**Title : Induced Emotion-Based Music Recommendation through Reinforcement Learning *by Roberto De Prisco .et al[1] and others***

**Abstract:** Music is widely used for mood and emotion regulation in our daily life. As a result, many research works on music information retrieval and affective human-computer interaction have been proposed to model the relationships between emotion and music. However, most of these works focus on applications in a context-sensitive recommendation that considers the listener’s emotional state, but few results have been obtained in studying systems for inducing future emotional states.This paper proposes Moodify, a novel music recommendation system based on reinforcement learning (RL) capable of inducing emotions in the user to support the interaction process in several usage scenarios (e.g., games, movies, smart spaces). Given a target emotional state, and starting from the assumption that an emotional state is entirely determined by a sequence of recently played music tracks, the proposed RL method is designed to learn how to select the list of music pieces that better “match” the target emotional state. Differently from previous works in the literature, the system is conceived to induce an emotional state starting from a current emotion instead of capturing the current emotion and suggesting certain songs that are thought to be suitable for that mood. We have deployed Moodify as a prototype web application, named MoodifyWeb. Finally, we enrolled 40 people to experiment MoodifyWeb, employing one million music playlists from the Spotify platform. This preliminary evaluation study aimed to analyze MoodifyWeb’s effectiveness and overall user satisfaction. The results showed a highly rated user satisfaction, system responsiveness, and appropriateness of the recommendation (up to 4.30, 4.45, and 4.75 on a 5-point Likert, respectively) and that such recommendations were better than they thought before using MoodifyWeb (6.45 on a 7-point Likert).

**Conclusion:** In the digital age, emotion/mood has become a fundamental criterion used by ICT systems in predicting social behaviors or conditioning people in their social interactions and work activities. In light of this, music systems that regulate mood and emotions in our daily life are arousing particular interest. Therefore, the affective computing research community has put efforts into modeling the relationship between music and emotion. Applications of affective computing studies can be found in education, health care, entertainment, affective ambient intelligence, multimedia retrieval, and music retrieval and generation. As for the specific musical context, most of these works consist of context sensitive recommendation tools which take into account the emotional state of the listener. Few results have been obtained in the study of music systems for induction of emotional states, i.e., methods to influence the emotional state of listeners and adapt interaction with technology to their affective state. In this work, we have employed RL methods for developing Moodify, a novel music recommendation system that can induce a target emotional state in the listener. We implemented Moodify in MoodifyWeb, a Web platform delivered to end-users. The results of an evaluation study carried out with potential end-users proved that our system is useful and satisfactory for all participants involved.

**What the Researchers Proposed: The "Moodify" System**

Instead of recognizing you're sad and giving you sad music, this system asks, "How do you feel now?" and "How do you want to feel?". For example, you can tell it you feel "Tired" and want to feel "Happy". The system doesn't just suggest one song. It creates a sequence of songs, which they call a "musical trajectory," to gradually shift your emotion from the starting state to your desired target state. They used **Reinforcement Learning (RL),** specifically a method named "**Go-Explore**". This AI agent learns your preferences through a feedback-based system.

During a training phase, you listen to music and give feedback on how it makes you feel. The agent uses this feedback to learn which sequences of songs are best at changing a user's mood. They tested the app with 40 people, who reported high satisfaction with the system's recommendations and responsiveness. Users felt the recommendations were better than they expected.

**Future Scope:**

**Integrate Directly with Spotify:** Instead of a separate website, they plan to build Moodify as a plug-in directly inside Spotify for a seamless user experience. **Add More Context:** They want to make the recommendations even smarter by considering the user's environment or activity. For example, the music needed to make you feel energetic at the gym might be different from the music needed when you're at home. Use "**Implicit" Feedback:** Right now, the user has to give explicit feedback by clicking buttons. In the future, they want the system to automatically understand your emotions by analyzing how you interact with your smartphone or other IoT devices, without you having to tell it anything. The current system was tested with 8 emotional states. To handle a much larger and more complex range of emotions, they plan to use a more powerful AI technique called **Deep Q-learning.**