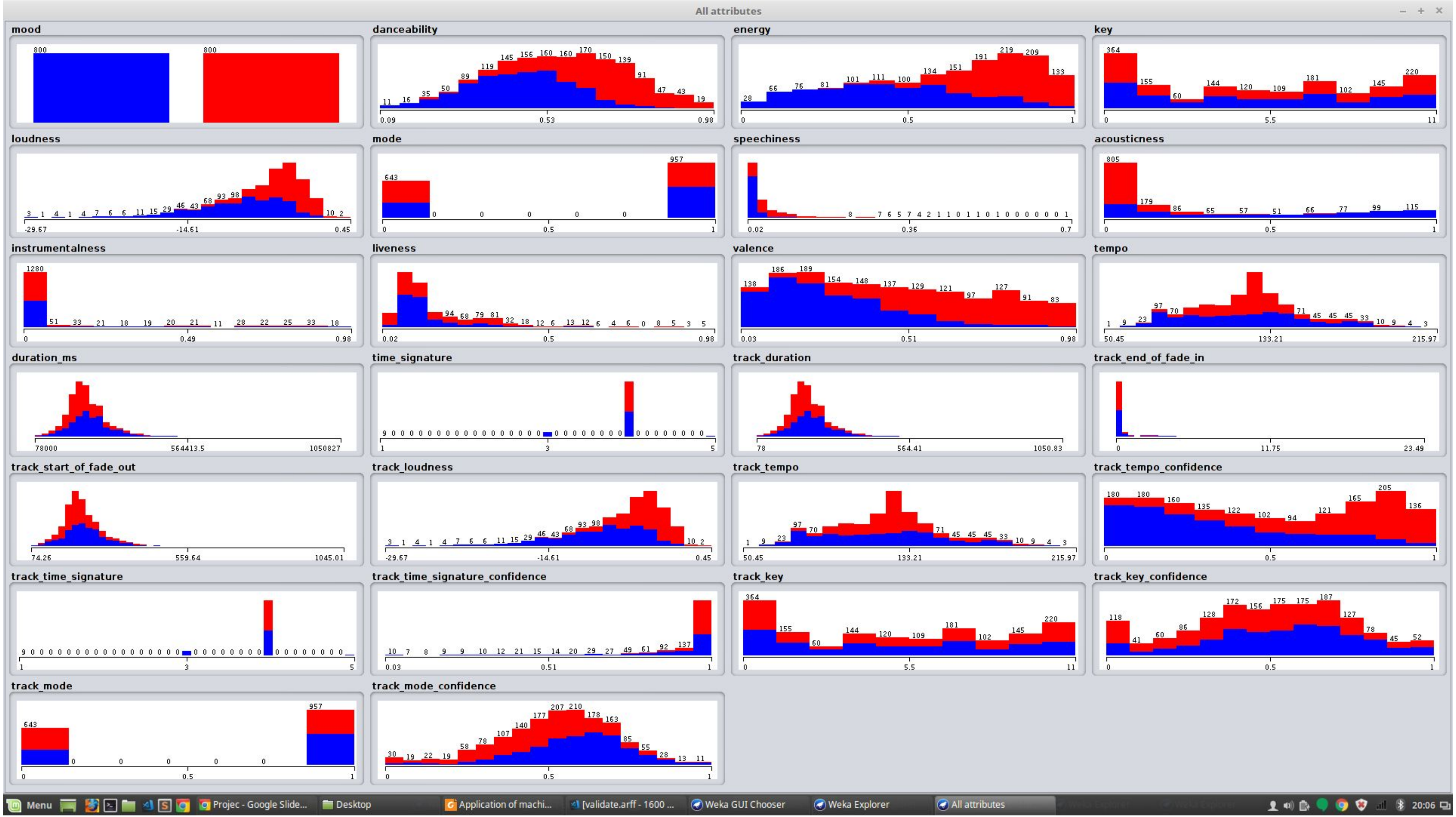
and many more...

Visualization: PCA



Feature Selection

- Intuition Based
- CfsSubsetEval
- SVM-RFE


All attributes
mood
800
800
danceability
0.09
0.53
0.98
energy
0
0.5
1
key
0
5.5
11
loudness
-29.67
-14.61
0.45
mode
643
957
0
0.5
1
speechiness
0.02
0.36
0.7
acousticness
805
0
0.5
1
instrumentalness
1280
0
0.49
0.98
liveness
0.02
0.5
0.98
valence
0.03
0.51
0.98
tempo
50.45
133.21
215.97
duration_ms
78000
564413.5
1050827
time_signature
1
3
5
track_duration
78
564.41
1050.83
track_end_of_fade_in
0
11.75
23.49
track_start_of_fade_out
74.26
559.64
1045.01
track_loudness
-29.67
-14.61
0.45
track_tempo
50.45
133.21
215.97
track_tempo_confidence
0
0.5
1
track_time_signature
1
3
5
track_time_signature_confidence
0.03
0.51
1
track_key
364
0
5.5
11
track_key_confidence
0
0.5
1
track_mode
643
957
0
0.5
1
track_mode_confidence
0
0.5
1
Menu
Projec - Google Slide...
Desktop
Application of machi...
[validate.arff - 1600 ...
Weka GUI Chooser
Weka Explorer
All attributes
20:06

Intuition Based & CfsSubsetEval

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

average merit		average rank		attribute
25	+- 0	1	+- 0	24 energy
24	+- 0	2	+- 0	25 danceability
22.8	+- 0.4	3.2	+- 0.4	20 speechiness
21.9	+- 1.044	4.1	+- 1.04	12 track_duration
20.7	+- 0.458	5.3	+- 0.46	19 acousticness
19.9	+- 0.539	6.1	+- 0.54	16 valence
19	+- 1.095	7	+- 1.1	13 time_signature
18.7	+- 1.187	7.3	+- 1.19	14 duration_ms
16.7	+- 0.9	9.3	+- 0.9	6 track_time_signature
15.4	+- 0.917	10.6	+- 0.92	18 instrumentalness
14.8	+- 0.872	11.2	+- 0.87	10 track_start_of_fade_out
13.4	+- 2.154	12.6	+- 2.15	11 track_end_of_fade_in
13.3	+- 1.345	12.7	+- 1.35	1 track_mode_confidence
12.3	+- 1.418	13.7	+- 1.42	7 track_tempo_confidence
11.1	+- 0.7	14.9	+- 0.7	3 track_key_confidence
10.9	+- 1.375	15.1	+- 1.37	22 loudness
8.6	+- 0.917	17.4	+- 0.92	9 track_loudness
7.8	+- 0.872	18.2	+- 0.87	5 track_time_signature_confidence
7.4	+- 0.917	18.6	+- 0.92	17 liveness
5.8	+- 0.6	20.2	+- 0.6	21 mode
5.1	+- 1.375	20.9	+- 1.37	15 tempo
3.4	+- 1.2	22.6	+- 1.2	23 key
3.1	+- 1.044	22.9	+- 1.04	2 track_mode
2.6	+- 0.663	23.4	+- 0.66	8 track_tempo
1.3	+- 0.64	24.7	+- 0.64	4 track_key

SVM-RFE

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

Modeling & Evaluation

- ANN
- SVM
- Decision Tree

Experiments

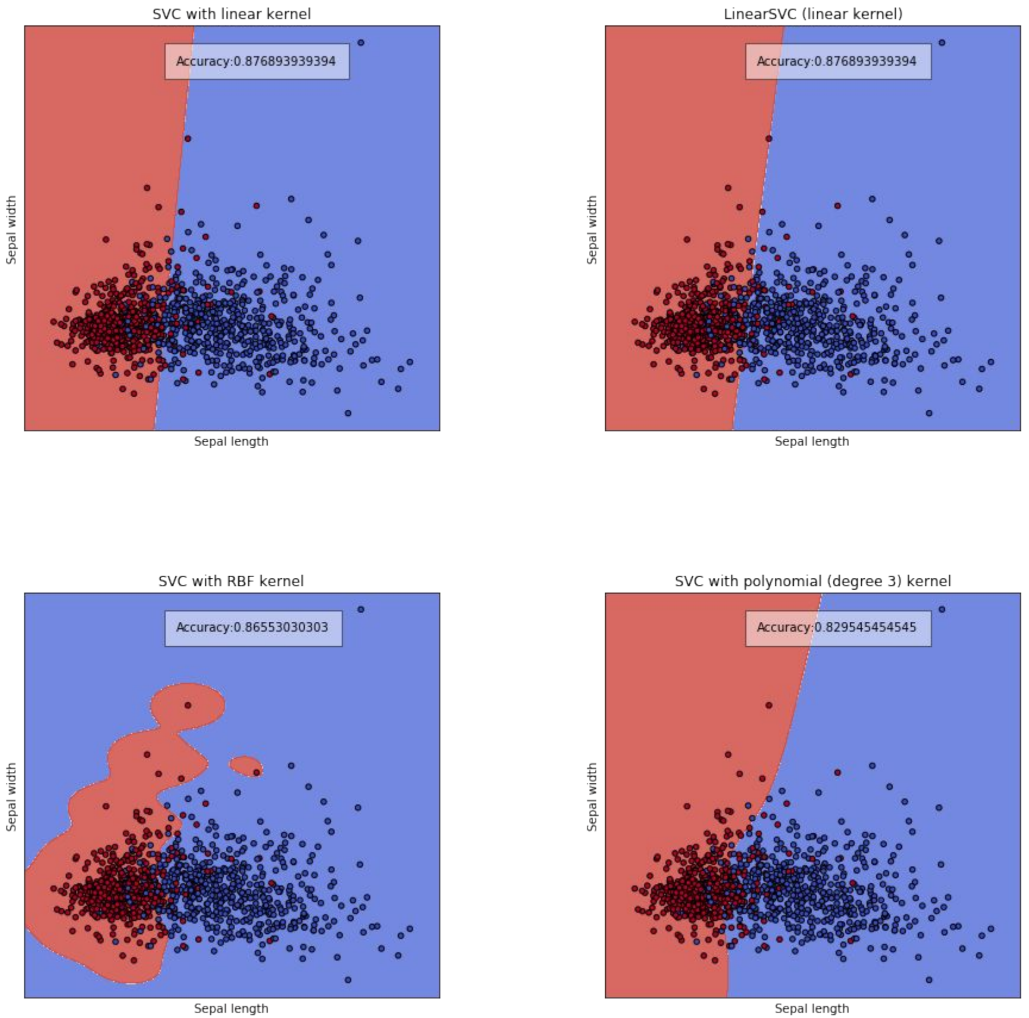
Total 1600 songs

- Train : 800
- Test: 600
- Validation : 200

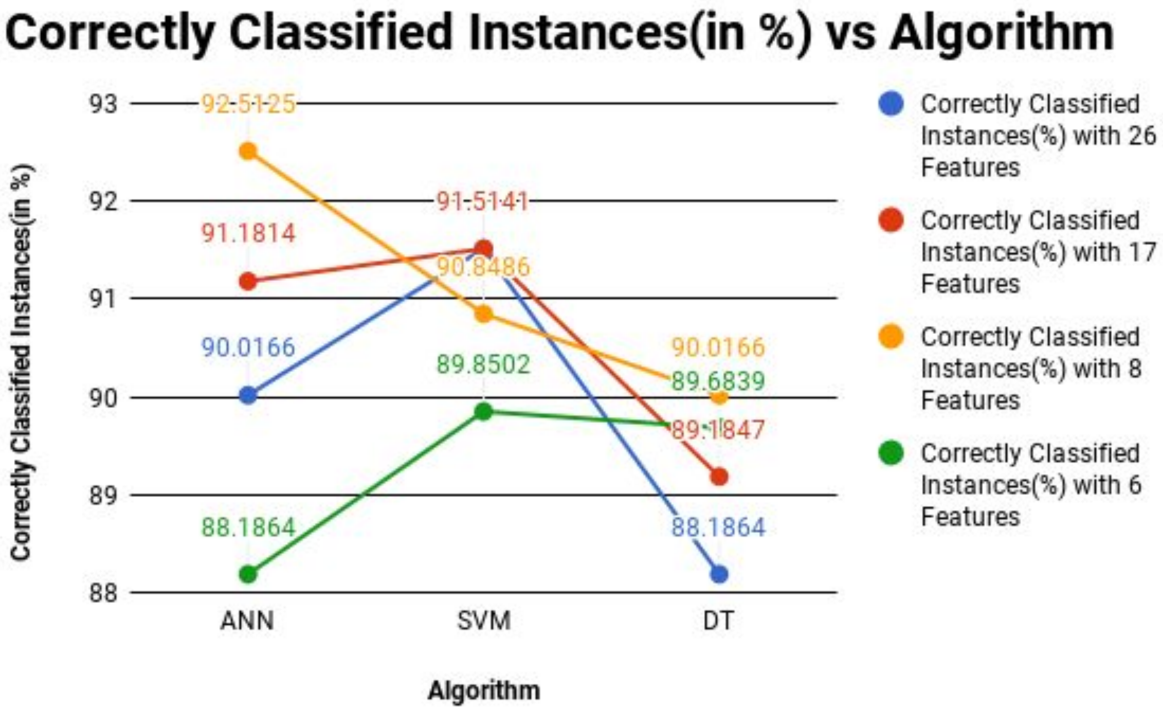
Tools:

- Weka
- Scikit (Python)

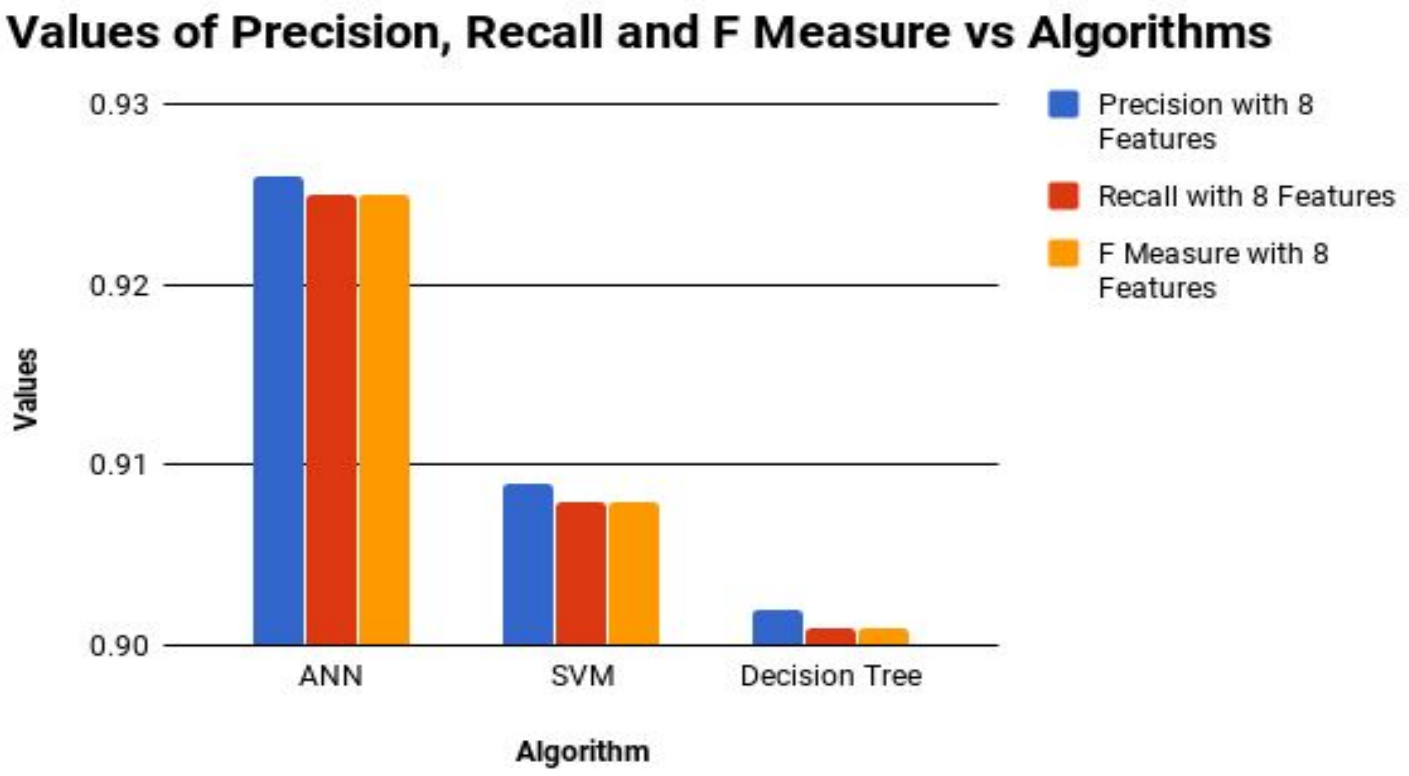
SVM on Principal Components



Comparison of Algorithms w.r.t. Feature sets

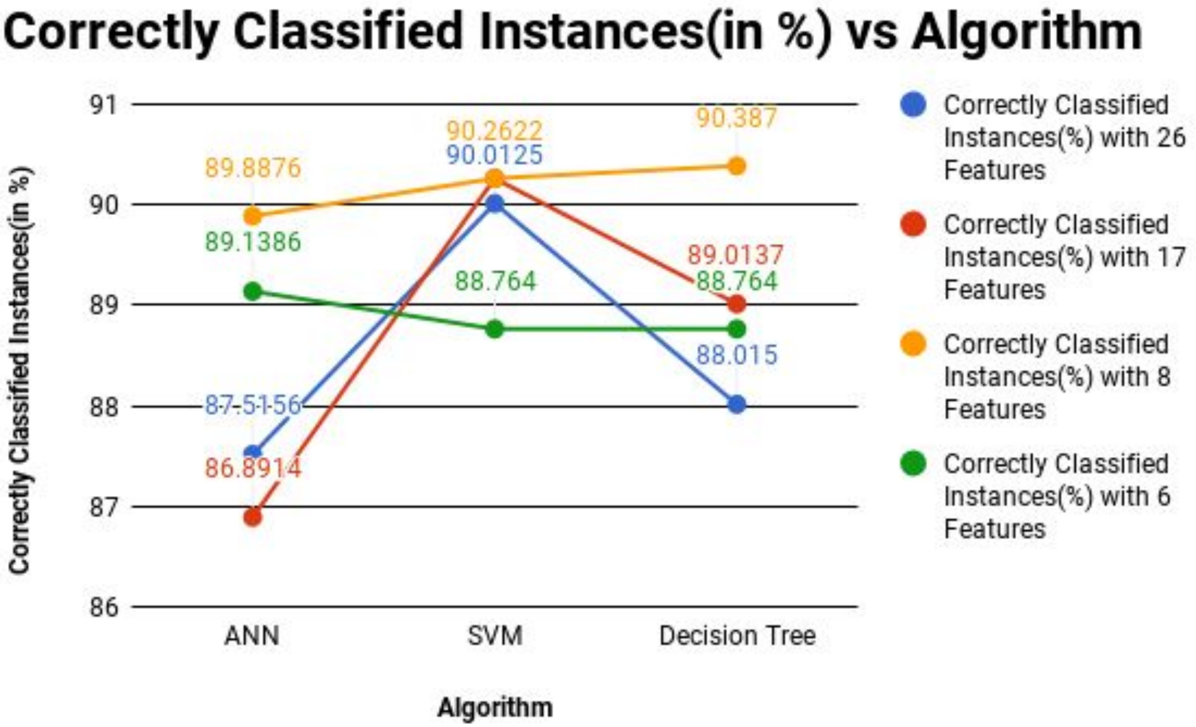


The best one: 8 Features using SVM-RFE

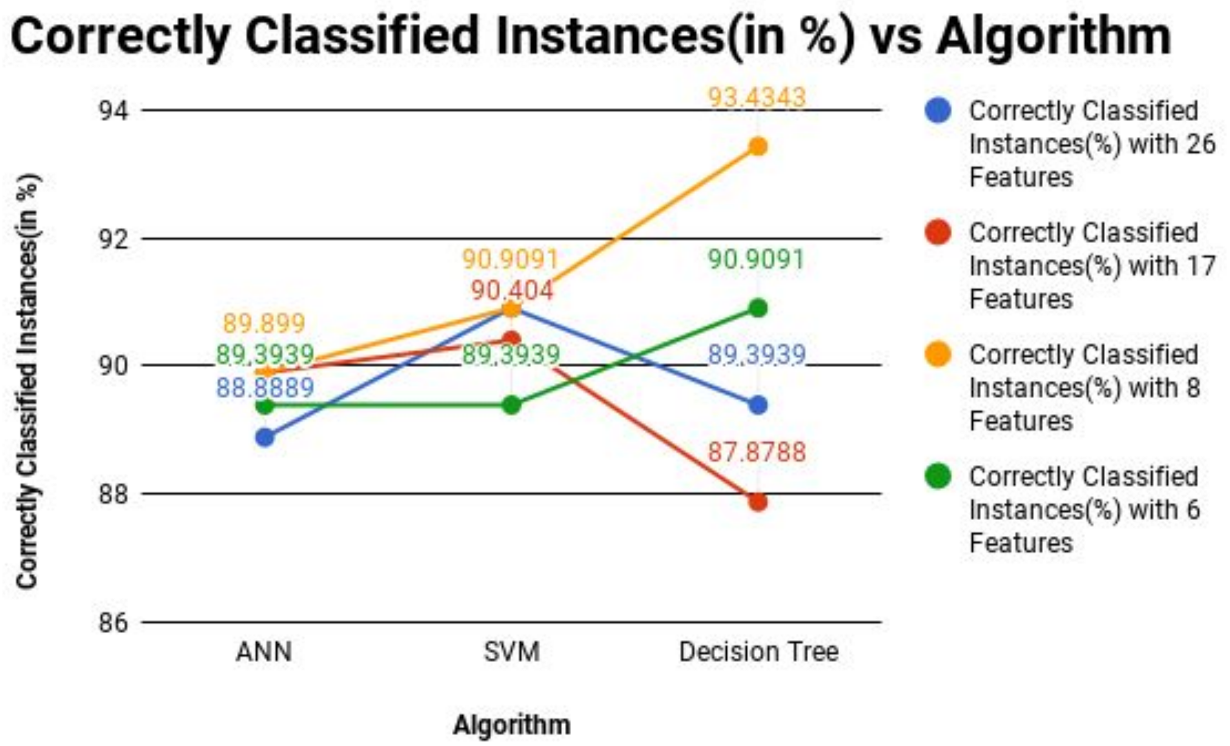


Validation

10-fold Cross Validation



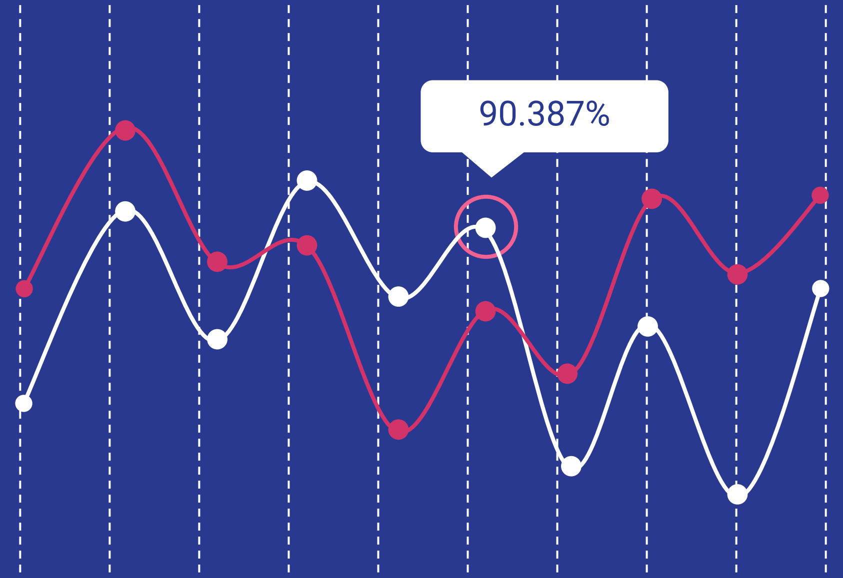
Validation Set



Results and Conclusion

Accuracy

90.387% using Decision Tree



Future Work

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

Thank You!!