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Stage de M2 (psychoacoustique/musique/émotions):  
Influence émotionnelle du *detuning* dans la voix chantée

Période: Février à Juillet 2017

### **Supervisors :**

Louise Goupil, Emmanuel Ponsot & Jean-Julien Aucouturier (“Perception and Sound Design Team”, IRCAM UMR9912)

### **Context :**

The internship is part of the project CREAM (“Cracking the Emotional Code of Music”, <http://cream.ircam.fr>), supported by a Starting Grant from the European Research Council. The student will be integrated in the CREAM project, based within the “Perception and Sound Design” team, IRCAM (1 Place Stravinsky, 75004 Paris).

### **Project description :**

Our capacity to communicate emotions in music has been the subject of impassioned psychology and neuroscience research in the past two decades. Music’s expressive acoustic cues are now widely believed to imitate those used in speech prosody, with e.g. fast pace and high intensity for happy music/speech, and monotonous pitches and dark timbres for sad music/speech (Juslin & Laukka, 2003). However, there has been very limited rigorous psychoacoustical research on how exactly speech emotional cues can be used in music, and vocal music in particular.

This internship proposes to look at the specific use of pitch. In speech, it is widely accepted that higher pitches are linked with positive valence (see e.g. Aucouturier et al, 2016). It would thus be predicted that detuning a singer by a few cents above the instrumental background would make a musical performance happier. However, in music, pitch relations obey to strict constraints of consonance, which do not exist in speech. Detuning a singer by one full semitone above the background results in very dissonant music, which is inversely correlated with positive emotional judgements (Cousineau, McDermott & Peretz, 2012). How these two mechanisms (higher pitch -> positive, higher dissonance -> negative) interact is very important for overall theories of speech/music emotions, yet it remains almost completely unknown (Zatorre & Baum, 2012).

### **Student role in the project :**

The project will consist of a series of psychoacoustical experiments to measure the link between increased/decreased pitch in speech and singing voice and the listener’s emotional response. The

student will participate in the experimental design (using skills in experimental psychology), stimulus preparation (using skills in sound/music production, and tools like AudioSculpt and Ableton live), experiment building (using skills in computer programming, and language like Python/psychopy), data collection (1-hour experiment on 20+ participants), data analysis (using skills in statistics, and tools like Python/pandas), and manuscript preparation.

## **Student's profile :**

We are looking for a Master's student with strong acoustic/audio signal processing/music production skills and a strong interest in experimental psychology and psychoacoustics. Experience with music production tools like Max and Ableton Live, and programming experience in Matlab or Python, will be appreciated. Any experience with experimental data collection, listening tests or cognitive modeling, while optional, will be also appreciated.

## **How to apply :**

Send a CV and detailed cover letter by email to Louise Goupil [louise.goupil@ircam.fr](mailto:louise.goupil@ircam.fr) & Jean-Julien AUCOUTURIER, [aucouturier@gmail.com](mailto:aucouturier@gmail.com)

## **References :**

- Aucouturier, J.J., Johansson, P., Hall, L., Segnini, R., Mercadié, L. & Watanabe, K. (2016) Covert Digital Manipulation of Vocal Emotion Alter Speakers' Emotional State in a Congruent Direction. *Proceedings of the National Academy of Sciences*, vol. 113 no. 4
- Cousineau, M., McDermott, J. H., & Peretz, I. (2012). The basis of musical consonance as revealed by congenital amusia. *Proceedings of the National Academy of Sciences*, 109(48), 19858-19863.
- Juslin, P. & Laukka, P. (2003) Communication of emotions in vocal expression and music performance : Different channels, same code?, *Psychological bulletin*, vol. 129, no. 5, p. 770.
- Zatorre, R. J. & Baum, S. R. (2012). Musical melody and speech intonation: Singing a different tune. *PLoS Biol*, 10(7), e1001372.