



# Introduction to **Audio Content Analysis**

module 13: mood recognition

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# introduction

## overview

## corresponding textbook section

## chapter 13

### ■ lecture content

- introduction to emotion and mood
- models for mood
- linear regression

### ■ learning objectives

- describe Russel's arousal-valence plane
- discuss commonalities and differences between mood recognition and genre classification
- implement linear regression in Matlab



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# mood recognition

## introduction

### ■ **objective:** identify mood/emotion of a song

### ■ **terminology:**

- *Music Mood Recognition* and *Music Emotion Recognition* usually used synonymously

### ■ **processing steps** (similar to genre and similarity tasks)

- extract features
- classify (possibly regression)

# mood recognition

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# mood recognition challenges

**What is the difference between mood and emotion**



# mood recognition

## challenges



## What is the difference between mood and emotion

many definitions out there but general consensus on

### ■ *emotion*:

- temporary, evanescent
- (directly) related to external stimuli

### ■ *mood*:

- longer term, stable
- diffuse affect state



# mood recognition

## challenges

### ■ ground truth data

- *verbalization* of emotions/moods usually misleading
- not easily *quantifiable*/categorizable
- changing over time?

### ■ research questions

- are *basic emotions* (happiness, anger, fear, ...) representative for music perception?
- should aesthetic emotions be distinguished from other emotions (guilt, shame, disgust, ...)?
- *aroused vs. transported/evoked vs. conveyed* moods?

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# mood recognition

## models

### ■ classification into **label clusters**<sup>1</sup>

Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Rowdy	Amiable/Good Natured	Literate	Witty	Volatile
Rousing	Sweet	Wistful	Humorous	Fiercy
Confident	Fun	Bittersweet	Whimsical	Visceral
Boisterous	Rollicking	Autumnal	Wry	Aggressive
Passionate	Cheerful	Brooding	Campy	Tense/Anxious
		Poignant	Quirky	Intense
			Silly	

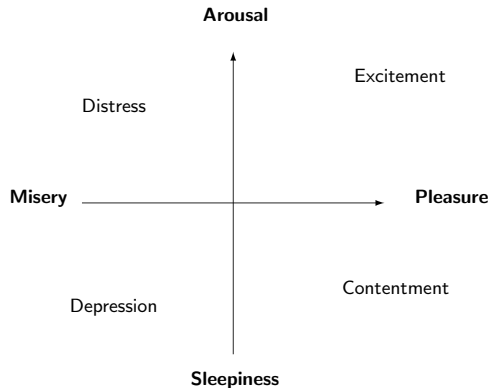
### ■ mood model, circumplex model

<sup>1</sup>X. Hu and J. S. Downie, "Exploring Mood Metadata: Relationships with Genre, Artist and Usage Metadata," in *Proceedings of the International Society for Music Information Retrieval Conference (ISMIR)*, Vienna, 2007.

# mood recognition

## models

- classification into **label clusters**
- **mood model**, circumplex model<sup>1</sup>



<sup>1</sup> J. A. Russel, "A Circumplex Model of Affect," *Journal of Personality and Social Psychology*, vol. 39, no. 6, pp. 1161–1178, 1980, ISSN:

# mood recognition

## mood model: regression modeling

### ■ mapping

- (N-dimensional) observation (feature) to 2-dimensional coordinate (valence/arousal)

### ■ training

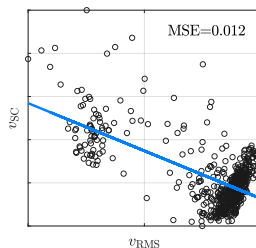
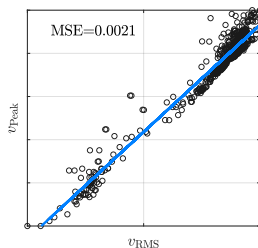
- find model to minimize error between data points and “prediction”

# regression

## regression

- linear regression: fit a linear function to a series of points  $(x_j, y_j)$

$$y_n = m \cdot x_n + b$$



- other regression approaches: SVR, DNNs, etc.

# mood recognition

## range of results

- highly dependent on data
- **5 mood clusters:**  
40–60% classification rate
- **mood model:**  
0.1–0.4 absolute prediction error (unit circle)



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# summary

## lecture content

### ■ emotion and mood

- emotion: temporary, related to external stimuli
- mood: long term, diffuse affective state

### ■ features

- 1 baseline features are identical to genre and similarity tasks

### ■ inference

- 1 often done as regression (as opposed to classification)

