Liver Disease Recognition: A Discrete Hidden Markov Model Approach

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The liver alongside the heart and the brain is the largest and the most vital organ within the human body whose absence leads to certain death. In addition, diagnosis of liver diseases takes a long time and requires sufficient expertise of physicians. To this end, statistical methods as automatic prediction systems can help specialists to diagnose liver diseases quickly and accurately. The discrete Hidden Markov Model (HMM) is an intelligent and a strong statistical model used to predict the types of liver diseases in patients in this study. The data in this cross-sectional study included information elicited from the records of 3411 patients with 5 different types of liver diseases including cirrhosis of the liver, liver cancer, acute hepatitis, chronic hepatitis, and fatty liver disease admitted to Afzalipour Hospital in the city of Kerman in the time period of 1394-1395. At first, the type of diseases for each patient was identified; however, it was assumed that the type of diseases is unknown and there were attempts to diagnose the type of the disease through the HMM to examine its accuracy. Therefore, the HMM was fitted to the data and its performance was evaluated by using the parameters of accuracy, sensitivity, and specificity. Such parameters of the model were separately calculated for the diagnosis of liver diseases. The highest levels of accuracy, sensitivity, and specificity were associated with the diagnosis of cirrhosis of the liver and equal to 0.69, 0.28, 0.77, respectively; and the lowest levels were related to the diagnosis of fatty liver disease with an accuracy level of 0.56 and a sensitivity level of 0.49. As well, the specificity level in the diagnosis of fatty liver disease was 0.49. The results of this study indicated the potential ability of the HMM; thus, the use of this model in terms of diagnosing liver diseases was strongly recommended.
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