

DETECTION OF LIVER DISEASE BASED ON FULLY CONVOLUTIONAL NEURAL NETWORK AND DEEP LEARNING

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Abstract – Liver disease is one of the most dreadful diseases. It is difficult to identify in the present situation. In our proposed work, the fully convolutional neural network (FCNN) has been initiated for liver disease to recognize and sort out the current issue. Here computed tomography (CT) images taken and distinguish the CT scans as healthy and unhealthy. Our proposed work includes extraction of images as input. By using CNN algorithm, the model will be trained and classify based on the labeled training set. The concept of deep learning shows the decision making of the pre-trained data of neural network through the inner layers of images which leads to predictions.

Key Words: Fully Convolutional Neural Network, Computed Tomography, Convolutional neural network

1.INTRODUCTION

Liver disease is a terrible disease, accountable for the deaths across worldwide [1]. It is an organ to generate metastases and CT (computed tomography) used for detection and diagnosis purpose. CNN basically receive performance on different tasks, such as image classification and recognition etc. [2]. It is a supervised learning model neural network. CNN are memory based and can retrieve by constructing high-level features [3]. CNN has been used for detection in several medical applications including pulmonary nodule, sclerotic metastases etc. In these duties, the CNN has been trained using patches taken out of the relevant region of interest (ROI) [4].

In this proposed work, we used a fully convolutional architecture for liver diagnosis and detection of liver metastases in computed tomography (CT) [1]. Fully convolutional network used for medical purposes like liver and brain diseases [2]. Fully convolutional network takes input of random size and produce output as well efficient manner. The loss function using convolutional architecture is to calculate image segmentation. The overall images separate patches and increase the image resolution. The output of this method is used for detection [3]. Since dataset is small, we use data augmentation by applying scale transformations to the available training images [4]. The difference in thickness is large in our data and provides fade appearance [5]. The scale transformations allow the network to learn change local texture properties [6]. In our preferred model we are using a fully convolutional neural network for liver diagnosis and detection of liver diseases in CT by using a small training dataset and compare with CNN [7].

Multiple cascaded networks have been introduced for better performance designed a network for liver disease segmentation that can be efficiently use object-edge information to cope with the boundary loss in the pooling operation. A modulation scheme of the loss function has been studied to handle class imbalance problems [1]. The increasing number shows widespread use of DL algorithm in the field of medical images [1]. While promising, the performance of DL-based methods is often hindered by insufficient training data or imperfect network architecture design [3]. This situation is provoked for medical image analysis, as the training dataset is much more limited than that for natural image applications.

2. LITERATURE REVIEW

Title 1: LIVER CANCER DETECTION USING HYBRIDIZED FULLY CONVOLUTIONAL NEURAL NETWORK BASED ON DEEP LEARNING FRAMEWORK

Authors: XIN DONG, YIZHAO ZHOU, LANTIAN WANG, JINGFENG PENG, YANBO LOU, AND YIQUN FAN

Description: Liver disease is terrifying across worldwide and hard to identify the present scenario. In our work, we are using hybridized fully convolutional neural network to identify the current issue.

Title 2: DEEP LEARNING INITIALIZED AND GRADIENT ENHANCED LEVEL-SET BASED SEGMENTATION FOR LIVER TUMOR FROM CTIMAGES

Authors: YUE ZHANG, (GRADUATE STUDENT MEMBER, IEEE), BENXIANG JIANG, JIONG WU, DONGCEN JI, YILONG LIU, YIFAN CHEN, (SENIOR MEMBER, IEEE), EDX. WU, (FELLOW, IEEE), AND XIAOYING TANG, (MEMBER, IEEE)

Description: In this paper, we initiate a novel level-set method integrating used for CT based liver disease. The CT image intensity values are shortened to lie in a fixed range to increase the image contrast nearby the liver, during preprocessing.

Title 3: KERNEL SPARSE REPRESENTATION-BASED CLASSIFIER

Authors: LI ZHANG, MEMBER, IEEE, WEI-DA ZHOU, MEMBER, IEEE, PEI-CHANN CHANG, JING LIU, MEMBER, IEEE, ZHE YAN, TING WANG, AND FAN-ZHANG LI

Description: In this paper, kernel sparse representation-based classifier (KSRC), a technique is involved in predictive scrutinize. We totally map these data into a high-dimensional kernel feature space by

using some nonlinear mapping associated with a kernel basis, since the data in an input space separable.

Title 4: IMAGE COMPRESSION USING SPARSE REPRESENTATIONS AND THE ITERATION-TUNED AND ALIGNED DICTIONARY

Authors: JOAQUIN ZEPEDA, CHRISTINE GUILLEMOT, AND EWA KIJAK

Description: A new image coder uses the Iteration Tuned and Aligned Dictionary as a change to image blocks taken over a well-structured grid. The superior sparsity can be well utilized for compacting CT images be in specific classes of images.

Title 5: LEUKOCYTE SEGMENTATION AND COUNTING BASED ON MICROSCOPIC BLOOD IMAGES USING HSV SATURATION COMPONENT WITH BLOB ANALYSIS

Authors: VONN VINCENT QUIÑONES, MERL JAMES MACAWILE, ALEJANDRO BALLADO JR., JENNIFER DELA CRUZ, MEO VINCENT CAYA

Description: The calculation of accurate count of leukocytes called as WBC (white blood cells) used for evaluating and diagnosis. Mainly, there are two methods to find leukocyte count. The first one is use of hematology analyzer and the other is done by manually. In this work, they used HSV (Hue, Saturation, Value) to produce faster as well as specific results.

3. PROPOSED METHODOLOGY

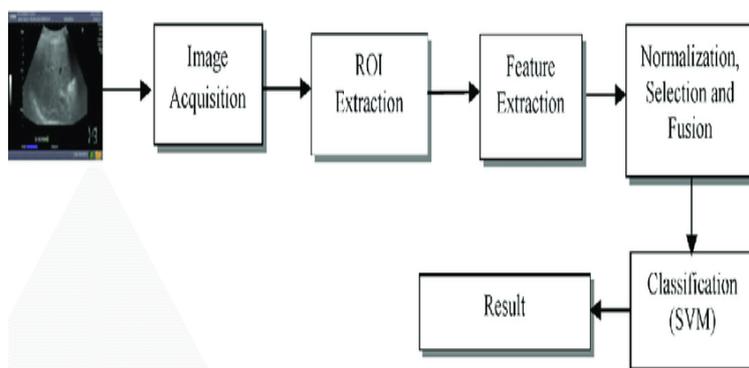


Fig 1: Block Diagram of the proposed work

In this proposed work, the Fully Convolutional Neural Network has been proposed for liver disease. It involves a training phase and a testing process. The gathered CT data has been enhanced through few methods known as data augmentation, during the training phase.

The input data is passed into to get a qualified Framework. Classification identifies the features of image. The feature extraction process has the testing of various layers of CNNs tried to find a better feature extraction. In the training phase, achieved a better model structure and results of CT images during the tested stage.

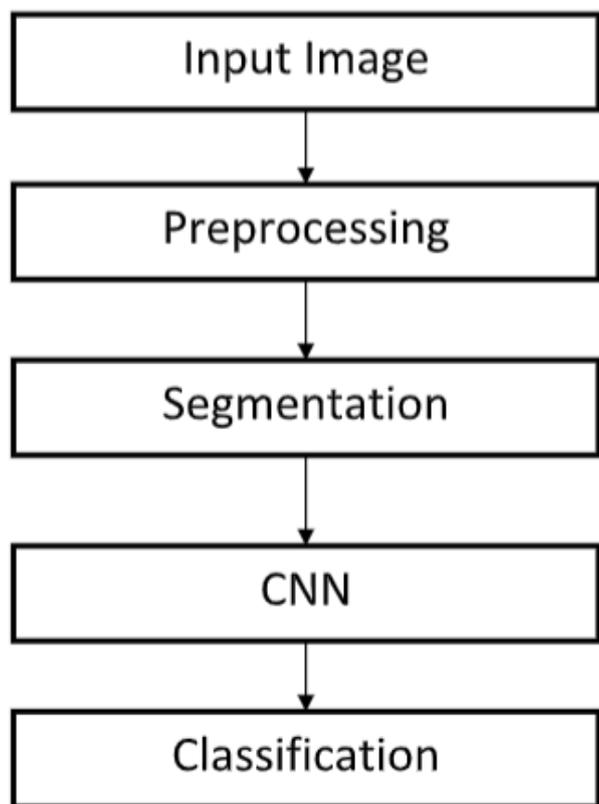


Fig 2: Flowchart for the present work

Here, we are giving the collected dataset as input from the system. The aim of pre-processing is a development of the image data that suppresses or strengthen few image features. Dividing a digital image into multiple subgroups called Image segmentation which assist in minimizing the difficulty of the image to make further processing. The concept of Neural Network is Known to the reader. When it comes to Machine Learning, Artificial Neural Network perform really well. Classification methods aim at recognize the category of a new monitoring among a set of categories on the basis of a labeled training set. Depending on the task, anatomical structure, tissue

preparation, and features the classification accuracy varies.

4. SIMULATION:

In the proposed work, we are using MATLAB (Matrix laboratory) for implementing the process. There are two datasets one is training dataset and testing dataset. Based on the accuracy and loss the output factor will be determined. MATLAB is a program that was originally designed to simplify the implementation of numerical linear algebra routines.

5. RESULT AND FUTURE ENHANCEMENT:

These procedures have released the variations in the texture patterns of healthy liver and unhealthy liver. These techniques are simpler to carry out and easy to operate. In future, the proposed system can be built more detailed and also new enhancement algorithms can be added so as to give the better result.

5. REFERENCES:

[1] E. Vorontsov, M. Cerny, P. Regnier, L. Di Jorio, C. J. Pal, R. Lapointe, et al., "Deep learning for automated segmentation of liver lesions at CT in patients with colorectal cancer liver metastases", *Radiol. Artif. Intell.*, vol. 1, no. 2, Mar. 2019.

[2] P. F. Christ, M. E. A. Elshaer, F. Ettliger, S. Tatavarty, M. Bickel, P. Bilic, et al., "Automatic liver and lesion segmentation in CT using cascaded fully convolutional neural networks and 3D conditional random fields", *Proc. Int. Conf. Med. Image Comput. Comput.-Assist. Intervent.*, pp. 415-423, Oct. 2016.

[3] G. Chlebus, A. Schenk, J. H. Moltz, G. B. van, H. K. Hahn and H. Meine, "Deep learning based automatic liver tumor segmentation in CT with shape-based post-processing", *Proc. 1st Conf. Med. Imag. Deep Learn. (MIDL)*, 2018.

[4] E. Trivizakis, G. C. Manikis, K. Nikiforaki, K. Drevelegas, M. Constantinides, A. Drevelegas, et al., "Extending 2-D convolutional neural networks to 3-D for

advancing deep learning cancer classification with application to MRI liver tumor differentiation", IEEE J. Biomed. Health Informat., vol. 23, no. 3, pp. 923-930, May 2019.

[5] O. Ronneberger, P. Fischer, and T. Brox, "U-Net: Convolutional Networks for Biomedical Image Segmentation," arXiv e-print

[6] S. Pereira, A. Pinto, V. Alves, and C. A. Silva, "Brain tumor segmentation using convolutional neural networks in MRI images," IEEE transactions on medical imaging, vol. 35, no. 5, pp. 1240-1251, 2016.

[7] P. Rajeswari and G. SophiaReena, "Analysis of Liver Disorder Using Data Mining Algorithm", Global Journal Of Computer Science And Technology, Vol 10, Issue November 2010.

[8] Smriti Mukesh Singh, Dr. Dinesh B. Hanchate, "Improving Disease Prediction by Machine", IRJET, Vol 5, Issue6, June 2018, Pp: 1542-1548.