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BRAIN TUMOR DETECTION USING DEEP LEARNING

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ABSTRACT:

The tremendous success of machine learning algorithms at image recognition tasks in recent years intersects with a time of dramatically increased use of electronic medical records and diagnostic imaging. This review introduces the machine learning algorithms as applied to medical image analysis, focusing on convolutional neural networks, and emphasizing clinical aspects of the field. The advantage of machine learning in an era of medical big data is that significant hierarchal relationships within the data can be discovered algorithmically without laborious hand-crafting of features. We cover key research areas and applications of medical image classification, localization, detection, segmentation, and registration. We conclude by discussing research obstacles, emerging trends, and possible future directions.

Keywords: CNN, tumor, HER, Deep learning.

1. INTRODUCTION

Machine learning algorithms have the potential to be invested deeply in all fields of medicine, from drug discovery to clinical decision making, significantly altering the way medicine is practiced. The success of machine learning algorithms at computer vision tasks in recent years comes at an opportune time

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when medical records are increasingly digitalized. The use of electronic health records (EHR) quadrupled from 11.8% to 39.6% amongst office-based physicians in the US from 2007 to 2012 [1]. Medical images are an integral part of a patient's EHR and are currently analyzed by human radiologists, who are limited by speed, fatigue, and experience. It takes years and great financial cost to train a qualified radiologist, and some health-care systems outsource radiology reporting to lower-cost countries such as India via tele-radiology. A delayed or erroneous diagnosis causes harm to the patient. Therefore, it is ideal for medical image analysis to be carried out by an automated, accurate and efficient machine learning algorithm. Medical image analysis is an active field of research for machine learning, partly because the data is relatively structured and labelled, and it is likely that this will be the area where patients first interact with functioning, practical artificial in- telligence systems. This is significant for two reasons. Firstly, in terms of actual patient metrics, medical image analysis is a litmus test as to whether artificial intelligence systems will actually improve patient outcomes and survival. Secondly, it provides a testbed for human-AI interaction, of how receptive patients will be towards healthaltering choices being made, or assisted by a non-human actor.

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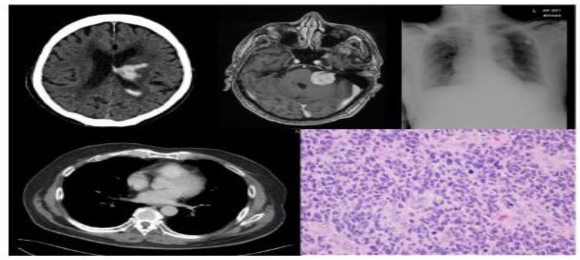
EXISTING SYSTEM:

There is a myriad of imaging modalities, and the frequency of their use is increasing. Smith-Bindman et al. [2] looked at imaging use from 1996 to 2010 across six large integrated healthcare systems in the United States, involving 30.9 million imaging examinations. The authors found that over the study period, CT, MRI and PET usage increased 7.8%, 10% and 57% respectively.



The symbolic AI paradigm of the 1970s led to the development of rule-based, expert systems. One early implementation in medicine was the MYCIN system by Shortliffe [3], which suggested different regimes of antibiotic therapies for patients. Parallel to these developments, AI algorithms moved from heuristics-based techniques to manual, handcrafted feature extraction techniques. and then to supervised learning techniques. Unsupervised machine learning methods

are also being researched, but the majority of the algorithms from 2015-2017 in the published literature have employed supervised learning methods,

PROPOSED SYSTEM:

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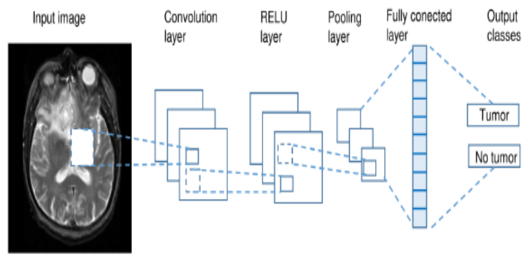

Currently, CNNs are the most researched machine learning algorithms in medical image analysis [4]. The reason for this is that CNNs preserve spatial relationships when filtering input images. As mentioned, spatial relationships are of crucial importance in radiology, for example, in how the edge of a bone joins with muscle, or where normal lung tissue interfaces with cancerous tissue. As shown in Fig. 2., a CNN takes an input image of raw pixels, and transforms it via Convolutional Layers, Rectified Linear Unit (RELU) Layers and Pooling Layers. This feeds into a final Fully Connected Layer which assigns class scores or probabilities, thus classifying the input into the class with the highest probability.

Detection, sometimes known as Computer-Aided Detection (CADe) is a keen area of study as missing a lesion on a scan can have drastic consequences for both the patient and the clinician. The task for the Kaggle Data Science Bowl of 2017 [64] involved the detection of cancerous lung nodules on CT lung scans. Approximately 2000 CT scans were released for the competition and the winner Fangzhou [65] achieved a logarithmic loss score of 0.399. Their solution used a 3-D CNN inspired by U-Net architecture [19] to isolate local patches first for nodule detection. Then this output was fed into a second stage consisting of 2 fully connected layers for classification of cancer probability. Shin et al. [24] evaluated five well-known CNN architectures in detecting thoracoabdominal lymph nodes and Interstitial lung disease on CT scans. Detecting lymph nodes is important as they can be a marker of infection or cancer. They achieved a mediastinal lymph node detection AUC score of 0.95 with a sensitivity of 85% using GoogLeNet, which was state of the art. They also documented the benefits of transfer learning, and the use of deep learning architectures of up to 22 layers, as opposed to fewer layers which was the norm in medical image analysis. Overfeat was a CNN pre-trained on natural images that won the ILSVRC 2013 localization task [66]. Ciompi et al. [67] applied Overfeat to 2-dimensional slices of CT lung scans oriented in the coronal, axial and sagittal planes, to predict
the presence of nodules within and around lung fissures. They combined this approach with

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simple SVM and RF binary classifiers, as well as a Bag of Frequencies [68], a novel 3-dimensional descriptor of their own invention.

Modules

Upload MRI image

Using this module we are uploading MRI train images and then application read all images and convert them grey format.

Using this module we will apply OSTU thresholding technique on each image to extract features.

Generate Train & Test Model

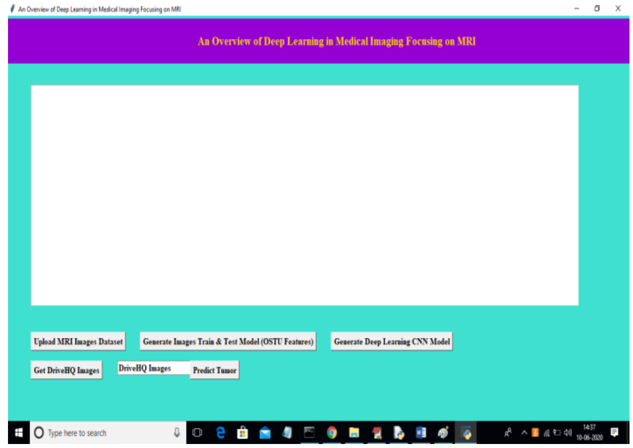
Using this module we will build array of pixels with all images features and then split dataset into train and test model to calculate accuracy using test images by applying train model on it.

Generate Deep Learning CNN Model

Using this module will input train and test data to auto stack CNN model to build training classifier.

Get DriveHQ Images

Using this module we will read test image from DriveHQ website and then application will apply CNN classifier model on that test image to predict whether image contains tumour disease or not.



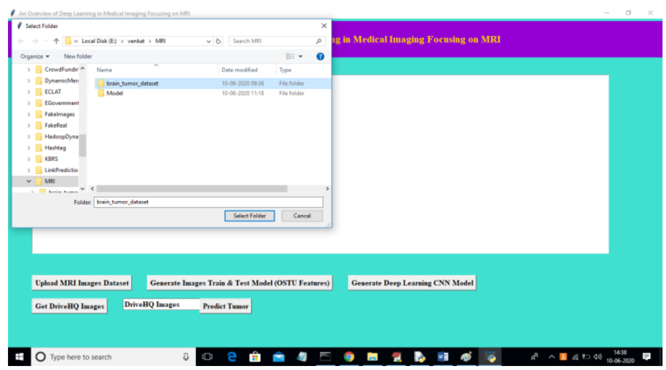


Fig1.2. Upload the dataset.

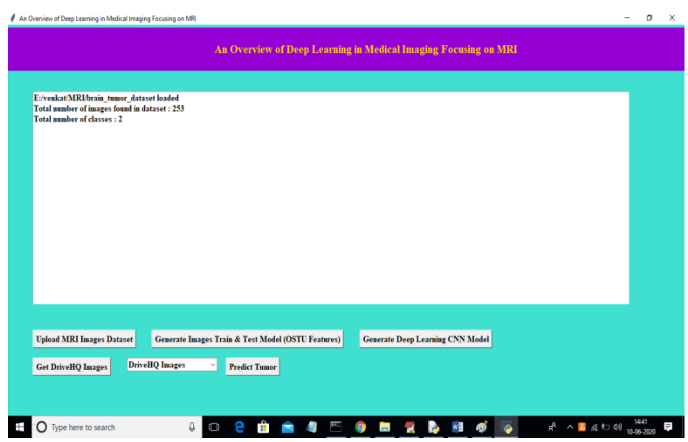


Fig.3. Train model.

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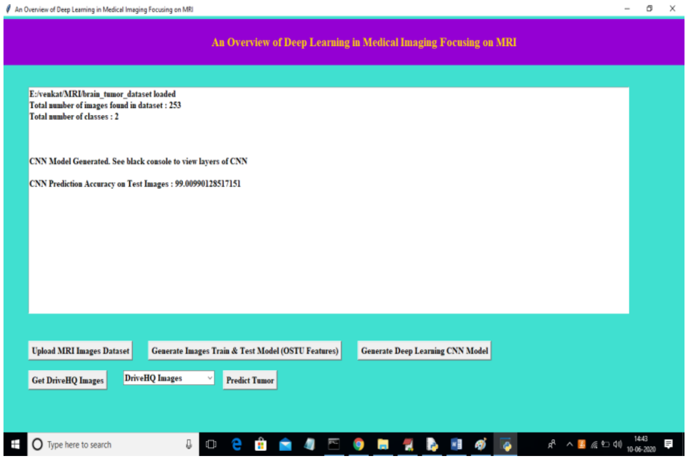

Fig.4. Deep learning algorithm.

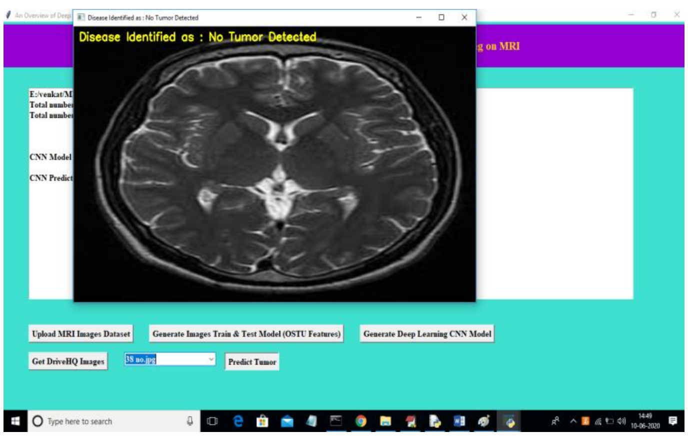

Fig.5. Output results.

CONCLUSION:

Arecurring theme in machine learning is the limit imposed by the lack of labelled datasets, which hampers training and task performance. Conversely, it is acknowledged that more data improves performance, as Sun et al. shows using an internal Google dataset of 300 million images. In general computer vision tasks, attempts have been made to circumvent limited data by using smaller lters on deeper layers , with novel CNN architecture combinations , or hyperparameter optimization

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