



Efficient prediction and classification for cirrhosis disease using LBP, GLCM and SVM from MRI images

K. Prakash , S. Saradha

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Abstract

To enhance the specificity of Magnetic resonance imaging (MRI) based cirrhosis stage-diagnosis, a method of diagnosis incorporating the scan image texture discovery with classification techniques are suggested. First of all the liver MRI images are preprocessed and Region of Interest (ROI) image field is retrieved from the MRI images and the Lloyd method is compressed and quantified. Then a Local Binary Pattern (LBP) process filtering the ROI image and then extracts the texture features of the LBP images from four directions with a twenty directional Gray-Level Co-occurrence Matrix (GLCM). After that, the Support Vector Machine (SVM) technique has been used for MRI image classification and cirrhosis disease prediction. The experimental findings indicate that the procedure suggested will diagnose hepatic cirrhosis correctly.

Introduction

The Cirrhosis disease is a medically common chronic and progressive hepatic syndrome due to the longer symptoms with one or more sources of hepatitis diffuse. Actual detection of advanced cirrhosis is of considerable therapeutic value by painless evaluation. Currently, surgical screening has been an effective tool for investigating liver disease. The conventional liver method [1], [2], [3] has major technique in MRI imaging with help of multi-variables, multi-angles, multi-serious imaging, no ionizing radiation and high quality imaging. The Cirrhosis scan images are more receptive and precise than ultrasound and a computerized tomography (CT) scan images. The texture features mostly represent the organization of the grayscale image as an essential part of image treatment. Various tissue and organs has distinct texture characteristics. The texture with same organism is also quite different in disease and healthy condition[4], [5], [6].Then the normal distribution and anomaly of some aspects of the medical scan image can be determined, and then the illness can be detected and defined for the target by isolation and examination of the texture characteristics. The extraction methods for texture feature are largely classified into four groups, namely the mathematical approach, the structure model, the design method and the technique for signal processing.Fig 1.

A Local Binary Pattern (LBP) and a Gray-Level Matrix are used in the Statistical Procedure (GLCM). The LBP is a widely used technique of image extraction, but LBP only takes note of the local image framework frequency and does not consider the image macro-structure. Where all scan images microstructures are identical and their macrostructures distinct, LBP makes it hard to discern them. GLCM is the vector used to describe an image that has macroscopic properties of a number of pixels with a particular grey value at any distance [9], [10], [11]. In this article, we have used GLCM to perform LBP filtering on the Region of Interest (ROI) image structure for the first time to remove the image microstructure. The GLCM would then be retrieved from an LBP image in the 4 quadrants and analyzed accordingly for the distributions of this micro structured in order to obtain the microscopically characteristics of the images. In the end, MRI images of healthy liver, initial stage cirrhosis and later cirrhosis are detected using the Support Vector Machine (SVM) process.

Section snippets

Literature review

The authors [25] have used two separate input data sets, evaluating that the AP data sets for each algorithm are superior than the UCLA dataset. The backward spread and the SVM are yielding better returns, based on their success in their classification KNN. For the whole chosen algorithm, the AP data set is better than UCLA. Find out the 95.07, 96.27, 96.93, 97.47 and 97 accuracy respectively for Naïve Bayes, C4.5, KNN, Backward propagation and SVM. The suggestion from Bendi et al. [26] was to...

Methodology

The proposed EP2CD (Efficient Prediction and Classification for Cirrhosis Disease) model has totally four phases process which are preprocessing, quantization compression, feature information discovery and applying SVM classifier for training....

Standard Local Binary Pattern

The standard Local Binary Mode (LBP) which can extract the textures from nearby fields can be successfully extracted in grayscale image and texture transformation descriptions in local image regions. The general concept is to use the grayscale value of center pixel as a scaling factor to render a binary number system of the texture feature compared to the pixel ranges of its neighborhood.

For illustration, in a rectangle pixel region of 3x3, the grays of about eight pixels are compared consecutively...

Result and analysis

In this research article the cirrhosis dataset has been taken from MVISS 3.0T and gaggie liver patient dataset for evaluate this proposed algorithm [20], [21], it contains totally 101,950 samples, which are included 81,232 typical liver image samples, 9653 early cirrhosis samples and 11,065 advanced cirrhosis samples. Every case contained two series, which are T1W class and the T2W class. The MRI sample liver image of healthy, early and advanced cirrhosis types has been shown in Fig. 4. It ...

Performance analysis

From the findings given in the previous section, it can be observed that classification performance for healthy liver cells has less efficiency in early cirrhosis and advanced cirrhosis. The proposed system has done the best in the classification of ROI and the event. This technique integrates ULBP with GLCM to prevent depletion of the LBP processor feature direction reduction to use LBP and GLCM texture extraction efficiencies incomplete. The typical texture features of the GLCM texture are...

Conclusion

Due to the fact that various stages of cirrhosis and liver fibrosis present in MRI images as various textures, this article relies on a cirrhosis screening method based on a study of the textures of images of liver MR. The low dimension texture features are derived by the use of the combination between LBP and GLCM, and the cirrhosis is calculated by the SVM classifier following the calculation and compression of the ROI image block. The findings reveal the efficacy of the proposed approach in...

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper....

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References (32)

B. Ragupathy *et al.*

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Int J Imaging Syst Technol. (2020)

J. Lee *et al.*

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BMC Cancer (2020)

M. Seror *et al.*

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Ann SurgOncol (2020)

Al-Asadi, Tawfiq A., and Diyar M. Witefee. "Geometrical Fusion Based on Chain Code Representation." In IOP Conference...

C.J.J. Sheela *et al.*

Morphological edge detection and brain tumor segmentation in Magnetic Resonance (MR) images based on region growing and performance evaluation of modified Fuzzy C-Means (FCM) algorithm

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Engineering Journal (2020)



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