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Predicting Liver Cancer using Deep Learning.4J

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ABSTRACT

Machine Learning(ML) is one of the faster growing and emerging technology in the model world which has numerous applications such as image processing ,predictions in various fields, fraud detection etc.., Machine learning has significant applications in healthcare industry such as medical image analysis, disease diagnosis and prognosis, health monitoring etc.., liver cancer, also called as hepatocellular carcinoma, is one of the serious and life threatening cancer.It is typically diagnosed by imaging tests such as MRI scan,CT scan and blood tests and sometimes biopsy. Machine Learning and its algorithms plays a significant role in diagnosing liver cancer.The proposed research work is to predict the liver cancer and its type using Machine learning algorithms and deep learning 4j package in weka software using our own CNN architecture using AlexNet , VGG-16 , VGG-19 , ResNet-50.The main aim of this research is to provide accurate results and avoid false results.

Keywords: Machine Learning(ML), Deep learning 4j, WEKA, AlexNet, VGG-16, VGG-19, ResNet-50.

1. INTRODUCTION

Deep learning is essentially a neural network with three or more layers. These neural networks attempt to simulate the behaviour of the human brain by matching its ability and allowing it to learn from large amounts of data. It drives many artificial intelligence applications and services that improve automation, performing analytical and physical tasks without human intervention. This technology lies behind everyday products and services as well as emerging technologies.

Deeplearning4j serves machine learning models for inference in production using the free developer edition of SKIL, the Skymind Intelligence Layer. A model server serves parametric machine learning models that make decisions about data. It is used for the inference stage of a machine learning workflow, after data pipelines and model training. A model server is the tool that allows data science research to be deployed in a real world production environment.

Artificial intelligence(AI) is the ability of a digital system or system controlled robot to perform tasks basically associated with intelligent agents. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristics of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience. Deep learning is a subset of machine learning which uses deep neural networks and Machine learning is a subset of Artificial intelligence. Hence Deep learning will also come under the domain of Artificial Intelligence.

2. RELATED WORKS:

[1].Automatic scan range for dose-reduced multiphase CT imaging of the liver utilizing CNNs and Gaussian models

Manh Ha Luu, Theo van Walsum , Hong Son Mai , Daniel Franklin, Thi Thu Thao Nguyen , Thi My Le , Adriaan Moelker , Van Khang Le , Dang Luu Vu , Ngoc Ha Le , Quoc Long Tran , Duc Trinh Chu , Nguyen Linh Trung

The method is based on a CNN model (YOLOv4) for detecting the liver in 2D slices, and LRS for fast liver range detection in a scout volume. Additionally, this method estimate the liver motion range in the scan range generation.The result shows that the automatic scan range generation can significantly reduce the effective radiation dose by an average of 14.5% (2.56 mSv) compared to manual performance by the radiographer from Y-90 transarterial radioembolization, while no statistically significant difference in performance was found with the CT images from intra RFA intervention.

[2].A DenseNet CNN-based liver lesion prediction and classification for future medical diagnosis

N Nanda Prakash ,V Rajesh , Dumisani LicksonNamakhwa,Sandeep Dwarkanath Pandey Sk Hasane Ahammad

This method proposes a deep liver abnormality detection with DenseNet convolutional neural network (CNN) based deep learning technique. This work collected liver Computed Tomography (CT) scan images from Kaggle dataset for training in the initial stage. The pre-processing has been performed with region-growing segmentation, and training is performed through DenseNet CNN. The real-time test images are collected from Government General Hospital Vijayawada (10,000 samples), verified on proposed DenseNet CNN to diagnose whether the input has a liver lesion. Finally, the results obtained and derived confusion matrix summarizes the performance of the proposed methodology with following metrics of accuracy at 98.34%, sensitivity at 99.72%, recall at 97.84%, throughput at 98.43% and detection rate at 93.41%.

[3].Multi-Stage Liver Segmentation in CT Scans Using Gaussian Pseudo Variance Level Set

Lifang Zhou, Lu Wang, Weisheng Li, Bangjun Lei, Jianxun Mi,Weibin Yang

The proposed method can successfully extract the liver from a CT slice including large intensities(a) and shapevariations(b), ambiguous boundaries(c), and long and narrow ravines. the segmentation results of the proposed method are competitive, there are still some cases where the segmentation results are poor. The red curve is the ground truth of the liver, the green arrow points to the area that is most likely to be mis-segmentation.

[4].Liver Cancer Detection Using Hybridized Fully Convolutional Neural Network Based on Deep Learning Framework

Xin Dong,Yizhao Zhou, Lantian Wang, Jingfeng Peng, Yanbo Lou, Yiqun Fan

A Convolutional Neural Network is trained to identify tumors and healthy voxels on all base-line liver maskings.The dataset system has been tested and achieved an average DSC of about 91% as Segmentation Precise and an FP reduction score of almost 92%.

3. METHODS, TOOLS AND DATA:

WEKA:

Weka (Waikato Environment for Knowledge Analysis) is a popular suite of ML algorithms and tools for data mining tasks. It provides a comprehensive set of functionalities for data preprocessing, classification, regression, clustering, association rules mining, and feature selection.

DEEP LEARNING 4j:

DL4j offers a variety of deep learning models such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), long short-term memory (LSTM) networks, and deep belief networks (DBNs). These models excel at tasks such as image recognition, natural language processing, and sequence prediction. You can build and train these models using DL4j's APIs.

CONVOLUTIONAL NEURAL NETWORK:

The key feature of **CNN** is their ability to automatically learn and extract features from images or other grid-like data through a process called convolution. This allows them to capture local patterns and spatial relationships present in the input data.

4. PROPOSED METHOD:

Our proposed system is to train the computer / machine using Deep Learning which is the subset of ML, by using kaggle datasets to diagnose liver cancer and to predict the exact stage of them. The CNN architecture that is going to be constructed will be used for any kind of data sets related to liver cancer . Deep learning 4j is used to construct the CNN architecture which gives the exact stage of the cancer. If provided, Real-time datasets from the hospitals will be used to diagnose, which is more efficient than the kaggle datasets.

5.RESULT BASED ON STUDY:

The results obtained from the study of research paper,"**A DenseNet CNN-based liver lesion prediction and classification for future medical diagnosis",**reveals that the proposed approach outperforms in several evaluation metrics. The values obtained for the several evaluation parameters are 98.34% accuracy, 99.72% sensitivity, 97.84% recall, 98.43% throughput, and 93.41% detection rate.

6.CONCLUSION:

The proposed model focuses on prediction of liver cancer and its stage.The proposed model is designed in the aim of providing more than 95% by using our own CNN architecture. Our future enhancement is to work with the help of real-time data sets where parameters are more efficient for training the model and the result is more accurate in predicting the exact stage of the liver cancer.

Conflict of interest statement

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

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