**Project Report**

**On**

**Brain Tumour Detection from MRI images**

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**Appendix**

**1. Introduction**

**1.1 Overview**

**Medical images are one of the most important resources used by doctors to diagnose brain tumours. A tool with high accuracy to automate this process can be extremely valuable. However, because of issues related to legal liabilities, such a tool cannot replace the expert opinions of trained physicians. The various types of medical imaging technologies based on non-invasive approaches like; MRI, CT scan, Ultrasound, SPECT, PET and X-ray. In comparison to other medical imaging techniques, Magnetic Resonance Imaging (MRI) is majorly used and provides greater contrast images to cancerous tissues. Therefore, brain tumour identification can be done through MRI images. We present a machine learning approach to detect whether an MRI image of a brain contains a tumour or not. The following article talks about the same.**

**1.2 Purpose**

**With the help of AI and ML one can try to predict the likelihood of redevelopment of cancer, right after the apparent resolution of the disease. The last point, prediction of cancer survivability predicts the outcome after the disease has been diagnosed, such as survivability, life expectancy, progression, tumour-drug sensitivity. This technology can leverage its robust ability to analyse data and predict the outcome accurately while a human expert at moments is likely to make errors. Besides improvement in the machine learning methods, the initial diagnosis of the tumour is removed by many scientists. The neural system performs a pivotal role in the recognition of the abnormal cell forms in the brain, which indeed gives an effective mechanism for developing brain tumour detection using MRI scanned 3 copies. Tumour surgery will be useful only when the abnormal cells are perfectly isolated from the normal cells. Analysis of the abnormal tumour cells and training on CNN (Convolutional Neural Network) with the foundation for the ML (Machine Learning) based tumour detection.**

**2. Literature Survey**

**2.1 Existing problem**

**Tumor is a disease whose curablity is largely dependent on its early detection. The earlier the tumor is detected the appropriate treatment can be opted and the greater the chance of survival. In a similar case, after the treatment this is always a possibility for the tumor to develop again and in either case early detection is an important step to tackle the problem. Doctors need to address many patients and patients are required to schedule appointments with a doctor, sometimes this is not very successful. A faster more accurate alternative to assess the MRI are required to address this kind of problem.**

**2.2 Proposed solution**

**We propose to make a web application for detection of tumors in the brain by analysing MRI scans of patients. The solution is majorly aimed at addressing the issues mentioned in Section 2.1. Making the process more automated and faster. The proposed solution uses CNN algorithm to detect features in MRI scans of the patient. The model is trained with more than 3000 MRI scans of patients both with and without tumors.**

**3. Block Diagram**

**3.2 Hardware/Software Design**

**Design flow:**

1. **Data Collection and preprocessing**
   1. **Collection of MRI scan images in .jpg format. ●**
   2. **Converting images into the same resolution. ●**
   3. **Increasing datasets using ImageDataGenerator**
2. **Model Building ●**
   1. **Adding CNN Layers ●**
   2. **Configuring Learning process**
3. **Model Deployment ●**
   1. **Making webpage using Flask ●**
   2. **Creating Static HTML templates ●**
   3. **Adding necessary CSS**

**Requirements:**

**Software:**

* **Python 3.X**
* **Keras 2.2.4**
* **Tensorflow 1.14.0**
* **Spyder**
* **Jupyter Notebook**

**Hardware:**

* **Laptop/Desktop**

**Experimental Investigation**

**Throughout the development of the project there were a lot of learnings, following were our findings.**

* **Large datasets are required for an application such as this.**
* **Since the MRI scans are a compilation of slices at different levels which makes it harder to make meaningful predictions.**

**5. Flow Chart**

**6. Result:**

**Successfully developed a web application that can detect brain tumors at an early stage. Following are the screenshots of the web application.**

**7. Advantages and Disadvantages**

* **Advantages**
  + **Faster and accurate detection**
  + **Can be used as second opinion**
* **Disadvantages** 
  + **Need big dataset for proper training**
  + **High computational requirement.**
  + **Comparatively slow Training**

**8. Applications**

**The application can be used by either patient or Doctor to get a second opinion. If the train dataset is adequate enough and the accuracy of the model is improved then this application can be used as the main determinant for presence of tumor, as this is already done in research and few hospitals. ML in detecting tumors is very promising and already a lot of research is underway.**

9. Conclusions

Convolutional neural networks (CNNs) have accomplished astonishing achievements across a variety of domains, including medical research, and an increasing interest has emerged in radiology. Although deep learning has become a dominant method in a variety of complex tasks such as image classification and object detection, it is not a panacea. Being familiar with key concepts and advantages of CNN as well as limitations of deep learning is essential in order to leverage it in radiology research with the goal of improving radiologist performance and, eventually, patient care.

10. Future scope

* Test out other algorithms for better accuracy.
* Increase more datasets.
* Building a dedicated phone app since a web application might not be as accessible/friendly. In an aim to provide self assessment.

11. Bibliography

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3. Mahmoud Al-Ayyoub, Ghaith Husari, Ahmad Alabed-alaziz, Omar Darwish (2015) Machine learning approach for brain tumor detection.