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MULTI-CLASSIFICATION OF BRAIN TUMOR IMAGES USING DEEP NEURAL NETWORK

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Abstract: One of the leading causes of cancer-related deaths globally is brain tumors. The categorization of brain tumors is a challenging scientific problem. Brain tumors come in a wide range of sizes, shapes, and intensities. It's possible for tumors from different pathological classifications to look similar. Brain tumors can be classified and diagnosed using a variety of imaging methods. Fortunately, due to its superior image quality and lack of ionizing radiation, Magnetic Resonance Imaging (MRI) is frequently used. Recent developments in deep learning have made it possible for radiologists to quickly analyse medical images using artificial intelligence (AI) techniques. In order to classify various types of brain tumors, CNN models can assist physicians and radiologists in validating their initial screening.

Keywords: Convolutional neural network , Deep learning ,Grid search, Hyper-parameter optimization, Tumor grading.

I. INTRODUCTION

The managerial hub of the human body is the brain. Through a large number of neurons and connections, it is responsible for the proper operation of all processes. Brain tumors are one of the most fatal diseases, with a very low chance of survival at their worst. As a result, early tumour diagnosis is crucial and depends on the skill and expertise of the clinician. As a result, those who are sick have a chance to continue living and surviving.

It is not a cancerous form that advances and spreads; rather, the benign tumour starts inside the brain and grows out gradually. Such a tumour is thought to be less aggressive as it won't spread throughout a person's body. Cancerous tumors that are growing are called malignant tumors. It invades other healthy tissues, quickly splits over unnoticed barriers, and quickly takes control of the entire body.Primary and secondary brain tumour can be divided into two categories.

About 70% of all brain tumour are primary, with secondary tumors making up the other 30%. Similar to how primary tumours are regarded as cancers that first arise in the brain, this group is determined by the tumor's origin. Malignant tumors, on the other hand, start out as primary tumors that arise in other parts of the body before changing into secondary tumors that spread to the brain.

The motivation behind this study is to detect brain tumour and provide better treatment for the sufferings. The abnormal growths of cells in the brain are called tumours and cancer is a term used to represent malignant tumours. Usually CT or MRI scans are used for the detection of cancer regions in the brain. Positron Emission Tomography, Cerebral Arteriogram, Lumbar Puncture, Molecular testing are also used for brain tumour detection. In this study, MRI scan images are taken to analyse the disease condition. Customized learning experiences: Online games can be customized to suit the needs and preferences of individual learners, making them an effective way to meet the diverse learning needs of students.

Density of the tumour can be estimated from the segmented mask and it will help in therapy. Deep learning technique is employed to detect abnormality from MRI images. Multi level thresholding is applied to segment the tumour region. Number of malignant pixels gives the density of the affected region.

A brain tumor is a growth of cells in or near the brain. Brain tumors can develop in brain tissue. Brain tumors can also form near brain tissue. Nearby are the nerves, the pineal gland, the pineal gland and the membranes covering the surface of the brain. Brain tumors can start in the brain. These are called primary brain tumors. Sometimes cancer spreads to the brain from other parts of the body. These tumors are secondary brain tumors, also called metastatic brain tumors.

There are many different types of primary brain tumors. Some brain tumors are not cancer. These are called non-cancerous or benign brain tumors. Non-cancerous brain tumors can grow over time and put pressure on brain tissue. Other brain tumors are brain tumors, also called malignant brain tumors. Brain cancer can grow quickly. Cancer cells can invade and destroy brain tissue. Brain tumors vary in size from very small to very large. Some brain tumors are found when they

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are very small because they cause symptoms that you notice right away. Other brain tumors grow very large before they are detected.

II. RELATED WORK

Some parts of the brain are less active than others. If a brain tumor starts in a less active part of the brain, it may not cause symptoms right away. A brain tumor can grow quite large before the tumor is detected. Brain tumor treatment options depend on the type, size, and location of the brain tumor. Common treatments include surgery and radiation therapy.

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A new transfer deep learning model was proposed by Alanazi et al. (2022) for diagnosis of brain tumor at an early stage using different subtypes such as glioma, pituitary, and meningioma. Convolutional neural network models are created from scratch to evaluate their performance on MRI brain images.

The types of brain tumors are: Gliomas and related brain tumors. Gliomas are growths of cells that look like glial cells. Glial cells surround and support neurons in brain tissue. Types of glioma and related brain tumors include astrocytoma, glioblastoma, oligodendroglioma, and ependymoma. Gliomas can be benign, but most are malignant. Glioblastoma is the most common malignant brain tumor.

There are Choroid plexus tumors. Choroid plexus tumors begin in the cells that make up the fluid surrounding the brain and spinal cord. This fluid is called cerebrospinal fluid. Choroid plexus tumors are located in the fluid cavities of the brain called ventricles. Choroid plexus tumors can be benign or malignant. Choroid plexus carcinoma is a malignant form of this type of brain tumor. It occurs more often in children. Tumors of the embryo. Embryonic tumors originate from cells left over from fetal development. Cells called germ cells remain in the brain after birth.

Embryonal tumors are malignant brain tumors that most often occur in infants and young children. The most common type of embryonal tumor is medulloblastoma. It is usually located in the lower part of the brain called the cerebellum.Germ cell tumors.

Germ cell tumors start in germ cells called gametes, which turn into sperm and eggs. Gametes are mostly located in the ovaries and testes. But sometimes they are in other parts of the body, including the brain. When germ cell tumors form in the brain, they are often located near the pineal gland or pituitary gland. Germ cell tumors are mostly benign. They are more common in children. Tumors of the pineal gland.

Pineal tumors begin in and around the pineal gland in the brain. The pineal gland is located in the center of the brain. It produces a hormone called melatonin, which helps you sleep. Pineal tumors can be benign or malignant. Pineoblastoma is a malignant tumor of the pineal gland that most often occurs in children.

Meningiomas are brain tumors that begin in the membranes surrounding the brain and spinal cord. Meningiomas are usually benign, but sometimes they can be malignant. Meningiomas are the most common benign brain tumor.

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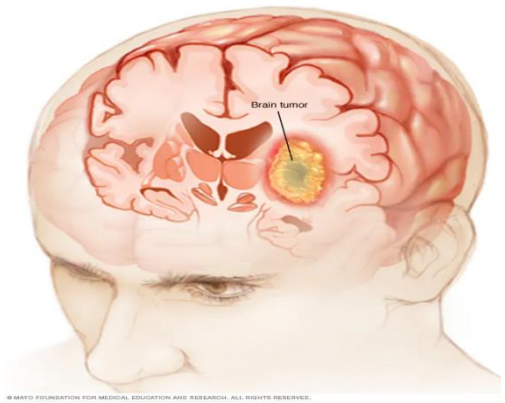
Nerve tumors are tumors that occur in and around nerves. The most common type of head is an acoustic neuroma, also called a schwannoma. This benign tumor is located in the cranial nerve that connects the inner ear to the brain.

Brain tumors can start in and around the pituitary gland. This small gland is located near the base of the brain. Most tumors that occur in and around the pituitary gland are benign. Pituitary tumors occur in the pituitary gland itself. A craniopharyngioma is a type of brain tumor that occurs near the pituitary gland.

Other brain tumors. Many other rare tumors can occur in and around the brain. Tumors can start in the muscles, blood vessels and connective tissue surrounding the brain. Tumors can form in the bones of the skull. Malignant brain tumors can start from bacteria-fighting immune cells in the brain. This type of brain cancer is called primary central nervous system lymphoma.



III. GOALS AND OBJECTIVES

Cancer spreads to the brain Brain metastases Brain metastases Open popup Secondary brain tumors occur when cancer starts elsewhere and spreads to the brain. When cancer spreads, it is called metastatic cancer. Any type of cancer can spread to the brain, but the most common types include: Breast cancer. Colon cancer. Kidney cancer. Lung cancer.

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Melanoma.

It is not clear why some cancers spread to the brain and others are more likely to spread elsewhere. Secondary brain tumors occur most often in people who have had cancer. Rarely, a brain tumor can be the first sign of cancer that has started elsewhere in the body. In adults, secondary brain tumors are much more common than primary brain tumors.

The main goal is about the detection using deep learning where it not only uses to classify the tumors but also it can identify different types of tumors.We can able to detect the tumor and also with their stages.Based on analysis, we can able to provide the percentage of the tumor..The main goal is to provide information about the tumor accurately to the patients where we can control several deaths by creating awareness of their situation in an early stage.

IV. METHODOLOGY

This chapter is all about the design phase of a system development.The design of a system is needed to the development of the system.The objective of this is to relate the process of the software design which we use.The system design is all about to full filling the requirements of the user.
The main aim of the system is to satisfy all the system requirements in a useful manner.The design holds the definitions of all modules and also their interactions with each module.

A. PROPOSED SYSTEM

Surgery It is generally accepted that complete or nearly complete surgical removal of a brain tumor is beneficial to the patient. The task of the neurosurgeon is to remove as much of the tumor as possible without damaging the brain tissue important for the patient's neurological function (such as the ability to speak, walk, etc.). Traditionally, neurosurgeons open the skull with a craniotomy to gain access to the tumor and remove as much of it as possible. During surgery, a drain (EVD) may be left in the cerebrospinal fluid cavity to drain the normal cerebrospinal fluid while the brain recovers from surgery.

Another procedure that is usually performed, sometimes before a tracheotomy, is called a stereotaxic biopsy. This minor surgery allows doctors to obtain tissue to make an accurate diagnosis. Typically, a frame is attached to the patient's head, a scan is performed, and the patient is then taken to the operating room, where a small hole is drilled into the skull to access the abnormal site. Depending on the location of the lesion, some hospitals may perform the same procedure without a frame.

A small sample is taken for examination under a microscope. In the early 1990s, computer devices called surgical navigation systems were introduced. These systems assisted the neurosurgeon in tumor guidance, localization and orientation. This information reduced the risks and improved the extent of tumor removal. In many cases, surgical navigation systems have allowed previously inoperable tumors to be removed with acceptable risks. Some of these systems can also be used for biopsies without the need to attach a frame to the skull. One of the limitations of these systems is that they use a preoperative scan (CT or MRI) to guide the neurosurgeon.

Thus, they cannot account for brain movements that may occur during surgery. Researchers are developing techniques that use ultrasound and perform surgery with MRI scanners to help update data from navigation systems during surgery. Intraoperative tongue mapping is considered by some to be a very important technique in patients with tumors affecting tongue function, such as large dominant hemispheric gliomas. This procedure involves surgery on a conscious patient and anatomical mapping of their language function during surgery. The doctor then decides which parts of the tumor are safe to cut. Recent studies have shown that cortical language mapping can be used as a safe and effective adjunct to optimize glioma resection while preserving important language sites. Some patients with brain tumors may require a ventriculoperitoneal hand.

Everyone has cerebrospinal fluid (CSF) in their brain and spine that circulates slowly at all times. When this flow is blocked, the fluid-containing sacs (ventricles) can expand, increasing the pressure inside the head, causing a condition called hydrocephalus. If left untreated, hydrocephalusqq can cause brain damage and even death. A neurosurgeon may decide to use a shunt to divert the spinal fluid away from the brain, thereby reducing the pressure. The body cavity into which the cerebrospinal fluid is directed is usually the abdominal cavity (the area surrounding the abdominal organs). The shunt is usually permanent. When it becomes blocked, symptoms are similar to the original condition of hydrocephalus and may include headache, vomiting, visual disturbances and/or confusion or lethargy. Another technique that can be used to manage blockages in the brain's fluid pathways is called an endoscopic third ventriculostomy. This helps the cerebrospinal fluid to redirect the obstruction without the need for a shunt.Radiotherapy Radiotherapy uses high-energy X-rays to destroy cancer cells and abnormal brain cells and shrink tumors. Radiation therapy may be an option if the tumor cannot be effectively treated with surgery. Standard external beam radiation therapy uses multiple beams of

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radiation to contour the tumor, limiting the dose to surrounding normal structures.

The risk of long-term radiation damage with modern management methods is very low. In addition to three-dimensional conformal radiotherapy (3DCRT), newer delivery methods include intensity-modulated radiotherapy (IMRT). Proton Beam Treatment uses a type of radiation in which protons, a form of radioactivity, are targeted specifically at the tumor. The advantage is that the tissue surrounding the tumor is less damaged. Stereotaxic radiosurgery (such as Gamma Knife, Novalis, and Cyberknife) is a technique that focuses radiation with several different beams on target tissue. This treatment does less damage to the tissues next to the tumor. There is currently no evidence that one delivery system is better than another in terms of clinical outcomes, and each has its own advantages and disadvantages.

Chemotherapy is generally considered effective in the treatment of certain childhood tumors, lymphomas, and some oligodendrogliomas. Although chemotherapy has been shown to improve overall survival in patients with the most malignant primary brain tumors, it does so in only about 20 percent of all patients, and doctors cannot easily predict which patients will benefit before treatment. Therefore, some doctors choose not to use chemotherapy because of possible side effects (scarring of the lungs, weakened immune system, nausea, etc.). Chemotherapy causes cell damage that normal tissue heals better than tumor tissue.

Chemotherapy resistance can include the survival of tumor tissue that cannot respond to the drug, or the inability of the drug to move from the bloodstream to the brain. There is a special barrier between the bloodstream and brain tissue called the blood-brain barrier. Some researchers have tried to improve the effects of chemotherapy by breaking this barrier or by injecting the drug into the tumor or brain. The purpose of the second group of drugs is not to destroy tumor cells, but rather to prevent tumor growth. In some cases, growth-modifying agents (such as the breast cancer drug tamoxifen) have been used to prevent the growth of tumors that are resistant to other treatments. In 1996, the US Food and Drug Administration approved the use of chemotherapy-impregnated discs that the neurosurgeon can use during surgery.

The discs slowly secrete the drug into the tumor and the patient receives chemotherapy with the systemic side effects of the treatment. Laser Interstitial Thermal Therapy (LITT) Laser Thermal Ablation is a newer technique used by some centers to treat smaller tumors, especially in areas that may be more difficult to access with previous open surgical procedures. This involves inserting a small catheter into the lesion, taking a biopsy if possible, and then using a laser to thermally remove the lesion.

This technique has only recently been used in the treatment of brain tumors, so its long-term effectiveness has not been proven. Investigational treatments Many new treatments are currently being investigated, especially for tumors that generally have a poor prognosis with existing conventional treatments. It is not known if these treatments work. Such therapies are administered according to a protocol and include various forms of immunotherapy, therapy using targeted toxins, anti-angiogenic therapy, gene therapy and differentiation therapy.

Combinations of treatments can also improve the outlook for patients by reducing adverse side effects. AANS does not endorse any treatment, procedure, product or physician mentioned in these patient information sheets. This information is provided as an educational service and is not intended as medical advice. Anyone seeking specific neurosurgical advice or assistance should contact a neurosurgeon or find one in their area using the AANS Find a Board Certified Neurosurgeon online tool between programming languages at any time and the progress will be stored. After completion, a successful completioncertificate will be issued.

B. DATA FLOW DIAGRAM

A dataflow diagram is a way of representing a flow of data through a process or a system.By using a simple graphical representation it can be transformed as the inputs for the system.

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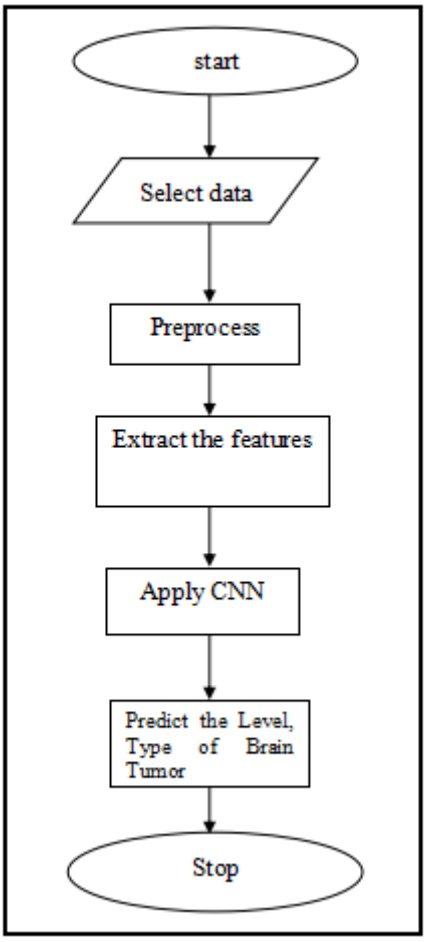

Fig. 1 Dataflow Diagram

V. CONCLUSION

The treatment of brain cancer is one of the most difficult challenges in neurosurgeryand oncology. Malignant gliomas involve, in their progression, multiple aberrant signaling pathways and the BBB restricts the delivery of many chemotherapeutic agents. Targeted therapies have successfully been applied in cancers, but their efficacy remains low in malignant brain tumors. There are several factors underlying the disappointing results in brain cancer therapeutics including limited tumor cell drug uptake, intracellular drug metabolism, inherent tumor sensitivity to chemotherapy, and cellular mechanisms of resistance. The results in the first experimental studies suggest that a single antiangiogenic therapy is not sufficient to eradicate glioma.

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[4] **Research Article | Open Access**Volume 2022 | Article ID 7897669 | https://doi.org/10.1155/2022/7897669 Hareem Kibriya,1**Rashid Amin**,1Asma Hassan Alshehri,2Momina Masood,1Sultan S. Alshamrani,3and Abdullah Alshehri4

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