

# A Survey on Liver Cancer Detection

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**Abstract:** Cancer is a leading causing death in the world. The liver cancer detection and diagnosis is one of the most important for prevention. Using the different segmentation methods and feature extractions the detection of liver cancer has been done. It is tedious and time consuming, because of the manual methods. This paper reviews various liver cancer detection algorithms and methodologies. The existing systems are discussed in this paper. The scope is to identify the new methodology and algorithm for the early liver cancer detection to save n-numbers of lives. Based on the accuracy and efficiency of the experiment results and comparing with other methodologies of the liver tumor detection.

**Index Terms:** liver tumor, segmentation, feature extraction, computed tomography (CT).

## I. INTRODUCTION

The **liver** is a largest gland and heaviest internal organ and it plays an important role in the human body. It is reddish-brown in color, it has four lobes of unequal size and it is in wedge shape. Therefore it is located in the abdomen below diaphragm in the upper right quadrant and its normal weight is 1.44-1.66 kg (3.2-3.7 lb.) It has wide range of functions, including protein synthesis, producing bile-digest fats, vitamins and other nutrients, and it keeps the body from harmful substances and free of toxins. It breaks down the medications and toxins from the body and also stores glucose.

Liver cancer has been among the 6 most common cancers and also a leading cause of cancer deaths worldwide. In 2015, it was reported that about 788,000 people died from this disease worldwide. It is also known as hepatic cancer, it starts in the liver and then it migrating to other parts of the body. It is also called as primary liver cancer. In the liver, when normal cell becomes abnormal due to the behavior and appearance it is known as Primary liver cancer. Hepatocellular carcinoma is the cancerous cells or malignant that develop in the liver normal cells (hepatocytes). The liver cancer is the leading death causing disease in the world, which is most common internal malignancies worldwide.

**The symptoms of liver damages:** The people who affected by liver cancer has these symptoms namely abdominal discomfort, pain and tenderness, yellowing of the skin and the whites of the eyes, which is called jaundice. The white, chalky stools, nausea, vomiting and bleeding easily, weakness and fatigue. The ultrasound is used to diagnosis of cirrhosis which should be taken for every 6 months in the liver for best results. The best way to detect liver cancer is through various methods and different techniques.

1. **Blood tests:** In liver cancer patients, Alfa-FetoProtein (AFP) is elevated of about 70%.
2. **Imaging studies:** For the detecting the liver cancer CT and MRI scans with contrast are preferred. It used to detect location and blood supply to the cancer. It is difficult to find the lesions less than 1 cm.
3. **Liver biopsy:** The sample tissue is taken from the liver tumor, then it is analyzed by the pathologist to confirm that is suspected diagnosis of liver cancer. The only risk in the biopsy is bleeding, infection or seeding of the needle track with cancer.



Fig 1: LIVER CANCER

## II. STAGES OF LIVER CANCER

Early detection of liver cancer is an important issue. So the stages of liver cancer is important in practical radiology. There are some techniques for staging the liver cancer.

STAGE	DESCRIPTION
<b>TNM system</b>	(T) Tumour-number and size of the primary tumor (N) Node-spread to nearby lymph nodes (M) Metastasis-metastasized to distinct part of the body
<b>Stage I liver cancer</b>	It is not grown into any blood vessels And cancer has not spread to nearby lymph nodes
<b>Stage II liver cancer</b>	It grown into the blood vessels All less than 2 inches (5 cm) in diameter Not spread to nearby lymph nodes
<b>Stage III liver cancer</b>	<b>Stage IIIA</b> : larger than 2 inches <b>Stage IIIB</b> : growing into a branch of the portal vein <b>Stage IIIC</b> : grown into a nearby organ All the above are not spread to nearby lymph nodes
<b>Stage IV liver cancer</b>	<b>Stage IVA</b> : spread to nearby lymph nodes <b>Stage IVB</b> : spread to other parts

Based on the different stages the survival rate of the liver cancer differs. If the liver cancer is detected earlier the patient is treated with proper medical treatment and the survival rate of the patient is high.

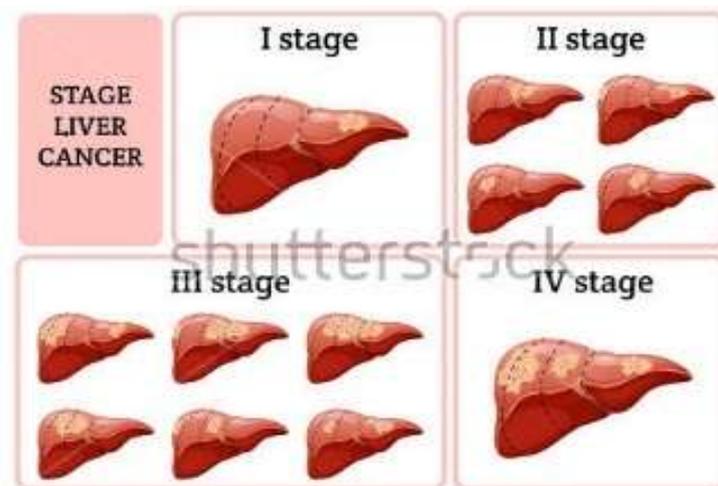


FIG 2: STAGES OF LIVER CANCER

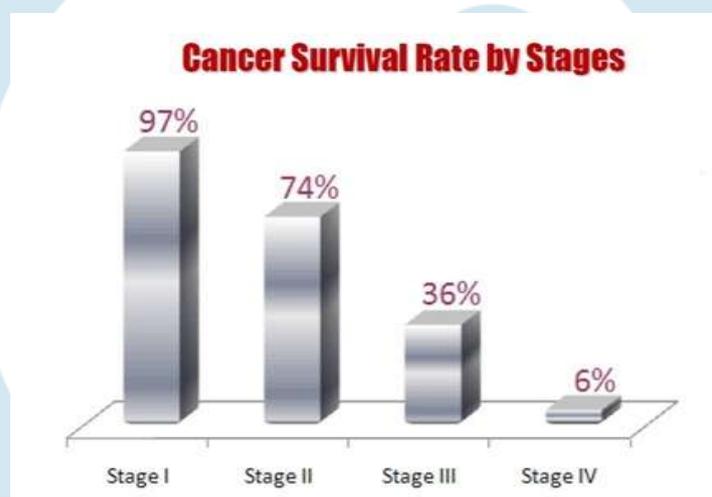


FIG 3: SURVIVAL RATE OF LIVER CANCER

Several researches are going on in detection of liver cancer. In this work CT or MRI image is used for the detection of liver cancer. It is very difficult to do detect especially manual detection. Manual detection causes so many errors, so we go for automatic detection process. Various techniques used for detection.

### III. LITERATURE SURVEY

Lei Meng, et al. [1] proposed a kernel based support vector machine (SVM) algorithm and apply histogram-based feature extraction method. The model is tested and it achieves an accuracy of 86.67%. Priyanka Kumar, et al. [2] used a Neuro-Fuzzy (NF) systems to detect the liver cancer. Detection of the tumor using both CT and MRI images and they results for few datasets.

Wen Li, et al. [3] proposed a deep Convolutional Neural Networks (CNNs) using CT images. Compared to other machine learning methods CNNs performed better. In [4] proposed the K-means clustering and Probabilistic Neural Networks (PNN) to detect the liver tumor using CT images. By using this PNN method, it is easy to detect the affected area in the liver.

In [5], proposed the Back-Propagation Neural Network (BPNN). In this BPNN is compared with the SVM method, the accuracy of BPNN is 73.23% and the SVM gives 63.11%. The result shows that BPNN is better than SVM. In [6], proposes an approach by region-growing and SVM Classifier. It uses the CT images and SVM classifier classifies the liver tumor. The proposed algorithm reduces the computation time. Therefore the tumor segmentation average accuracy rate of 99.17 %.

In [7], they used the Kernel Fuzzy C-means (KFCM). It uses the kernel function on fuzzy c-means clustering (FCM), they calculated PSNR and MSE for FCM and KFCM method. After comparing both methods, KFCM method is more efficient.

In [8], proposed the multiple ROI technique. Compare the multiple ROI with the single ROI. The classification accuracy is over 98% in this proposed method. In [9], proposed the Statistical parameter-based segmentation method. The analysis as a radiomic

signature, it will be used to capture tumor. The efficiency is better compared with region growing and intensity-based thresholding methods.

In [10], proposes the Convolution Neural Networks (CNNs) to segment the liver and the detection of liver using deep learning method. In [11], proposed the Cascaded Fully Convolution Neural Networks (CFCNs) for segmenting the liver. It achieves 94% dice scores.

In [12], proposed the 2D convolutional deep neural network for liver tumor segmentation with a shape-based post processing. It detects 77% compared with human experts. In [13], used the Penguin Search Optimization Algorithm (PeSOA) and Probabilistic Neural Network (PNN) for classification of liver cancer. It achieves 98.92% accuracy.

#### IV. CONCLUSION

This paper describes various algorithms and methodologies for the liver cancer detection. The liver tumor detection is challenging task. Based on the accuracy and efficiency the diagnosis of liver tumor is detected earlier. According to the experts, the detection result is better than accuracy of naked eye for the early detection of the liver cancer. MATLAB software tool is used for the processing and various neural networks used for the classification of tumor.

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