Music Emotion Recognition

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Introduction

➔ What is MER ....

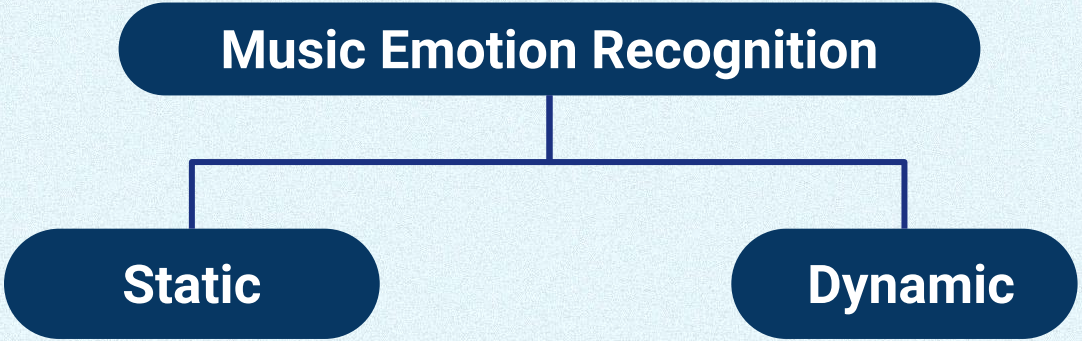
A process of using computers to extract and analyze music features, form the mapping relations between music features and emotion space, and recognize the emotion that music expresses

➔ Importance of MER

MER has an enormous significance in real world applications such as ,

- **Music recommendation**
- **Music therapy**
- **Music data management**

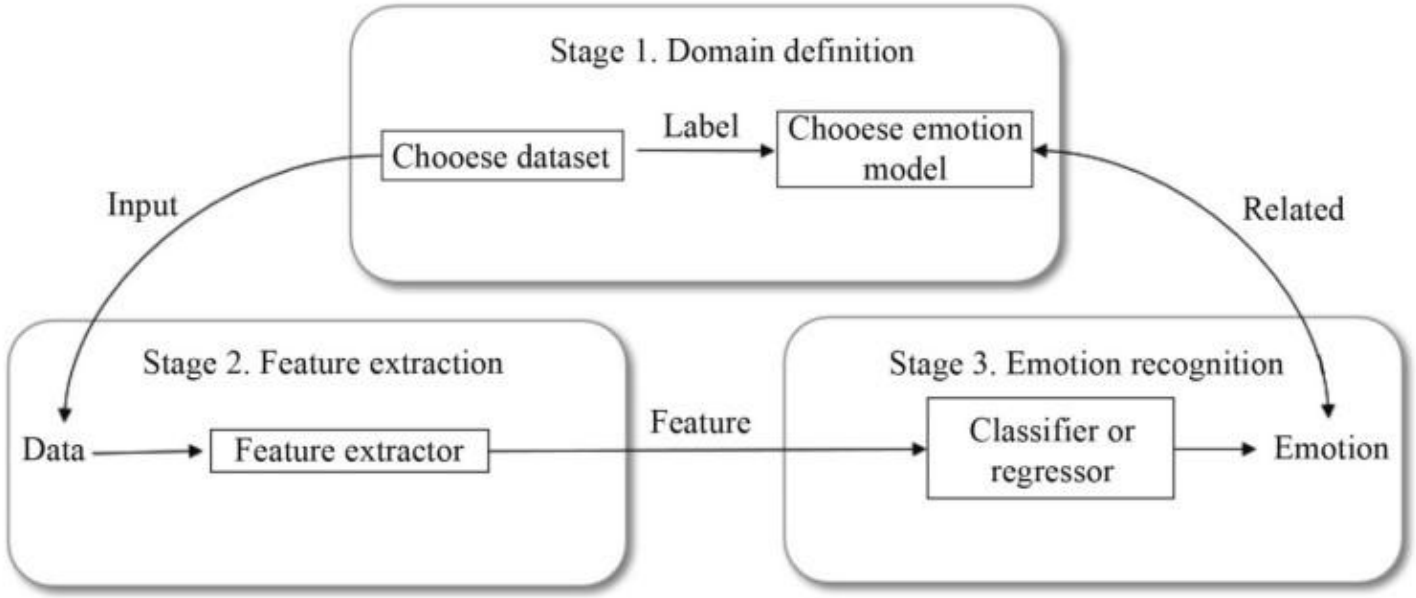
Research Background



- Song level MER
- Assign overall emotion label

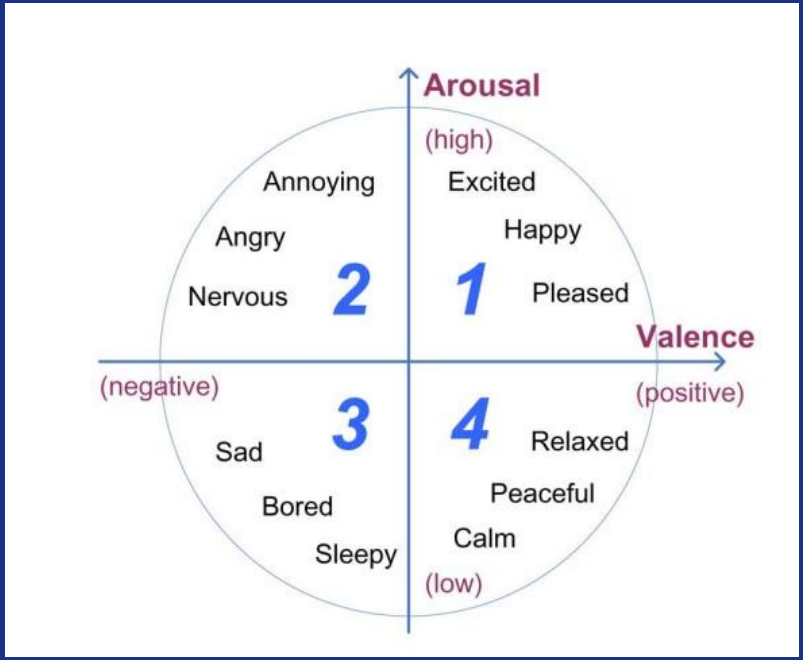
- Music emotion variation detection (MEVD)
- Consider emotion in music as a changing process

MER framework



Emotion Models

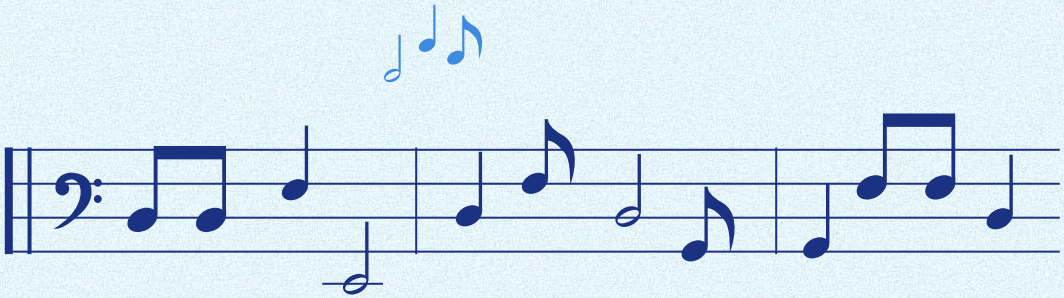
Model name	Application Domain	Emotion conceptualization	Number of classes /dimensions
Hevner affective ring	Music	Categorical	67
Russell's model	General	Dimensional	2
Thayer's model	General	Dimensional	2



Thayer's arousal-valence emotion plane

Objective

- To review the current state of research in Music Emotion Recognition and identify methodologies, techniques, and challenges associated with developing effective MER systems with a focus on improving system performance using efficient algorithms.



Summary of the Literature Review

[4] San Diego, La Jolla University of California, "***Comparison and Analysis of Deep Audio Embeddings for Music Emotion Recognition***",13 - April - 2021

[7] Ye Ma, XinXing Li, Mingxing Xu, Jia Jia and , Lianhong Cai, **"Multi-scale Context Based Attention for Dynamic Music Emotion Prediction"**, October 2017.

[9] Xinxing Li, Jiashen Tian, Mingxing Xu, Yishuang Ning, and Lianhong Cai," **DBLSTM - Based Multi-scale Fusion for Dynamic Emotion Prediction in Music".**

[11] Yu Xia and Fumei Xu, "***Study on Music Emotion Recognition Based on the Machine Learning Model Clustering Algorithm***", October 2022.

[12] Na He, Sam Ferguson "***Music emotion recognition based on segment-level two-stage learning***", 25 - April - 2022

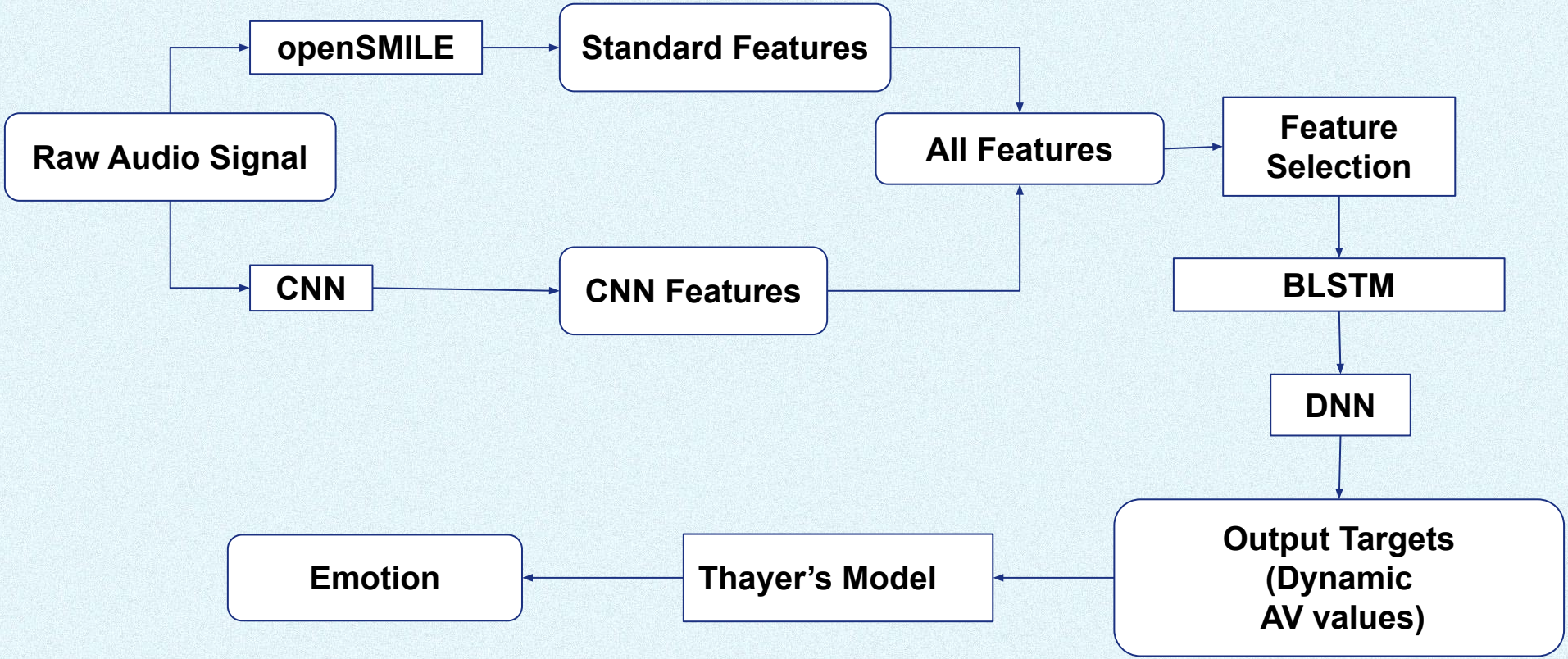
[13] Xinxing Li, Jiashen Tian, Mingxing Xu, Yishuang Ning, and Lianhong Cai," ***DBLSTM - Based Multi-scale Fusion for Dynamic Emotion Prediction in Music"***.6 June 2022

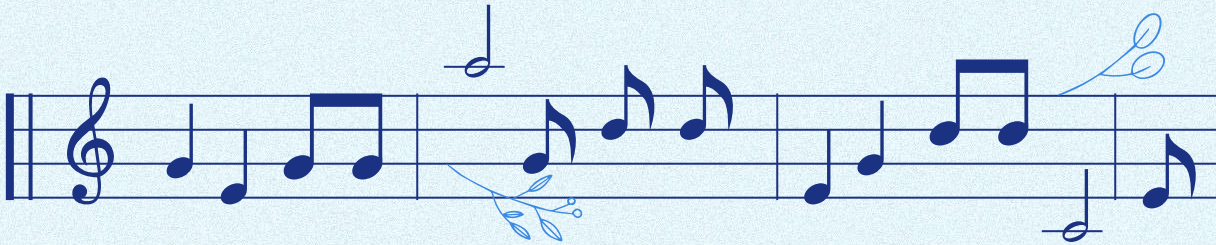
[22] Serhat Hizlisoy, Serdar Yildirim, Zekeriya Tufekci "***Music emotion recognition using convolutional long short term memory deep neural networks***", 2020

Reference	Training Models	Result Measures	Result	Dynamic MER	Hybrid Models	DL in FS	DL in OP
[4] 2021	VGGish, SVM, MLP, CNN, RNN	F - Score R2 - Score	Classification Results of Each Quadrant	✔	✖	✖	✔
[7] 2017	LSTM	RMSE	Outperformed most of the models (MLR, SVR, GPR)	✔	✖	✖	✔
[9]	DBLSTM, MLR, SVR, ELM, ANN	RMSE	Identified the effect of sequence length Post-processing after fusion gave the best result	✖	✔	✖	✔
[11] 2022	SVR , RBRF	MAE R2 score	Outperformed traditional methods (SVR, SVM)	✖	✔	✖	✖

Reference	Training Models	Result Measures	Result	Dynamic MER	Hybrid Models	DL in FS	DL in OP
[12] 2022	CNN-based autoencoder model, BiLSTM model	F1-score	PMEmo dataset, 1-s segment shows the best valence results	✔	✖	✔	✔
[13] 2022	LSTM, CNN, HMM, MCMM, RL-RNN	Recall Rate	The algorithm in this paper has a better effect, with higher generalization, stability	✔	✖	✖	✔
[22] 2021	LSTM, DNN	Accuracy precision recall, F-measure	Performance increased with the proposed model compared to SVM, KNN, and RF after applying CFS.	✖	✔	✔	✔

Proposed Methodology





Initial Results and Findings .....

Data Set - DEAM

- **MediaEval Database for Emotional Analysis in Music**

- **Obtained From Kaggle - https://www.kaggle.com/datasets/imsparsh/deam-mediaeval-dataset-emotional-analysis-in-music**

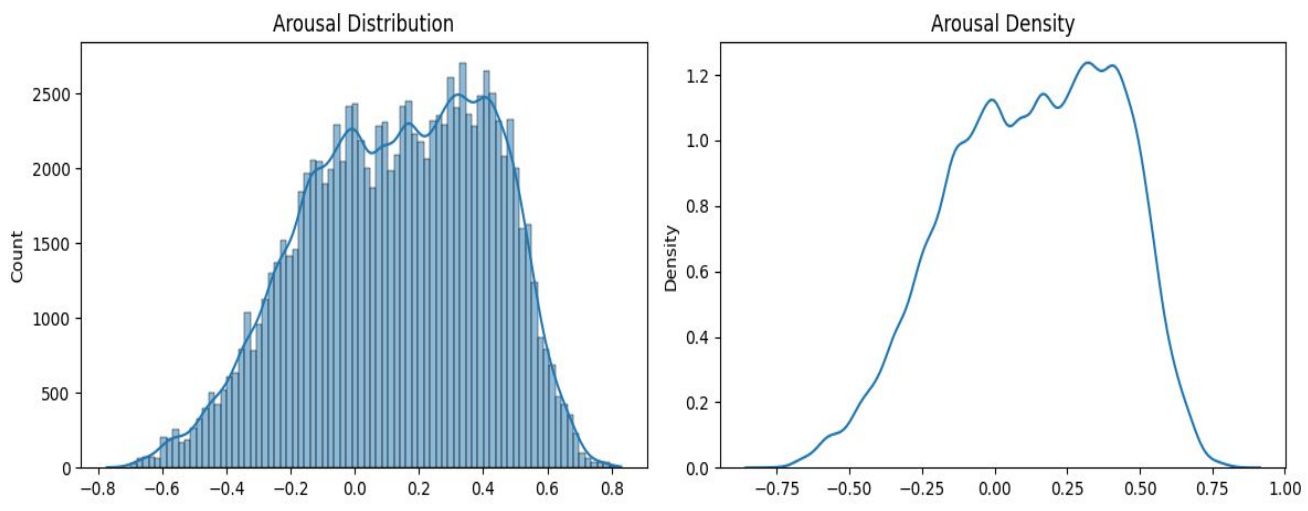
- **1802 songs annotated with valence and arousal values both continuously (per-second) and over the whole song**

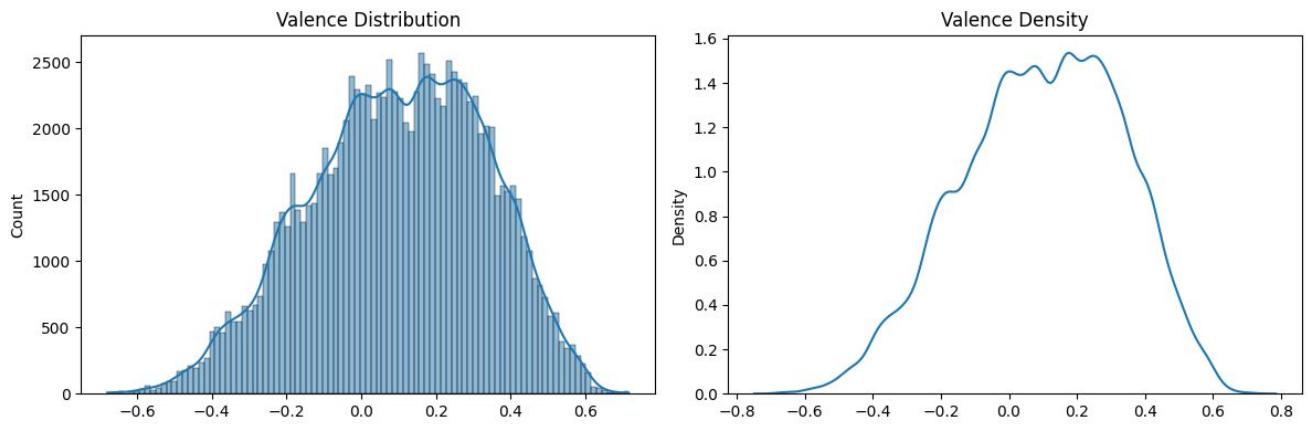
- **A and V values - Target variables**
- **Music Features of the songs - Feature variables**

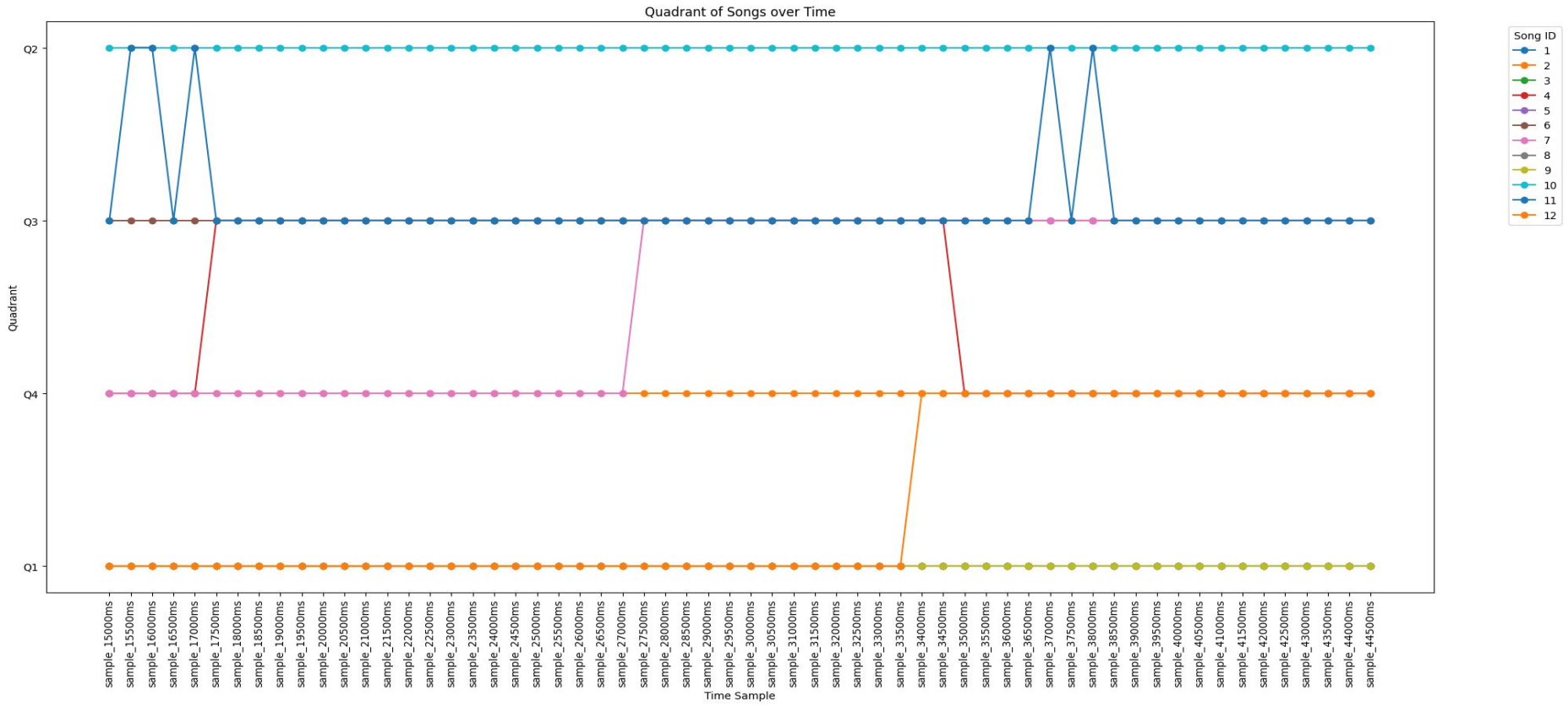
Data Pre-processing

- ➔ Handling Missing Values
- ➔ Dealing with Outliers
- ➔ Checking the Balance and Skewness of Data
- ➔ Feature Selection
- ➔ Splitting the Dataset
- ➔ Handling Time-Series Data

Analysis of the Dataset






Quadrant of Songs over Time
Quadrant
Q2
Q3
Q4
Q1
Time Sample
Song ID
1
2
3
4
5
6
7
8
9
10
11
12
sample_15000ms
sample_15500ms
sample_16000ms
sample_16500ms
sample_17000ms
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sample_40500ms
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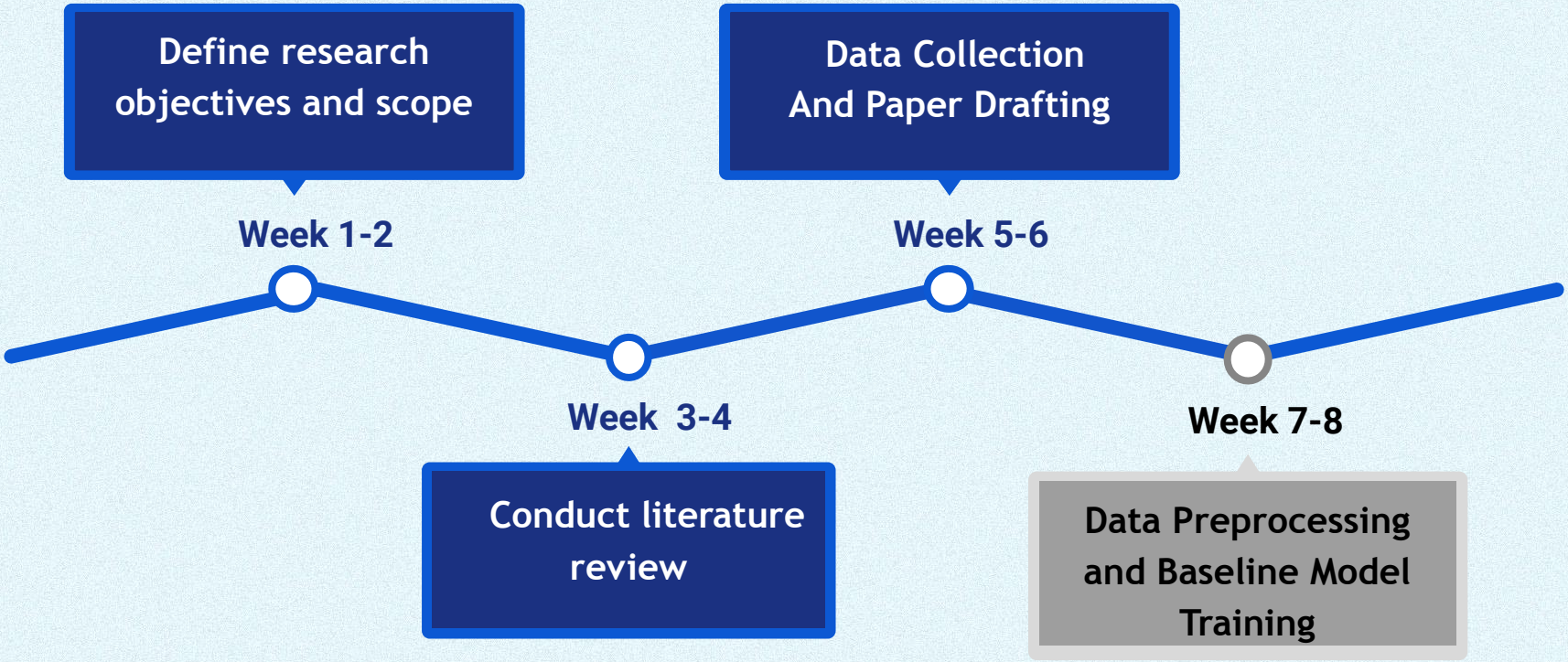
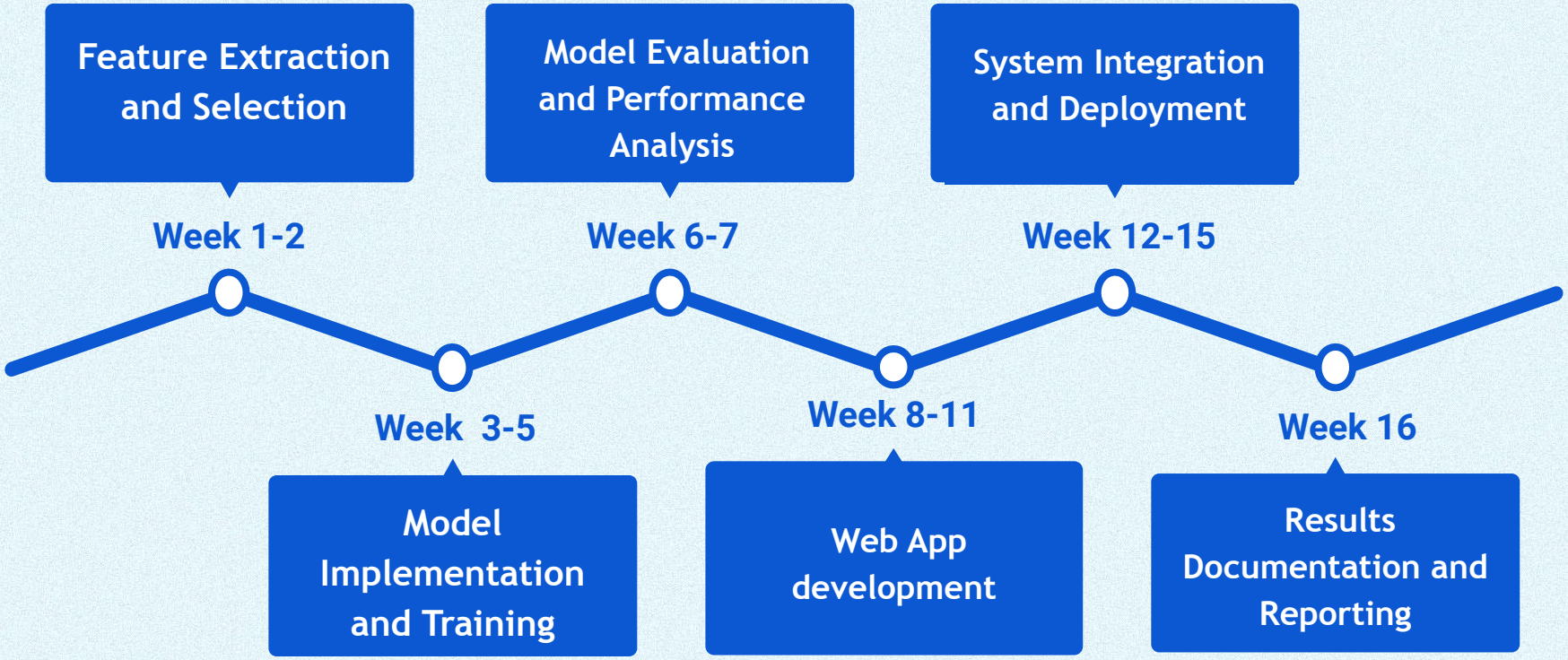
sample_43500ms
sample_44000ms
sample_44500ms

Work Plan for the 7th Semester

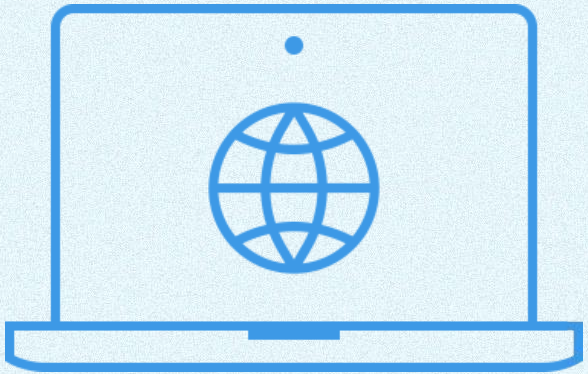


Work Plan for the 8th Semester



Expected Main Outcomes

Recognition System



Web Application

Thank You !

Q & A