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Research Article

Determining the Distinguishing Feature in Brain Signal Processing: A Case Study of Heroin Addicts

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Abstract

This study aims to identify and determine distinguishing features of brain signals in heroin-addicted individuals. Electroencephalogram (EEG) signals were collected from 16 brain channels for 15 addicted and 15 healthy individuals. Frequency and non-frequency features were evaluated using the Davies-Bouldin index. The results indicate that in heroin-addicted individuals, the frequency power in the upper alpha sub-band of the O1 channel decreased, while the approximate entropy in the Cz channel increased. To classify the data and distinguish addicted individuals from healthy ones, a Support Vector Machine (SVM) classifier was employed. The accuracy and precision of detection for approximate entropy were 91.50% and 91.15%, respectively, while for the upper alpha power of the O1 channel, they were 95.92% and 92.18%, respectively. The findings confirm the significance of selected features in distinguishing heroin-addicted individuals. The analysis of brain signals can provide a deeper understanding of the effects of heroin use on brain activity and contribute to improving treatment strategies and addiction prevention.

Keywords: Addiction, Brain signal analysis, Davis-Bouldin index, Power spectrum, Heroin.

Highlights

- Selecting appropriate and specific features in addicted and healthy individuals based on individual characteristics of heroin addicts or healthy individuals based on a feature selection method.
- Selecting a distinguishing feature from the Davis-Bouldin method.
- Determining a distinguishing feature for diagnosing addiction in brain signals.
- Examining time and frequency domain features to identify a distinguishing feature.
- Introducing a new database in diagnosing addiction based on brain signals.

Citation: [in Persian].