ABSTRACT

The major challenges in medical domain is the extraction of comprehensible knowledge from medical diagnosis such as Cardiotocography (CTG). In this information era, the use of machine learning tools in medical diagnosis is increasing gradually. This is mainly because the effectiveness of classification and recognition systems has improved in a great deal to help medical experts in diagnosing diseases.

Cardiotocography (CTG), consisting of fetal heart rate (FHR) and tocographic (TOCO) measurements, is used to evaluate fetal well-being during the delivery. Since 1970 many researchers have employed different methods to help the doctors to interpret the CTG trace pattern from the field of signal processing and computer programming. They have supported doctors with interpretations in order to reach a satisfactory level of reliability so as to act as a decision support system in obstetrics. More than 30 years after the introduction of antepartum Cardiotocography into clinical practice, the predictive capacity of the method remains controversial. In a review of lot of articles published on this subject, it was found that its reported sensitivity varies between 2 and 100%, and its specificity between 37 and 100% . So, in this work, machine learning and datamining techniques are used for the classification of CTG data and propose new methods with improved classification accuracy.
In this research, an Elaborate literature survey and background study was made on existing clustering and classification algorithms and CTG data classification methods. An Evaluation on Automated Classification Methods for the Clustering and Classification of Cardiotocogram Data was made and the results has been presented. An Outlier Based Bi-level Neural Network (BL-NN) Classification System for Improved Classification of Cardiotocogram Data has been presented. An Outlier Based Bi-Model Neural Network (BM-NN) based Classification System for Improved Classification of Cardiotocogram Data has been presented. A PCA based Improved Bi-Model Neural Network (IBM-NN) based Classification System for Improved Classification of Cardiotocogram Data has been presented.

In this research three hybrid neural network based classification systems are successfully designed and evaluated the performance of the three methods with respect to three different metrics. The proposed methods BL-NN, BM-NN and IBM-BPN were compared with normal BPN based method. According to the arrived results, the performance of the proposed supervised machine learning models provided excellent improvement in accuracy. It was found that, the proposed BL-NN, BM-NN and IBM-NN based classifier was capable of identifying Normal, Suspicious and Pathologic condition, from the nature of CTG data with very good accuracy. If the performance of IBM-NN with respect to all the metrics, then it outperformed the other compared algorithms.