ANALYSIS OF NEURAL CORRELATES OF DIFFERENT MUSIC GENRES USING MACHINE LEARNING

Diksha Srivastava and Anuj Kumar Bharti
School of Computer Science engineering and Technology, Bennett University India
<E21CSEU0293@bennett.edu.in, bharti.anujk@gmail.com >

Human brain follow a modular approach, i.e. different classes of stimuli are process in different brain regions. Auditory stimuli processing is also dependent on the category (e.g. santences and music are having different neural patterns) (Rogalasky et al., 2011). Further to add, music perception is highly dependent on behavioural traits such experience of the music (Chapin et al, 2010),

Nakai, Koide-Majima, and Nishimoto (2020) has experiment with 10 music genres and processed the fMRI scans of 5 subjects. They have reported that superior temporal region (STG) was having different pattern for different music generes, which was capable of classifying the neural activity through data analysis approach.

We have aquired the fMRI data of their experiment (from https://openneuro.org/datasets/ds003720/versions/1.0.0) and applied machine learning for automatic classification of neural activity for different music generes. The data contains fMRI scans for 5 subjects and each subject gone through 12 training runs and 6 test runs. In each training run 10 music genere played in random order for 15 seconds each, after intimitaning the genere name. In test run, 10 music generes were played for 15 seconds each but without intimating the name of genere.

The preprocessing of the data is done in SPM 12 and for machine learning, PRONTO V3.0 was used. To make the feature efficient we limited the feature calculation to STG only. The STG mask was created SPM anatomy toolbox. For each training run, a voxel based feature set was prepared. Using the label from design matrix, a supervised machine learning alogorithm (support vector machine-SVM) has been applied.

The results shows that SVM was able to classify the music generes with significantly better accuracy.

References:

Chapin, H., Jantzen, K., Scott Kelso, J. A., Steinberg, F., & Large, E. (2010). Dynamic emotional and neural responses to music depend on performance expression and listener experience. *PloS one*, *5*(12), e13812.

Koide-Majima, N., Nakai, T., & Nishimoto, S. (2020). Distinct dimensions of emotion in the human brain and their representation on the cortical surface. *NeuroImage*, *222*, 117258.

Rogalsky, C., Rong, F., Saberi, K., & Hickok, G. (2011). Functional anatomy of language and music perception: temporal and structural factors investigated using functional magnetic resonance imaging. *Journal of Neuroscience*, *31*(10), 3843-3852.