

CONVOLUTION NEURAL NETWORK BASED BRAIN TUMOR DETECTION USING EFFICIENT CLASSIFICATION TECHNIQUE

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Abstract

An Excessive growth of unwanted cells in the brain is called brain tumor which is the most important barrier to prevent the rest of the brain from growing which can cause cancer. It was divided it into four types in total. The first type can easily remove these tumors surgically; the second type and the third type grow slowly and spread to nearby tissues, causing a small brain tumor. In this paper an efficient tumor detection method was proposed and these were performed well and identify the different levels of cancer with an efficient manner. In this proposed method focused on CNN image classification technique where the existing tumor images are available in the data base and the proposed method compare all the images and identify the size of the tumor, exact location and the level of the tumor. So the proposed method get high accurate results with short period of time.

Keywords:

CNN Image Classification, Unwanted Cells, Brain Tumor, Surgical Tumors, Tumor Images

1. INTRODUCTION

Abnormal growth of cells in the brain is referred to as brain tumor. It can be classified as a primary brain tumor and a secondary brain tumor. The first stage tumor is a non-cancerous benign (benign) brain tumor or cancerous tumor [1]-[3]. A secondary brain tumor is a cancer that spreads to another part of the body and spreads to the brain. The softened brain tumor grows slowly and can be easily removed depending on where it grows. Cold brain tumor does not easily penetrate into other systems of the normal brain. However, cancerous brain tumors can grow very fast and damage nearby brain tissue [4]. But for some as a baby gets older, he or she will outgrow this. The removal of a brain tumor has always been a challenge for the medical profession. But it is true that many types of brain tumors have been cured by one or more therapies. More modern technology helps to accurately predict the nature of the brain tumor. Some are harmless and non-cancerous, while others are malignant [5]. As these cells grow, the tumor compresses the blood vessels in the brain or brain, causing headaches and other neurological symptoms. For half of brain tumor patients, headache is the worst symptom. This type of headache is usually dull, persistent and worsens with valsalva maneuverability (such as coughing or holding during bowel movements). Headache often occurs or is worse on the same side of the tumor, but may be generalized. This is due to increased intraocular pressure (ICP) or hydrocephalus-excess cerebrospinal fluid (CSF) in the brain. CSF is the normal fluid that surrounds and mattresses your brain and spine [7]. If a tumor obstructs the normal flow of this fluid, it causes a buildup, which creates a lot of pressure. As you can imagine, this pressure can cause a variety of symptoms including pain, vomiting, seizures these are symptoms that doctors can see when examining the eye.

Brain tumors can cause symptoms in more than one way. They cause localized symptoms, depending on the specific area of the brain, or whether they cause the symptoms properly. Local symptoms (specific symptoms) are often associated with the part of the brain that is subject to the brain. For example, a tumor of the brain that impairs vision may cause double vision [8]. Tumors in a controlled area of the brain can be caused by immobility. Systemic symptoms (general symptoms) can be caused by problems such as increased inflammatory pressure (increased pressure on the brain). High intrusive pressure can cause headaches, fatigue, and / or seizures. Third, brain tumor problems can occur when a tumor in one part of the brain causes pressure on another part of the brain. It can cause loss of consciousness or changes in breathing and heart rate.

2. LITERATURE REVIEW

Any cancer elimination consists of three main areas: chemotherapy, radiation and surgery. It has its own properties in the fight against this disease. Chemotherapy is ineffective if there is a brain tumor for such a diagnosis. Treatment is mainly based on postoperative removal of the tumor. However, there is something to complete the removal of all tumors [9]. For the most part, it depends on their spread. Sometimes the building can be placed on key structures. Complete independence from these tumors can lead to brain damage. In such cases, only the permitted area is removed and the residue is removed with radiation or chemotherapy [10]. The Cyber Knife, Gamma Knife - There are new technologies that are an alternative to surgery. Such methods allow high levels of radiation to pass through the brain tumor. Purification is so effective that in the early stages it is often used as the main method of struggle. Today's drug is developing and implementing new methods of surgery [11].

This is ultrasound and laser technology. Radiation therapy is one week after surgery. Of course, it depends entirely on the size of the cancer. It varies from twenty-seven days. There is another way to combat the disease. It is cold surgery. This method allows the brain tumor to freeze. The treatment is considered completely effective [12]. The freezing of cancer cells using liquid nitrogen at reduced temperatures. There are timely and appropriate diagnosis - and the chance of a successful recovery from brain cancer [13]. The treatment, which makes it an excellent prognosis, is carried out in the above three directions. Survival of patients with cancer in the early stages of treatment for five years is 60 to 80% - that is statistical [14]. If the sad picture was later found to be a brain tumor. It can have consequences. The impossibility of having surgery leads to the point of disappointment [15]. The chance of survival of these patients in a five year period is only 30-40%. Of course, at first it depends on the size of the tumors.

3. PROPOSED METHOD

The proposed CNN based brain tumor identification (CNNBTI) monitor the following Symptoms identification varies depending on the location of the tumor, its size, and the speed at which it develops. It enters directly into the brain tissue, damaging internal organs that cause vision, movement, speech, hearing, memory, and behavior. The pressure caused by the tumor causes the surrounding brain tissue to swell. The following important details to follow the confirmation of brain tumors shown below:

- Headache monitoring
- Unexplained nausea and vomiting
- Vision Disorders identification
- Slow emotional numbness in the arm or leg
- Difficulty in speaking
- Confusion in daily routines
- Changes in personality and behavior
- Seizures in people who have never had a seizure before
- Ear problems
- Hormonal disorders

3.1 FIRST STAGE BRAIN TUMOR

Primary brain tumors may appear in or near the brain, that is, in the skull, meninges, cranial nerves, or capillaries. The majority of brain tumors in children are primary brain tumors. About 25 percent of all brain tumors are first-degree brain tumors. But the cause of the brain tumor has not been determined.

3.2 SECONDARY BRAIN TUMOR

A secondary brain tumor is a cancer cell that grows in some part of the body and spreads to the brain. Lung and chest cancer can spread to the brain. Three-quarters of all brain tumors in the world are secondary brain tumors. Sometimes a brain tumor is a sign that cancer has developed elsewhere in the body.

It is rare to diagnose this because the symptoms of a brain tumor appear in the symptoms of many other diseases. There are many layers to predicting the presence of a brain tumor. First a neurological test is performed to determine if the senses are functioning properly. Physicians will perform the following tests depending on the results.

- **C.T. Scan:** This gives a two-dimensional image of the brain. Some many CDs. After the scans, a dye is inserted into the blood so that the brain can be clearly seen on X-ray. It only takes about 10 minutes to pick up.
- **Magnetic acoustic imaging scan (MRI):** This involves taking multiple images of the brain, including magnetic fields and sound waves. You will be placed on a cylindrical machine for 15 minutes to an hour. MRI The advantage of the scan is that it accurately captures the soft tissues of the body and bone.
- **Angiogram:** A special dye that is inserted into your bloodstream. This die passing through the blood vessels is visible on X-ray. This will accurately show the blood vessels in the area surrounding the brain tumor.

- **X-ray of the Head and Scalp:** This X-ray reveals changes in the cranial bones as signs of a brain tumor. It also shows calcium deposits associated with brain tumors.
- **Other Scans:** MRS Physicians can predict brain chemistry and blood flow using scans, single photon emission tomography (SPECT) or position emission tomography (PED).

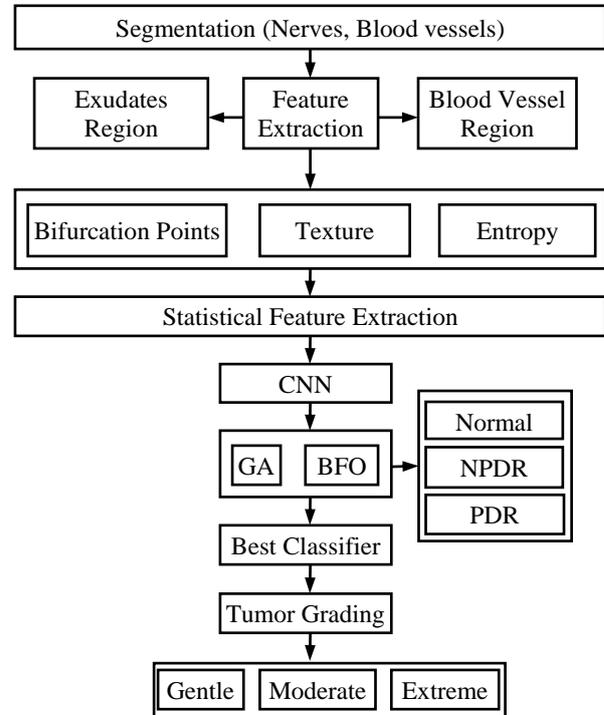


Fig.1. Proposed method block diagram

In the proposed hybrid kernel ELM, a positive regularization coefficient is introduced in order to make the learning system more stable. Assume HH' is non-singular, the coefficient $1/\lambda$ is added to the diagonal of $H'H$ in the more stable and with better generalization performance. We then can have,

$$\beta = H'(\lambda^{-1} + HH')e^{-1} \tag{1}$$

$$f(x) = h(x)\beta = h(x)H'(\lambda^{-1} + HH')e^{-1}(T) \tag{2}$$

The output function can be written as,

$$f(x) = h(x)H'(\lambda^{-1} + HH')e^{-1}(T) \tag{3}$$

But above all, the only test that can help predict the presence of a brain tumor is a biopsy. This is done as part of surgery to remove the tumor or take a small sample of the tumor and send it to a biopsy to diagnose a cancerous tumor. The Doctors usually place a small hole in the skull and insert a very thin needle into it to remove the tissue. CT scan will be the guide for this. This tissue is then examined under a microscope to confirm that it is a tumor. If it is a tumor, its nature will be examined. Only then will the type of treatment be determined.

4. RESULTS AND DISCUSSION

The proposed CNN based brain tumor identification (CNNBTI) was compared with the existing 3D Segmentation Method (3DSM), Shape constrained automatic segmentation

(SCAS), Gabor Wavelets and SVM Classifier (SVMC) and Wavelet-Based Texture Classification (WBTC)

4.1 STAGE 1 DETECTION AND IDENTIFICATION

Tumors that are in the early stages are characterized by slow growth. The disease, slightly affected battery. At this stage, the tumor undergoes surgical intervention. The effect of action is generally positive.

Table.1. Comparison of stage 1 detection and identification

Input Images	3DSM	SCAS	SVMC	WBTC	CNNBTI
1000	74.24	76.32	88.20	77.34	96.47
2000	74.74	76.32	89.29	77.60	96.58
3000	75.49	77.15	90.43	78.17	96.64
4000	75.49	76.42	90.07	77.03	96.69
5000	74.44	75.31	88.54	76.01	96.73
6000	74.16	74.91	87.90	75.77	96.76
7000	74.88	75.48	88.48	76.42	96.78

However, the symptoms of a brain tumor at this stage are very mild. Patients may experience weakness, dizziness and pain. That is not to say that someone has cancer, many of the diseases associated with these symptoms are rare. Therefore, most of the people do not pass the complete test of the organism. Only the development of that disease can be determined.

4.2 STAGE 2 DETECTION AND IDENTIFICATION

The tumor slowly begins to cover nearby cells. Despite this, surgery is still allowed. Going for surgery is more likely to cure the patient.

Table.2. Comparison of stage 2 detection and identification

Input Images	3DSM	SCAS	SVMC	WBTC	CNNBTI
1000	73.38	75.26	84.87	74.02	96.48
2000	74.67	76.01	89.49	77.42	96.58
3000	74.42	75.98	89.49	77.06	96.65
4000	74.29	75.16	89.02	75.87	96.69
5000	74.37	75.07	88.82	76.00	96.73
6000	74.36	74.94	88.56	76.02	96.76
7000	74.01	74.52	87.93	75.59	96.78

If you treat the symptoms of a brain tumor, it may be accompanied by nausea and possible vomiting. These events are not related to the food process. Mouth reflex is caused by a change in intracranial pressure. The patient may experience seizures and seizures.

4.3 STAGE 3 DETECTION AND IDENTIFICATION

The disease is exacerbated. The disease is a threat to the patient's life. Malignant cells are rapidly introduced into the

tissue. Most often, doctors classify the condition as a non-surgical brain tumor. Treatment takes symptomatically different medications to place.

Table.3. Comparison of stage 3 detection and identification

Input Images	3DSM	SCAS	SVMC	WBTC	CNNBTI
1000	65.95	84.85	63.69	78.50	94.47
2000	64.29	78.99	70.53	72.32	94.58
3000	63.84	80.13	71.82	70.83	94.64
4000	68.53	78.99	73.96	67.59	94.69
5000	68.92	78.11	72.39	68.31	94.73
6000	68.76	76.91	70.77	68.44	94.76
7000	68.02	75.26	68.97	67.17	94.78

4.4 STAGE 4 DETECTION AND IDENTIFICATION

This is the most dangerous stage of cancer. The forecast is unfavorable. Rapid tumor reproduction affects almost the entire brain.

Table.4. Comparison of stage 4 detection and identification

Input Images	3DSM	SCAS	SVMC	WBTC	CNNBTI
1000	69.89	80.39	78.94	77.92	93.47
2000	69.18	77.63	78.73	74.88	93.58
3000	69.25	78.61	79.99	74.34	93.64
4000	71.86	77.69	81.18	72.04	93.69
5000	71.59	76.69	79.60	71.98	93.73
6000	71.37	75.90	78.35	71.94	93.76
7000	71.31	75.37	77.44	71.53	93.78

However, there are cases of successful surgical intervention. For example, if the tumor is placed in the secular area. Further radiation and chemotherapy can stop the process of dividing cancer cells. But often this condition is characterized by an irreversible process. Any treatment can only delay the disease.

5. CONCLUSION

In this paper, the proposed framework for identifying tumor cells in the various phases has been presented. In this System, it is consisting of four stages such as preprocessing, segmentation, feature extraction and classification, have been proposed. The preprocessing stage extracts background pixels to empower the working on further stages on the foreground pixels only. In the segmentation process the threshold method is carried out whereas region growing is adopted here. In the region growing methods, the evaluated sets are very small at the start of the segmentation process. After segmentation, the feature extraction had done it shows that the proposed method has high accuracy than counter let, wavelet, wavelet methods. The extracted images are then classified by using the best classifier; however, this is used here. The proposed CNNBTI was getting good results while compared with the existing 3DSM, SCAS, SVMC and WBTC.

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