International Journal for Modern Trends in Science and Technology
Volume 9, Issue 10, pages 08-18.
ISSN: 2455-3778 online
Available online at: http://www.ijmtst.com/vol9issue10.html
DOI: https://doi.org/10.46501/IJMTST0910002

Liver Tumor Prediction using Novel Intelligent Methodologies – A Comparative Analysis

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To Cite this Article
G. Saravanan and Dr. P. Geetha. Liver Tumor Prediction using Novel Intelligent Methodologies – A Comparative Analysis, International Journal for Modern Trends in Science and Technology, 2023, 9(10), pages. 08-18.https://doi.org/10.46501/IJMTST0910002

Article Info
Received: 12 September 2023; Accepted: 02 October 2023; Published: 06 October 2023.

ABSTRACT

Liver cancer is one of the maximumcommonaberrant tumors and the second leading cause of cancer-related mortality. Primary (i.e., originating from the liver) and subsequent (i.e., spread to the liver) tumors frequently form in the liver. Accurate segmentation and early liver tumors prediction remain difficult tasks due to its complicated backdrop, diverse, and diffusive structure. Therefore, in this paper there are several of intelligent techniques has been applied for prediction to find the suitableoutcomes of a liver tumor.Many strategies are used to assess the variability of liver tumor prediction; these are described in more detailed in this paper. Many methods have been used to estimate the liver tumorand in this paper the users making the general analysis and also the comparative analysis are carried out in the conventional and intelligent techniques.

Key Words:Deformable Encoder-Decoder Network (DefED-Net), Hepatocellular Carcinoma (HCC),Natural Language Processing (NLP), Intelligent Methodologies.

ABBREVIATIONS

MC	-	Moving Cube Algorithm
HIFU	-	High-Intensity Focused Ultra- Sound
HCC	-	Hepatocellular Carcinoma
CRLM	-	Colorectal Liver Metastases
SBRT	-	Stereotactic Body Radiation Therapy
PHLF	-	Posthepatectomy Liver failure
OPTGCE	-	Optimized Guided Contrast Enhancement
TILS	-	Tumor-Infiltrating Lymphocytes
MWA	-	Microwave ablation

1. INTRODUCTION

A tumor is an irregular accumulation of cells in the body, sometimes referred to as a neoplasia. Cells not dying as expected or dividing more quickly than usual are the causes of it. There are two types of tumors: malignant and benign. The immunological microenvironment of tumors may influence how well a therapy works.Cold-type cancers exhibited different DSS than inflamed and excluded type tumors once the tumor were alienated into three T cell-based categories. [1].The

use of microarray technology to characterize cancers at the gene appearance level has meaningfully altered clinical oncology. The effectiveness of particular cancer therapies has also been studied using the microarray technique. One would anticipate that the use of array technologies, which rely on hundreds of bits of data, might be adept at classifying tumor subtypes. Also, these models have shown the biological traits of the tumors that affect their performance. [2].

The hepatic artery and portal vein provide our liver's blood supply, making it a highly perfused organ. In addition to secreting bile, this organ also stores glycogen and distributes blood nutrients to the gastrointestinal system. The goal of the current work is to use the suggested anechoic chambers coupling model to estimate the temperature of the liver tumor during an HIFU thermal ablation. The occurrence finite-amplitude wave propagation is modelled using the linear Westervelt equation.

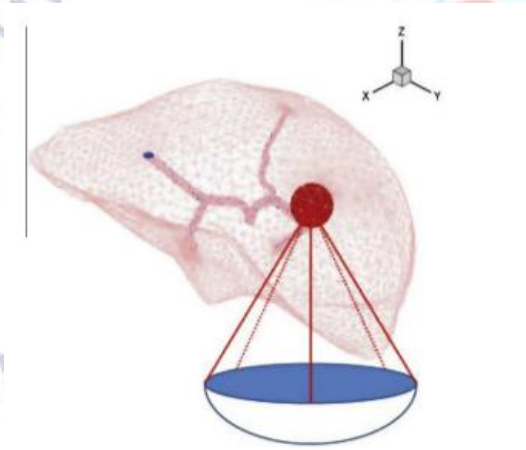

Figure 1: Diagram of the model, which contains the liver, solid tumor, and artery.

Anon-natural solid tumor with a radius of 0.01 m and the hepatic artery from a patient are both included in the 3-dimensional liver model. Figure 1 depicts the single component, spherically focused HIFU transducer that was employed in this investigation. It has a diameter of 10 cm and a radius of curvature of 10 cm. [3].

The instant most common cancer-related cause of death is liver cancer, and HCC is the sixteenth greatest cause of death globally. HCC is a complicated condition with a poor prognosis. In order to enhance HCC patient survival, a transdisciplinary approach to individualized clinical decision making is necessary. Single nucleotide polymorphism and microsatellites from cirrhotic livers have been connected to the development of HCC. Because at-risk patients may easily be recognized due to the reality of fundamental viral hepatitis or other liver diseases, HCC is an appealing target for preventative intervention. [4]This syndrome also affects people with liver cancers like HCC. The most common liver tumor globally and the third-leading cause of cancer-related mortality is HCC. Most cases of HCC are found in people with fundamental liver disease. Chronic liver disease patients have persistent fibrosis, hepatic tenderness, and abnormal hepatocyte regrowth.

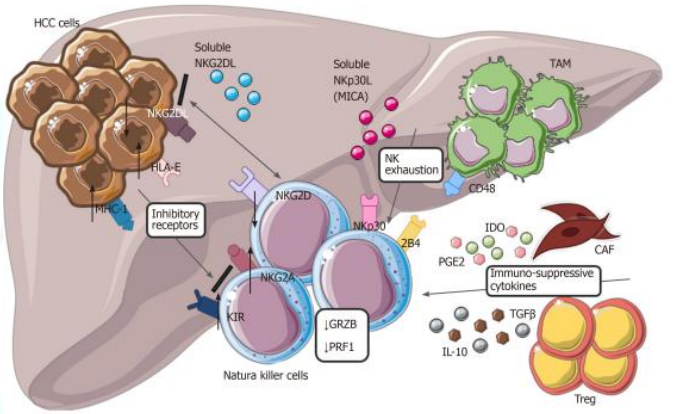

Figure 2: Variation of natural killer cells cytotoxic movement in hepatocellular carcinoma.

Figure 3 demonstrates that tumor cells with tumor-associated macrophages and other cells in the tumor cells are involved in the normal killer cell malfunction, which lowers their potential to recognize and eliminate malignant cells. [5]. yet, prognostic prediction is poor when just tumor variables are taken into account since the underlying liver's health has a significant impact on heaptocarcinogenesis. Cirrhosis and chronic active hepatitis are well-known clinical underlying hepatic variables that increase the potential for HCC. Yet, it is uncertain what role background hepatic variables of the genetic or epigenetic nature play in the development of HCC. HCC. Review the background liver variables and tumor factors that have already been found from a molecular biology perspective in the current investigation, and also present our combined array analysis [6].

There are several different primary and secondary tumor's that can be malignant liver tumors. Modern medicines have dramatically increased survival rates while using a range of neoadjuvant and adjuvant methods, even if surgery is still the primary curative treatment. Many advances have been beneficial for the management of liver tumor. For the majority of liver

cancer types, surgical excision combining resection and transplant continues to be the only effective therapy [7]. A prospective curative vs palliative strategy must be decided upon first before the therapy paradigm for individuals with CRLM can be determined. The primary emphasis of the current curative-intent treatment plan for some individuals is liver resection. Several representations have been advanced to make forecasts before to liver resection, but our model is more focused on predicting survival after resection since it incorporates histological growth patterns and CRLM resection margins, which are not known pre - operatively [8].

The most communal liver tumor in children is Hepatoblastoma, which is a rare tumor with a frequency of about one case per million kids every year. Pediatric HCC has a poorer prognosis than HB and is substantially less prevalent. Hepatocellular dangerous neoplasms, also known as transitional liver cell tumors, are liver tumors that can grow on healthy liver tissue and have HB and HCC histological characteristics. These tumors are commonly found in older children and early teenagers. [9]. In the end, a greater percentage of patients with main and subordinate liver cancers can be provided with a local curative treatment option thanks to the application of these sophisticated equipment and cutting-edge approaches. The existing stereotactic methods for thermal ablation are described in this article, along with a summary of the clinical data that support them. [10].

A SBRT's quick acceptance for the conduct of liver malignancies is a result of its development and effectiveness in the treatment of lung cancer. Small liver tumors can respond quite well to SBRT. a complete approach to ablative SBRT dosages for patients with large liver tumors that combines traditional, contemporary, and cutting-edge radiation principles. The authors explore these ideas in relation to massive, incurable liver tumors and go into how this method might significantly increase patients' life times when they would otherwise have very bad prognoses and few therapeutic alternatives. [11] Liver resection is being done more often for both benign and cancerous diseases. While preoperative diagnosis, surgical technique, and postoperative care have improved, PHLF remains a major factor in morbidity and death after liver resection.

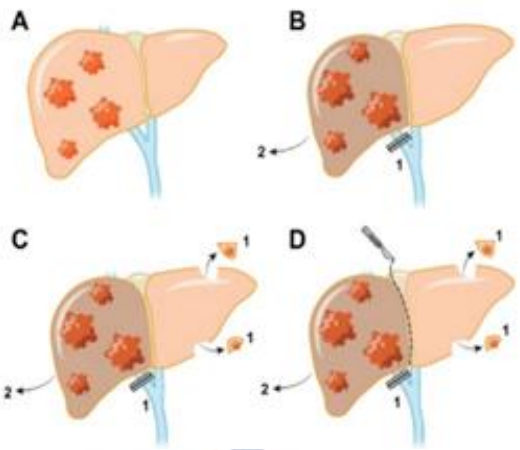

Figure 3: Regarding pre- or post-operative interventions and their impact on the amount of the liver that remains after surgery.

(A) Hepatocellular carcinoma. The next steps are shown in Figure 3: (B) Embolization or crosslinking of the right portal branch; (C) Exclusion of background tissue from the right gateway branch and tumors from the left hemi-liver; and (D) Elimination of tumors from the left hemi-liver, in situ dissociation of the medial, and simultaneous complexion of the right portal vein split [12].

The initial recommendations for the frequency band, matching medium choice, and transceivers for the creation of a heat imaging equipment for observing the changes in treated tissue and monitoring thermal ablation therapies of liver cancers. Measurements made on a post-ablation ex vivo ovine liver provided the thermally ablated liver's dielectric characteristics [13]. Nevertheless, more work has to be done in the clinic to implement augmented reality technology in liver hurtful surgery, whether it be laparoscopic operation or surgical intervention. Tracking hepatic deformation throughout surgery using identification-based methods. During laparotomy, a tracking opinion is physically placed to the surface of the liver, and throughout the ensuing operation, an infrared camera tracks it in real time [14]. Primary and metastatic liver cancer are both successfully treated using image-guided tumor elimination. Lastly, utilizing the number of fatalities, the severity of the problems, and the characterization of the percutaneous ablative method employed, and the liver tumor diagnosis, the data type for primary outcome was retrieved [15].

2. LIVER TUMOR PREDICTION IN CONVENTIONAL TECHNIQUES

Many strategies are used to assess the variability of liver tumors prediction; these are described in more detail below. There are several methods that have been used to forecast liver tumors, such as the SBRT method, the MWA method, and the OPTGCE method.

2.1 SBRT Technique

The area of the presenteducation was to use MRI to examine the threshold dosage for localized liver injury following SBRT in cirrhotic and normal livers. The usage of radiotherapy as a healing rather than soothing treatment for different cancers has expanded significantly as a result of SBRT, which has lately gained growing interest as a therapeutic modality. High tumor reaction and specific control rates have been shown in several trials utilizing SBRT for liver cancers. Current radio therapeutic methods, such as SBRT, can deliver larger radiation levels while sparing OARs as compared to older methodologies. Sometimes, split regimens are used as an alternate to SBRT. For patients with liver tumors who are medically unable to undergo surgery, SBRT is a well-recognized therapy option that can offer effective in-field local autonomy. Yet, in individuals with HCC and liver metastases, out-field intrahepatic recurrence is the primary reason for therapeutic failure. This method is not appropriate in all circumstances since it is only effective for tiny, well-defined tumors that may be detected on imaging tests like CT or MR scans [16].

2.2 MWA Technique

The use of electromagnetic wave heating inside the target cell at microwave frequencies is a potential therapy choice for individuals with liver cancer. MWA has larger ablation capacities in a short processing time and is fewervulnerable to the heat-sink effect than other approaches. For the strategy of modern MWA schemes that incorporate actionchecking capabilities, knowledge of the dielectric characteristics of the battered tissues is crucial. Polarization processes determine how biological tissue exhibits its dielectric characteristics. The dipolar orientation of hydrogen atoms is the main polarization process in the occurrencevariety from 0.5 GHz to 26.5 GHz. Relative permittivity takes on a complicated form as a result of the loss processes in tissue.

$$\varepsilon_r^* = \varepsilon_r^{'} - j\varepsilon_r^n \quad (1)$$

$$\Delta = \left\| \frac{\varepsilon^*_{Tumor} - \varepsilon^*_{Normal}}{\varepsilon^*_{Normal}} \right\| \quad (2)$$

The actual and unreal sections of the acquired permeability data are taken into consideration for the examination of the dielectric change between the malevolent and standardmaterial regions for every tolerant. As a result, users say that the dielectric contrast 1 is calculated in equation 2. Abdominal discomfort, liver infection, fever, and abnormal liver tests are potential adverse effects of ablation treatment. Despite being rare, serious problems are still a possibility [17].

2.3 OPTGCE Technique

In order to do image-guided surgery, it is essential to segment the tumor in computed tomography images. In a two-step procedure, the proposed OPTGCE system uses structural information from the input picture as well as contextual from the guiding image. The low-contrast CT picture is subjected to HS-based CE founded on the second dispersion of an appearance from a complementary modality, namely MRI. The purpose of the OPTGCE is to aid tumor segmentation by emphasizing the presence of certain features in the picture and conveying as much structural information as possible. Yet, OPTGCE effectively keeps the consistency of tumor shape in the augmented picture while also producing sharp tumor edges [18].

2.4Hepatobiliary Anatomy safe Technique

The liver, which is the biggest organ in the abdomen, is crucial for maintaining homeostasis because it regulates metabolism, stores glycogen, detoxifies drugs, produces a variety of serum proteins, and secretes bile. In this paper the in elevationdisease and deathcharges that have been linked to hepatobiliary processes have significantly decreased as a result of improvements in informationconcerning hepatobiliary structure and harmlessmethods for major liver surgical resection. However, physicians who have been faced with continual or massive outflow from the liver seem to be more probable to have afflicted it as a base of malicioustempers. Additionally, fewer patients now have needless laparotomies without liver resection due to the detection of unanticipated extra hepatic dissemination of malignant illness as a result of more thorough and precise anatomic imaging of extra medullary locations. The hepatobiliary system is vital for ingestion and frequentlycontains the liver and biliary tract.

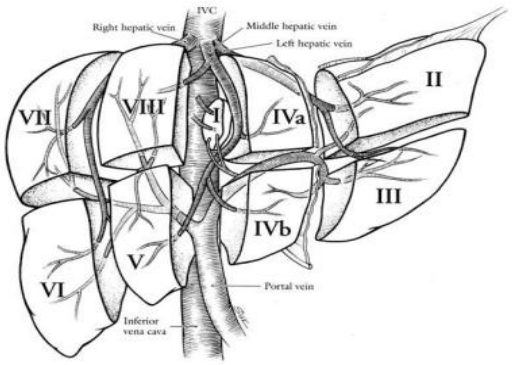

Figure 4: Created on Couinaud's classification of the gateway vein blood supply and hepatic venous outflow, the liver is divided into 8 divisions.

The discovery of the eight hepatic sections (numbered I–VIII) was a crucial milestone in the growth of harmless, anatomic hepatic resections. Couinaud's characterization of the segmentation liver architecture was founded on entrance vein input and hepatic vein outflow in Figure 4.Hepatocellular disease refers to any ailment that impairs the hepatobiliary state's capacity to function normally. From a simple taint or marks to life-threatening illnesses like cancer, the disease may affect everyone. The liver, gallbladder, and bile ducts are the hepatocellular state's organs [19]

2.5 HCC Techniques

Hepatocellular carcinoma and cholangiocarcinoma are now treated with liver surgery as the precious metal due to notable advancements in surgical methods and related specialties. Patients with HCC typically have cirrhosis, steatosis, or portal hypertension as their primary liver disease, but impulsive HCC in a healthy liver is unusual (10%). As patients with fibrosis or cirrhosis run the risk of developing complications after having their livers removed, many staging systems include these variables to help patients receive the best possible care. The characteristics of impulsive HCC without fundamental liver ailment differ from those of cirrhotic individuals. These tumors often manifest in a late stage, have a big size, and frequently metastasize to the lungs throughout the course of adopt. HCC monitoring may have unfavorable effects on one's health, relationships, finances, and chance of diagnostic errors [20].

2.6 Immunotherapeutic Technique

The distinctive anatomical characteristics of the liver enable highly targeted immunotherapeutic delivery strategies that may increase anticancer effectiveness while reducing off-target harm to healthy organs. This paper provides an impression of the immunobiology of the intrahepatic region and explains how it may be used to identify challenges in immunotherapy for liver cancers and provide potential solutions. The liver's suppressor cells obstruct the creation of efficient anticancer immunotherapy techniques. For the creation of new immunotherapeutic strategies for liver cancers, a greater comprehension of hepatic immune cell biology will be necessary. An accurate intrahepatic delivery method, a tumor-killing approach, and medicines that can reverse the suppressive role of liver immune cells are all necessary for immunotherapy for liver cancers to be successful.

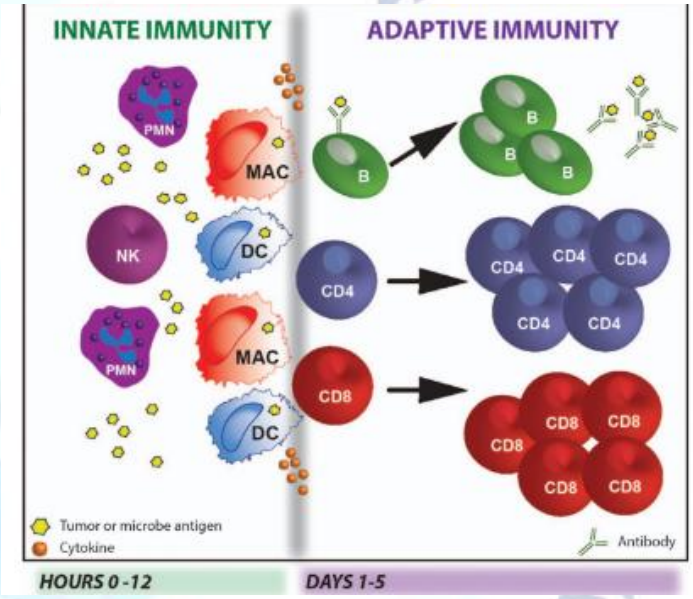

Figure 5: Innate and adaptive immunity.

TILs in resected tissues and their prognostic significance have been thoroughly examined in relation to liver cancers, both primary and metastatic tissue. Innate and adaptive immunity, the two primary immune response components, collaborate to achieve this goal Figure 5. Immune cells may unintentionally target healthy tissue, despite the fact that immunotherapy is intended to aid your immune system's attack on cancer cells. This is referred to be an unfavorable immune-related consequence [21].

3. LIVER TUMOR PREDICTION IN INTELLIGENT TECHNIQUES

Many strategies are used to assess the variation of liver tumor prediction; these are described in more detail below. Several methods, such as NLP, m-UNet, and more detection methods, have been employed to predict liver tumours.

3.1 NLP Technique

In this paper, integrate efficient Natural Language Processing with comprehensible machine learning to provide a two-stage report structure technique. First, NLP is used to obtain the feature keywords, which are also referred to as patterns in this research. The factor phrases may be utilized for model optimization, while the feature dimensions obtained by NLP can be used as the feature measurements for learning. In addition, several difficulties are concealed in the characteristic keywords. The associated hepatic problems can be bridged if the issues are identified. Tokenizing, break word elimination, stopping, periodincidencecontrol, inverse-document occurrence calculation, and n-gram modelling are some of the components of classical NLP. As well as having benefits (less expensive than hiring human workers, faster customer service response times, and ease of implementation), using NLP has drawbacks (training a model can take some time, and it's not completely dependable).

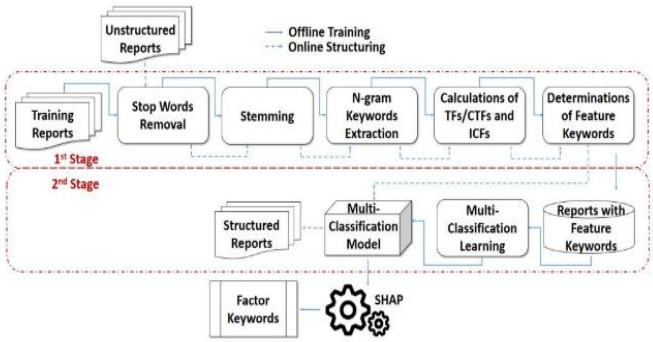

Figure 6: Overview of the given model

The offline learning and online organizing stages of the proposed technique are separated. Moreover, two-stage processes including NLP and ML are carried out at each step. Figure 6 shows the issue keywords and structured reports that will be produced [22].

3.2 mU-Net architecture Technique

This paper propose this method for fully involuntaryliver-tumor division. Theopen dataset for liver tumor division was used to illustrate the effectiveness of the modified U-Net (mU-Net). The U-Net has lately grown in prominence for image investigation jobs and has produced encouraging results. In order to prevent repetition of small resolution feature map data, the suggested network employs a residual path. The modified U-Net prevents repetition of low resolution knowledge of features to citationadvancedequalstructures of high quality texture features for big objects by adaptively incorporating features in the leftover track into structures in the residual connections. The mU- Net can handle edge data better and data about the items' morphology [23].

3.3 Cascade Network Technique

This paper suggest a cascade net built on the liver localization network, the liver segmentation network, and the tumor subdivision network. In several cases, a cascading technique to remove unnecessary information and lessen training difficulties and administrative costs. The hard attention mechanism is the name for this strategy. The findings of divisionnets with confident detection were masked to decrease incorrect positives and independent of a tumor division cascade network. While the hard attention technique can increase segmentation results due to the intricacy of liver tumors, it has not been successfully implemented in this area.

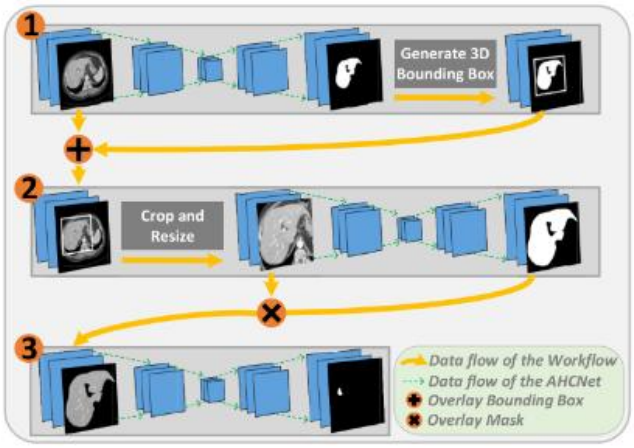

Figure 7: Overview of the upcoming liver and development segmentation workflow.

The initial AHCNet performs liver roughdivision on the total Trans abdominal image and trains liver-specific filters. Users create a cascade division model for contrast-enhanced abdominal CT pictures of the liver and tumors because precise liver segmentation is the foundation of tumor segmentation and lesions, to lessen the number of false positives. Figure 7 depicts the cascaded network's work – flow [24].

3.4 Novel 3D Convolutional Neural Network

In this study, a new 3D CNN that can distinguish between main and advanced liver cancers using dispersion MRI (DWMRI) data is proposed and evaluated. The CNN was developed for skinorganization in medical imaging. The new network comprises of a fully associatedcoat and a Softmax layer

for classifier, and four sequentially strung 3D Convolutional layers with a 3x3x3 kernel size and ReLU as the activation function. The 3D input size was secure at 30 slices in order to adhere to the functional specifications of the 3D CNN enforcing fixed extent for all contribution image-data. The proposed technique may be utilized to resolve a diversity of cancer classification issues in medical imaging to help decision-making and optimize therapy, or it can be used as a starting point for further radio genomics research towards additional, genetic tumor categorization from imaging data. An intriguing idea that will be investigated is assimilating the delivered 3D CNN construction and relatedfeatures with much more instinctive ones, such asconsistency and hand-crafted [25].

3.5 DNA Methylation Technique

A DNA methylation outline of the growth DNA contrasted to that of healthy cells, which shows tissue development and tumor progression, allows for the identification of cancer and the prognosis of its genesis. By characterizing the tumor methylene in migrating tumor DNA, modern technologies are able to provide a number of novel ctDNA methylation indicators, which can contribute more details to medical decision. One of the epigenetic processes that controls expression of genes in organisms is DNA methylation. While tumor types also matter, larger tumors often produce more ctDNA than smaller ones. Those with confined illness, whose blood levels actually rise with the progressing tumor stage, had lower ctDNA levels than individuals with advanced disease. Individuals with different liver illnesses have higher levels of the hepatic part of ctDNA, which is likewise correlated with higher levels of blood liver function. [26].

3.6 DefED-Net Technique

According to this article, the liver and liver tumors can be segmented using a DefED-Net. Flexible convolution can help the system acquire convolution layers with the right site structure information, which can enhance the representations abilities of the DefED-feature Net. Using the LiTS and the 3DIRCADb, two open benchmark datasets, the proposed DefED-Net is assessed. Studies show that DefED-Net outperforms advanced nets in regards to feature capture and eventually boost for the liver tumors.

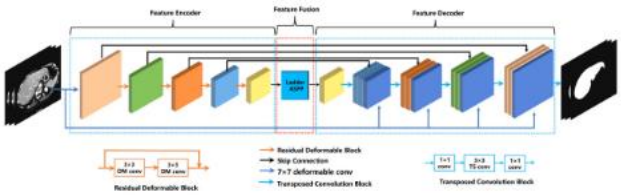

Figure 8: Creation of the proposed DefED-Net.

The DefED-architecture Net's is seen in Figure 8. The DefED-Net, which is an improved U-net and is made up of three shares as coder, a central micro - controller, and a cryptographer. The DefED-Net uses the dc with remnant structure to produce image features as opposed to the U-net. Due to the use of distortion convolution, the DefED-Net is better than ordinary U-Nets at representing transformation matrix. Eventually, without growing the size of the models, the suggested DefED-Net delivers the best liver classification performance [27].

4. COMPARATIVE ANALYSIS OF THE CONVENTIONAL TECHNIQUES IN LIVER TUMOR PREDICTION

A Comparative analysis is carried out amid the different conventional techniques employed for Predict the liver tumor.Table 4 shows the comparative analysis for different liver tumor prediction in conventional techniques

Sl. No	Author/ Year of publication	Methodology	Advantages	Disadvantages
1	Terrence CH Hui*et al* (2021)	Microwave ablation Technique [28].	It offers improved multiple-applicator capability and lower sensitivity to heat sinks or local perfusion, and no need for ground pads.	Some individuals could feel a little bit of pain or discomfort at or close to the treated location.

2	Marco Maccauro *et al* (2018)	Selective internal radiation therapy [29].	Treatment decrease tumors to the point that they can be surgically removed or ablated. It can also prolong life and enhance quality of life.	Abdominal discomfort for many hours following the surgery
3	Riccardo Lencioni *et al* (2020)	Image guided Radiofrequency Technique [30].	It has a better possibility of improving your symptoms and possibly curing them altogether.	At the location of insertion, some persons feel brief numbness, weakness, swelling, or bruising.
4	Gianpiero G Gravante *et al* (2020)	Radiofrequency ablation Technique [31].	Compared to open surgery, it has shorter hospital stay and a quicker recovery.	Infections of the epidermis at the injection site.
5	Federica De Muzio *et al* (2022)	LI-RADS Technique [32].	To standardize the reporting and data collecting for hepatocellular carcinoma on CT and MR imaging.	Liver disease brought on by either arterial conditions or intrinsic hepatic fibrosis are among the methodological limitations.
6	Alexandru Cernicanu et al (2022)	Magnetic resonance Technique [33].	It is positivelychanges soft tissue than CT and is more capable of unique between overweight, aquatic, power, and other soft tissue.	Some people may be afraid to be in a small space due to the loud noises that the magnets produce.
7	Vimoj J Nair *et al*(2019)	Stereotactic Ablative radiotherapy [34].	It is highly accurate and effective.	This method is not appropriate in all circumstances since it is only effective for tiny tumors.

5. COMPARATIVE ANALYSIS OF THE INTELLIGENT TECHNIQUES IN LIVER TUMOR PREDICTION

A Comparative analysis is carried out amid the different intelligent techniques employed for predict the liver tumor. Table 5 shows the comparative analysis for different liver tumor prediction in intelligent techniques

Sl.No	Author/ Year of Publication	Methodology	Advantages	Disadvantages
1	Song-Toan Tran *et al* (2021)	Multiple Layer U-Net Technique [35]	It is more effective for object segmentation and requires less training samples.	There is some risk that the net learning will disrespect the layers where nonconcrete features are signified since knowledge may slow down in the internal layers of deeper models.
2	Yue Zhang *et al* (2020)	Novel level-set Technique [36].	It is easy to follow structures with changeable topology	To design adequate velocities for proceeding the level set purpose, they demand a lot of consideration.

3	Tongle Fan*et al* (2020)	A Multi-Scale ConsiderationSystem Technique [37].	It represents various semantic information of the original photos, and their combination might be beneficial for vision tasks.	Many variables, including as interference, noise, and other problems, limit the amount of resources that may be used.
4	Matthias Ilmer *et al* (2022)	Liver Transplant Oncology Technique [38].	Managing cancer in unique life circumstances.	Oncologists may work really long and erratic hours.
5	Leonie Gebauer *et al* (2021)	Whole liver tumor burden Technique [39].	The WLTP regulations describe consumption and emissions in daily use more accurately,	It was only put to use if liver metastases could be found using the software that is now in use.
6	David Nam *et al* (2020)	Handcrafted image analysis Technique [40].	Every item has its own character that is to be admired, offering authenticity and a guarantee that no two pieces are ever the same.	The assessment dataset utilized has a significant impact on the ability to identify prominent characteristics.

Figure 9 shows the specificity comparison amid different techniques like (HCC) [20], (OPTGCE) [18], (SBRT) [16]. On comparing these given techniques, the HCC technique attains highest accuracy of about 90% and is better compared to other techniques.

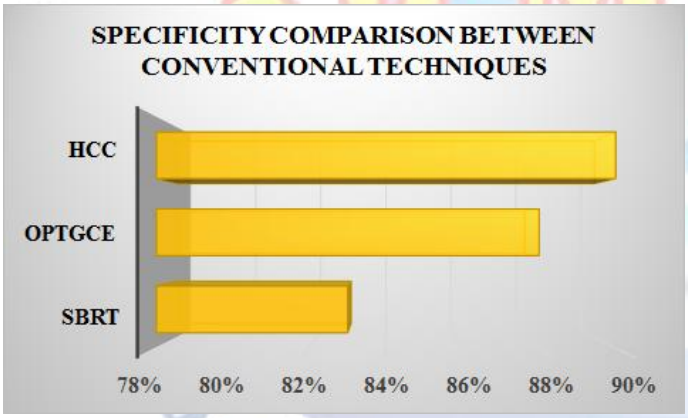

Figure 9: Specificity Comparison in Conventional Techniques

Figure 10 shows the specificity comparison amid different techniques like (NLP) [22], (m-UNET) [23], (Cascade Network) [24]. On comparing these given techniques, the NLP technique attains highest sensitivity of about 83.27% and is better compared to other techniques

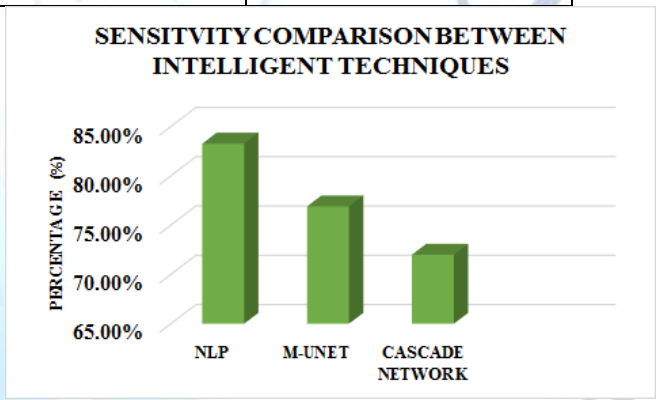

Figure 10: Sensitivity comparison in intelligent techniques

6. CONCLUSION

As one of the major causes of death, liver tumor disease routine is a key issue in medical data gathering. Doctors might be able to better adapt to patient analysis and treatment with the use of novel techniques, which has the potential to increase their knowledge, notably in the prognosis of liver cancer. This study tries to categories the prediction of liver tumor by applying intelligent techniques.Numerous techniques, including NLP, OPTGCE, MWA, SBRT, and others, are compared in order to determine which one provides the best liver tumor prediction, improved spontaneous event identification, measurement, and other advancements that might provide a method to quantify dynamical occurrences in liver tumor prediction.The HCC has a greater specificity prediction accuracy of 90% than other approaches, and the NLP Technique achieves a sensitivity prediction accuracy of 83.27%. It is feasible to

enhance prediction accuracy in the future by utilizing innovative, upgraded intelligent methods.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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