

# An SVM Approach to Liver Lesion Border Extraction for Liver Cancer Analysis

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## ABSTRACT

Authoritative analysis and prior identification of liver cancer is significant difficulty in the area of practical radiology. Doctors should know the feature of the tumor to provide effective treatment for the victim and helps doctors in further diagnosis. This paper intends the method for analyzing the liver under cancer positive environment. The proposed technique uses learning approach called Support Vector Machine (SVM) classifier to identify the liver from overlapped organs and tissues in CT image. It also uses systematic approach for liver lesion or tumor identification and extraction using image smoothing and refining method. The proposed technique constituted to extract the lesion with common reference point as backbone.

**Keywords:** Radiology, Tumor, Support Vector Machine (SVM), Smoothing.

## INTRODUCTION

Liver cancer is the most dangerous cancer among variety of cancer. Due to this every third living is cause of death and which is nearly a sixth most common cancer in the world. Liver cancer is also known by the name hepatic cancer and most of the liver cancer is common to Hepatic cellular carcinoma (HCC) [1]. Liver cancer is the uncontrolled growing of tissue within the liver. Tumors are of two types such as non-cancerous cells (benign) and cancerous cells (malignant). There are 12000 deaths per year in the worldwide due to liver cancer. To avoid this, problem need to be analyzed in earlier stages because earlier detection

can help doctors to save lives and does not make very much complication on the human health [2].

Generally there are many improvements in field of medical imaging techniques such as image processing machine learning techniques and artificial intelligence and these technologies can be used by experience radiologist [3]. Together with experienced radiologist and medical technology for computer aided diagnosis results in the accurate characterization of liver lesion. These techniques will provide clinical assistance to the doctors to improve the diagnosis and maximizes the accuracy of

the diagnosis [4]. This technique helps in avoiding surgery and biopsy risks toward the victim.

Tumor extractions in the liver CT images are absolutely necessary process in computer aided surgery and computer aided nature of illness identification [5]. But still authoritative analysis and prior detection of liver cancer is a significant difficulty in the field of practical radiology doctors should know the feature of the tumor in order to give effective treatment for victim also helps doctors in further diagnosis [1]. Any general method of automatic or semi-automatic computer aided system will assists doctors to provide the effective treatment for the patients by diagnosing the liver cancer feature. Common technology for detection liver consisting of five main stages: image acquisition, image preprocessing, image segmentation of liver and detection of lesion, feature extraction and classification of liver using any type of classification.

## LITERATURE SURVEY

The following description contains related work on liver cancer analysis and various methods included in processing of liver tumor. This survey is based on the combinations of machine learning techniques, preprocessing techniques, segmentation techniques and feature extraction methods that are incorporated detect the liver tumor or the liver lesion.

### a. Diagnosis of liver lesion from Computed Tomography images using DIP

Dr. Alyaa H Ali *et.al* has demonstrated the diagnosis of liver tumor from Ct images. Initially author decided to use CT image from image acquisition then it is followed by segmentation process to identify the liver image from CT image. K means clustering approach is used as the segmentation

process. By using this method author also achieved increased accuracy in the image. Author also considered different parameters to such as diameter and perimeter of the liver. These parameters are considered to determine the irregularity of the tumor and also easy to find out the feature of the tumor. Author successfully detected tumor which are invisible to the human eye in CT images [6].

### b. Analysis of liver MRI images for cancer detection using genetic algorithm

Yamini u *et.al* proposed methods that deal with finding size of the area affected by the cancer. In this work author concentrated on reducing time of finding cancer affected tissues and reduces the manual process in order to find the cancerous area. Author operates genetic algorithm on the MRI images to resolve the physical efforts for doctors by finding the cancer with new advanced detection technique [7].

### c. Feature extraction and classification of ultrasound liver image using HT and PF and SVM classifier

R.Sugnya *et.al* appraise the three modules to diagnose the disease liver. First module encompasses the method anisotropic diffusion speckle reduction method which is used as pre-processing technique. Second module is feature analysis that contains the twelve harlick features, applied to pathology bearing region of image. But they found the disease with only five harlick features out of twelve features. The final module is classification module that captures the result of second module to classify the image with respect to the five harlick features. Result by applying all these techniques is increased accuracy. Here accuracy rate is better when it is estimated with the other feature analysis method [8].

#### d. Liver tumour detection in Computed Tomography images by adaptive contrast enhancement and EM/Minimax Priority Model algorithm

Yu masuda et.al presents new method for automatic detection of tumor from liver CT/MRI images. Initially preprocessing has been done which incorporated the methods histogram transformation methods to increase the contrast of the input image. The result of action is produced as input to the EM/MPM algorithm which is machine learning approach based on Bayesian learning approach. MPM is a type of function that detects the misclassified pixels. These methods detected the liver tumor accurately [9].

### PROPOSED WORK

Proposed method provides the systematic approach to analysis of liver which is under cancer positive environment. It uses the machine learning techniques called SVM to detect liver from surrounding overlapped organs. Liver tumor or lesion can be extracted from smoothing and refining method. These techniques also incorporated to extract the lesion with respect to a constant reference object as backbone.

Sometimes when tumor region is too small it is difficult to recognize from the manual process i.e. by using human eye. The main contribution of this work is the detection and extraction of liver using SVM classifier and detection and extraction of tumor with respect to constant reference backbone because to have the clear mark of liver lesion in various cases of abdomen states.

The proposed work is basically incorporated with seven processing steps: image acquisition, image preprocessing, Image segmentation, SVM classifier, feature Extraction, Reconstruction and backbone analysis. Figure 1 shows the processing of

detection and extraction of liver tumor with constant reference point backbone

- Image Acquisition: process of retrieving the image from source i.e. from MRI machines.
- Pre-processing: Pre-processing step in the image processing involves the common processing methods to remove the lowest level background frequency of noise, reflection removal, increasing the intensity of the each pixel and the main aim is to intensify the image data to identify the different organs in the CT image by restraining unwanted deforms and it also makes better some of the important feature that are necessary for the future extraction.
- Image Segmentation: Image segmentation is dividing image into several segments. The main aim of the segmentation is to make image representation for future analysis.
- Feature Extraction: Feature extraction is the class of dimensionality reduction that used to represent the interesting portion of the image in proper manner to perform desired task. This is helpful when image size is too big and requires task to be completed quick, on these situations feature extraction is efficient method to get the result in short time.
- Image Object Classification: The SVM classifying technique is an independent dimensionality function and takes a very long time. SVM is well known as feed forward network which contains nonlinear units with a single layer and the classifying results of SVM are highly accurate. This classification can be done based on the custom data sets of the liver image. This method is used to detect the liver from overlapped organs of type stomach, kidney and liver parenchyma.

- **Backbone Analysis and Reconstruction:** The reconstruction is technique to covert image from 1D to 2D or 3D, which is incorporated to extract the lesion with respect to a constant reference object as backbone. An iterative reconstruction technique is adapted because this makes the work easier in the detection and extraction of liver tumour. Detection and extraction of tumour with respect to constant point of reference backbone has done because to have the clear mark of liver lesion in various cases of abdomen states.

## EXPERIMENTS AND RESULTS

SVM classifier is incorporated to extract the liver from abdomen CT images with backbone as reference. Figure 2 shows the result of SVM classifier applied to preprocessed liver CT images. Reconstruction method is applied to the result of SVM figure 2 to extract the liver lesion from the image. Figure 3 shows the result of extraction of liver cancer tumor with reference to backbone. Backbone is taken as reference point because most of the abdomen CT images must have backbone and also it is easy to analyze the liver cancer image to extract the liver tumor for various abdomen cases. From the figure 3 it can be able to see even the tumor growing directions.

## CONCLUSION

Liver cancer is the most dangerous cancer in the world wide and it is difficult to identify during earlier stages manually by the doctors. Hence this needs to be analysed in the earlier stages by the doctors in order to provide effective treatment for the victim. Proposed method resolve the difficulty of earlier analysis by introducing methods pre-processing, image Segmentation, SVM approach as machine learning technique and

feature extraction. The result of extraction of liver has been tested for various cases of abdomen states and it becomes easy for the doctors to know feature of the tumour.

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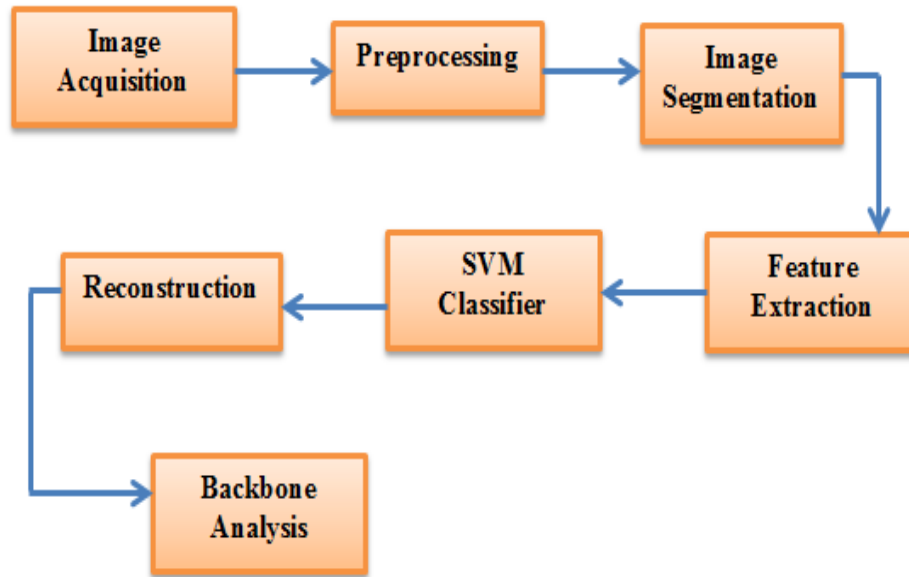


Figure 1: Processing of proposed work

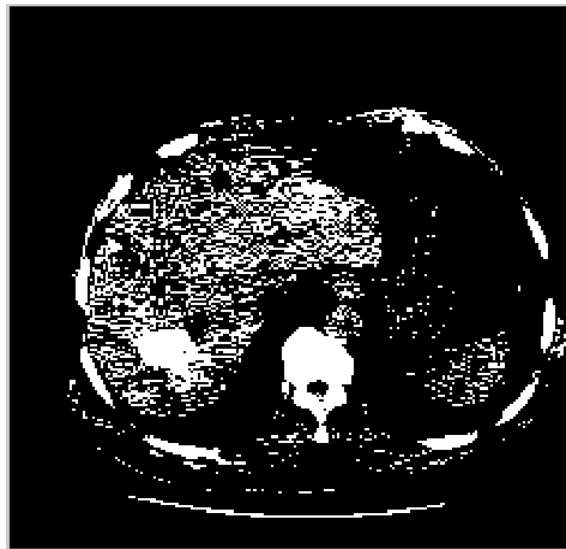
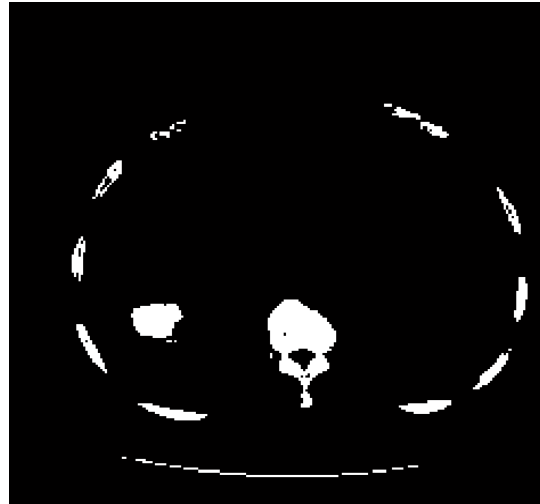


Figure 2: Result of SVM classifier with respect to backbone



**Figure 3: Result tumor extraction and backbone analysis**