Chapter 52
Music Emotions Recognition by Machine Learning With Cognitive Classification Methodologies

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ABSTRACT

Music emotions recognition (MER) is a challenging field of studies addressed in multiple disciplines such as musicology, cognitive science, physiology, psychology, arts and affective computing. In this article, music emotions are classified into four types known as those of pleasing, angry, sad and relaxing. MER is formulated as a classification problem in cognitive computing where 548 dimensions of music features are extracted and modeled. A set of classifications and machine learning algorithms are explored and comparatively studied for MER, which includes Support Vector Machine (SVM), k-Nearest Neighbors (KNN), Neuro-Fuzzy Networks Classification (NFNC), Fuzzy KNN (FKNN), Bayes classifier and Linear Discriminant Analysis (LDA). Experimental results show that the SVM, FKNN and LDA algorithms are the most effective methodologies that obtain more than 80% accuracy for MER.

1. INTRODUCTION

Music is not only a form of art but also a language that expresses human emotions, inner modes and affective information (Juslin, & Sloboda, 2001; Wang, Rodríguez, & Ramos, 2012; Wilson & Keil, 2001). It is generally perceived that music would not be composed, performed or comprehended without affective cognition and involvement. Because music expresses human emotions including joy, happiness, annoyance, sadness and pain, aesthetics and cognitive science recognize music as one of the powerful affective expression means.

It is recognized that music creation and appreciation are a subjective cognition process. Individuals may have different experience and understanding of the same piece of music, as well as different extends of emotionally affective effects. Therefore, it is a challenging problem to rigorously recognize and evaluate emotions of music and songs in musicology, esthetics, psychologists, and cognitive science (Juslin, & Sloboda, 2001; Wang, Rodríguez, & Ramos, 2012; Wilson, Keil, & Wilson, 2001; Hallam, Cross, & Thaut, 2008). One of the encouraging solutions for addressing the challenges is cognitive machine learning (Wang, 2015, 2016, 2017). Various machine learning algorithms are widely adapted to recognize music emotions (Yang, Lin, Su, & Chen, 2008; Bang, Kim, & Lee, 2013; Mokhsin, Rosli, Zambri, Ahmad, & Rahah, 2014; Jens, Sand, & Jan, 2015; Chin, Lin, Siahaan, Wang, & Wang, 2013).

There are two categories of methodologies for MER known as characteristic regression in the Valence-Arousal plan (Charanya, & Vijayalakshmi, 2015; Deng, Lu, & Liu, 2015; Wang, Wang, & Lanckriet, 2015; Lee, Jo, & Lee, 2011; Chin, Lin, & Siahaan, 2014; Soleymani, Aljanaki, & Yang, 2014; Soleymani, Caro, Schmidt, Sha., & Yang, 2013; Wang, Yang, Wang, & Jeng, 2012) and feature classification (Laurier, Grivolla, & Herrera, 2008; Schuller, 2010; Trohidis, Tsoumakas, Kalliris, & Vlahavas, 2008; Yang, Liu, & Chen, 2006). In this paper, music emotions were classified into four types such as pleasing, relaxing, angry and sad based on machine learning methodologies.