

## Feature Engineering of EEG applied to Mental Disorders: a Systematic Mapping Study

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**Resumen(Abstract).** Around a third of the total population of Europe suffers from mental disorders. The use of electroencephalography (EEG) together with Machine Learning (ML) algorithms to diagnose mental disorders has recently been shown to be a prominent research area, as exposed by several reviews focused on the field. Nevertheless, previous to the application of ML algorithms, EEG data should be correctly preprocessed and prepared via Feature Engineering (FE). In fact, the choice of FE techniques can make the difference between an unusable ML model and a simple, effective model. In other words, it can be said that FE is crucial, especially when using complex, non-stationary data such as EEG. To this aim, in this paper we present a Systematic Mapping Study (SMS) focused on FE from EEG data used to identify mental disorders. Our SMS covers more than 900 papers, making it one of the most comprehensive to date, to the best of our knowledge. We gathered the mental disorder addressed, all the FE techniques used, and the Artificial Intelligence (AI) algorithm applied for classification from each paper. Our main contributions are: (i) we offer a starting point for new researchers on these topics, (ii) we extract the most used FE techniques to classify mental disorders, (iii) we show several graphical distributions of all used techniques, and (iv) we provide critical conclusions for detecting mental disorders. To provide a better overview of existing techniques, the FE process is divided into three parts: (i) signal transformation, (ii) feature extraction, and (iii) feature selection. Moreover, we classify and analyze the distribution of existing papers according to the mental disorder they treat, the FE processes used, and the ML techniques applied. As a result, we provide a valuable reference for the scientific community to identify which techniques have been proven and tested and where the gaps are located in the current state of the art.

