Scientific Summaries - Brain Waves and Emotions

1. Recognition of human emotions using EEG signals: A review

This comprehensive review, published in *Computers in Biology and Medicine*, provides a detailed overview of EEG-based emotion recognition. The authors discuss how brain waves - such as alpha, beta, theta and gamma - are associated with different emotional states. They classify several methods for extracting features from EEG signals, such as frequency analysis, time-frequency transformations, and nonlinear dynamic parameters. Multiple classification algorithms such as SVM, k-NN, and deep learning are also discussed, with comparisons in accuracy and applicability. The study confirms that EEG is a robust signal for interpreting emotional states if processed and interpreted correctly.

🔗 Article: https://www.sciencedirect.com/science/article/pii/S001048252100490X
📚 PubMed: https://pubmed.ncbi.nlm.nih.gov/34388471/

2. EEG-based emotion recognition systems; comprehensive study

This study in *Heliyon* provides a systematic review of existing emotion recognition systems that use EEG. It explains how emotions are classified based on the circumplex model (valence, arousal) and how EEG data are processed. The authors analyze various methods for signal preprocessing, feature extraction, and classification. They show that machine learning models such as Random Forest and CNN are effective in detecting emotional states with EEG signals. An important part of the article is the discussion of dataset variations (such as DEAP and SEED) and how they affect performance. The article concludes that consistent preprocessing and model selection are crucial for reliable emotion recognition.

🔗 Article: https://www.sciencedirect.com/science/article/pii/S2405844024075169
📚 PubMed: https://pubmed.ncbi.nlm.nih.gov/38818173/

3. Human Emotion Detection via Brain Waves Study by Using EEG Signals

This paper explores how human emotions can be automatically detected via EEG brain waves. It describes a practical implementation linking simple software interfaces to EEG instruments. Although less in-depth than other studies, this paper provides an accessible approach to EEG interpretation, focusing on visual indicators, such as changes in brain activity per hemisphere during emotional stimuli. The study confirms that different emotions (such as happiness, anger, sadness) show different EEG patterns.

🔗 Article: https://scispace.com/papers/human-emotion-detection-via-brain-waves-study-by-using-2yc1du5xi9

4. EEG Signal Based Human Emotion Recognition Brain-computer Interface using Deep Learning and High-Performance Computing

This research proposes an advanced method to process EEG signals for emotion recognition using deep learning and brain network connectivity. The authors introduce convolutional neural networks (CNN) combined with Long Short-Term Memory (LSTM) models for temporal analysis of brain waves. They claim higher accuracy in detecting complex emotional states, with improved performance through GPU-optimized computing. This approach is especially powerful when processing large-scale EEG datasets.

🔗 Article: https://link.springer.com/article/10.1007/s11277-024-11656-5

5. Emotion recognition with EEG-based brain-computer interfaces: a systematic literature review

This systematic review examines how EEG-BCI systems are used for emotion recognition. The article reviews more than 80 relevant studies and compares different methodological approaches. It discusses how emotion recognition via EEG can contribute to personalized technologies, including affective computing, and highlights challenges such as individuality of brain signals, reliability, and privacy. The authors advocate for more standardized datasets and benchmark methods to enable cross-study comparisons.

Article: https://link.springer.com/article/10.1007/s11042-024-18259-z