Hair analysis by means of laser induced breakdown spectroscopy technique and support vector machine model for diagnosing addiction

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Abstract
Along with the development of laboratory methods for diagnosing addiction, concealment ways for creating false results, either physically or chemically, have been in progress. In this research, based on the Laser Induced Breakdown Spectroscopy (LIBS) technique and analyzing hair of addicted and normal people, a new method is proposed to overcome problems in conventional methods and reduce possibility of cheating in the process of diagnosing addiction significantly. For this purpose, at first, we sampled hair of 17 normal and 17 addicted people and recorded 5 spectrums for each sample, overall 170 spectrums. After analyzing the recorded LIBS spectra and detecting the atomic and ionic lines, as well as molecular bands, relative intensities of emission lines for Aluminum to Calcium (Al/Ca) and Aluminum to Sodium (Al/Na) were selected as the input variables for the Support Vector Machine (SVM) model. The radial basis and polynomial Kernel functions as well as a linear function were chosen for classifying the data in SVM model. The results of this research showed that by the combination of LIBS technique and SVM one can distinguish addicted person with precision of 100%. Because of several advantages of LIBS, such as high speed analysis and being portable, this method can be used individually or together with available methods as an automatic method for diagnosing addiction through hair analysis.

Keywords: Laser Induced Breakdown Spectroscopy (LIBS), hair, addiction, Support Vector Machine (SVM)

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