Reconceptualizing the Affective Brain – Insights from fMRI Meta-analysis using Author Topic Modeling

Abstract

How affective experiences arise in the human brain remained a topic of heated debate over the past 20 years. One camp of researchers postulated the existence of distinctive, basic emotions each associate with a unique neural fingerprint (affective programs), whereas the opposing camp suggested that different emotions should be viewed as the interactions between two or three latent, orthogonal dimensions (dimensional view) each characterized by a corresponding brain circuit.

In an attempt to investigate the issue, it employed a novel machine learning technique, Author Topic Modeling, to analyze a large body of emotion-related neuroimaging data from the BrainMap database. Author Topic Modeling was developed to perform automatic text mining to extract the latent themes (i.e. topics) underlying a corpus of texts written by different authors, using Bayesian statistics. When applying to neuroimaging data, it can be used to extract the latent brain circuits underlying a group of tasks (Yeo et al., 2015).

In the current study, it identified 1297 studies from the BrainMap database that either examined the neural activities associated with discrete emotional states. Using the Author Topic Modeling approach, it identified two latent brain circuits that closely resemble the brain networks of i) hedonic value representation & saliency processing, & ii) affective appraisal and self-referential processing. It argues that the findings call for an evolutionary-based framework of understanding on affective processes in the brain. Further implications on mental health and resilience will be discussed.