# MAKE IT HAPPEN


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# Tell us a bit about yourself

- COMMUNITY SOFTWARE
- ELECTRIC BILL SOFTWARE
- FACIAL RECOGNITION
- WEB DEVELOPMENT (FRONTEND & BACKEND)
- Past Hackathon experiences : 4
- Accolades or awards that you have received : 1
- GOOGLE CLOUD CERTIFIED

# RADIOLOGY IMAGE ANALYSIS FOR MEDICAL INTERFACES

**BRAIN TUMOR DETECTION USING IMAGE SEGMENTATION**

- STEPS :

1. PREPROCESSING
2. IMAGE SEGMENTATION
3. FEARTURE EXTRACTION
4. CLASSIFICATION

# Tech Stack

Please mention your Tech Stack (wherever applicable)

- Backend : JAVA compatible with MATLAB Compiler SDK™
- Frontend : MATLAB R2023b
- Cloud Service Providers : NONE
- Database : DOWNLOADED IMAGES
- SOFTWARE REQUIREMENTS : Windows 11
- HARDWARE REQUIREMENTS :

1. Processor: Intel® Core™ i5
2. Memory: 8.00 GB
3. SSD: 512 GB

# Detailed Description of the solution

- **PREPROCESSING**

It is very difficult to process an image. Before any image is processed, it is very significant to remove unnecessary items it may hold. After removing unnecessary artifacts, the image can be processed successfully. The initial step of image processing is Image Pre-Processing. Pre-processing involves processes like conversion to grayscale image, noise removal and image reconstruction. Conversion to grey scale image is the most common pre-processing practice. After the image is converted to grayscale, then remove excess noise using different filtering methods.

- **IMAGE SEGMENTATION**

Segmentation of images is important as large numbers of images are generated during the scan and it is unlikely for clinical experts to manually divide these images in a reasonable time. Image segmentation refers to segregation of given image into multiple non-overlapping regions. Segmentation represents the image into sets of pixels that are more significant and easier for analysis. It is applied to approximately locate the boundaries or objects in an image and the resulting segments collectively cover the complete image. The segmentation algorithms works on one of the two basic characteristics of image intensity; similarity and discontinuity.

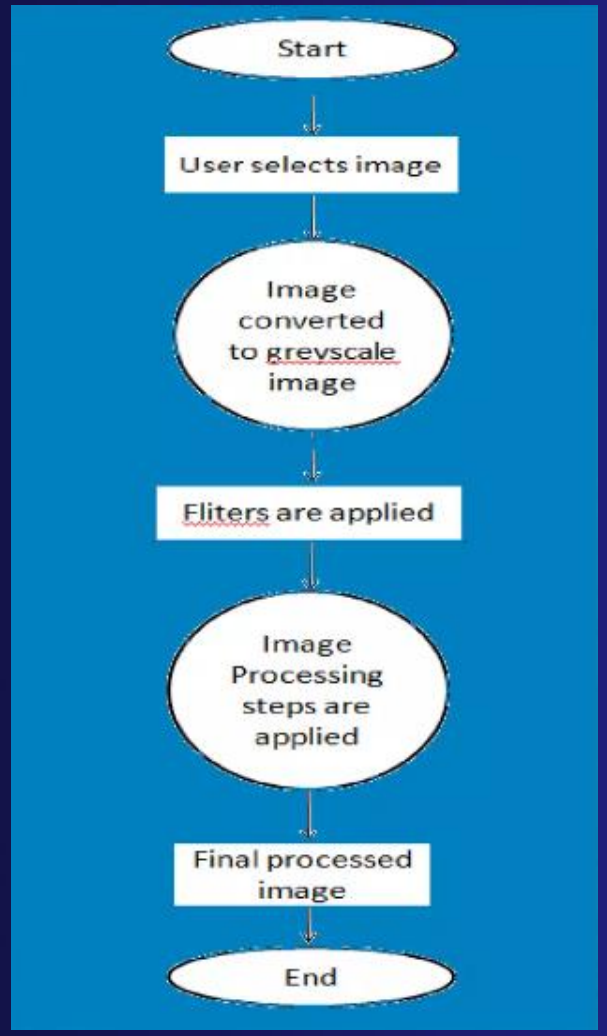
- **FEATURE EXTRACTION**

Feature extraction is an important step in the construction of any pattern classification and aims at the extraction of the relevant information that characterizes each class. In this process relevant features are extracted from objects/ alphabets to form feature vectors. These feature vectors are then used by classifiers to recognize the input unit with target output unit. It becomes easier for the classifier to classify between different classes by looking at these features as it allows fairly easy to distinguish. Feature extraction is the process to retrieve the most important data from the raw data.

- **CLASSIFICATION**

Classification is used to classify each item in a set of data into one of predefined set of classes or groups. In other words, classification is an important technique used widely to differentiate normal and tumor brain images. The data analysis task classification is where a model or classifier is constructed to predict categorical labels (the class label attributes). Classification is a data mining function that assigns items in a collection to target categories or classes. The goal of classification is to accurately predict the target class for each case in the data.

# Data Flow Diagram



# So, how is your solution different?

## EXISTING SYSTEM

- As MRI images are prone to more noise and interference, doctors felt difficult to detect the tumor at early stage.
- They not only felt difficult to detect the tumor at early stage, they also took many days to detect manually.
- Due to these difficulties medical field faces certain problems.

# PROPOSED SYSTEM

- The proposed work is to overcome the existing system.
- This system detects the tumor from the MRI images through image processing method and that includes some techniques.
- Those techniques are the modules of the project.

# Future possible enhancements

- **Multi-Modal Image Fusion**: Incorporating information from multiple imaging modalities (e.g., MRI, CT, PET) to enhance tumor detection and provide more comprehensive insights into tumor characteristics.
- **Interactive Visualization Tools**: Implementation of interactive visualization tools to allow medical professionals to explore segmented tumor regions in 3D, enabling better understanding and analysis.
- **Enhanced Data Augmentation Techniques**: Exploration of advanced data augmentation techniques to generate synthetic training data and improve model generalization to diverse imaging conditions.
- **Explainable AI**: Integration of explainable AI techniques to provide insights into the decision-making process of segmentation algorithms, enhancing transparency and trustworthiness for clinical adoption.

# Risks/ Challenges / Dependencies

- **Segmentation Accuracy**: Ensuring precise delineation of tumor boundaries to avoid diagnostic errors.
- **Image Quality Challenges**: Overcoming issues such as noise, artifacts, and variations in imaging techniques to improve segmentation performance.
- **Data Availability and Annotation**: Securing access to sufficiently diverse and well-annotated datasets for robust model training.
- **Long-term Monitoring Solutions**: Developing tools capable of supporting longitudinal analysis for effective patient management.

# Conclusion

- A Brain Tumor MRI image is applied to preprocessing and after that tumor is extracted morphological and watershed segmentation processes.
- The medical image segmentation has difficulties in segmenting complex structure with uneven shape, size and properties.
- For accurate diagnosis of tumor patients, appropriate segmentation method is required to be used for MRI images to carry out an improved diagnosis and treatment.

The Brain Tumor detection is a great help for the physician and a boon for a medical imaging and industries working on the production of MRI images.

# Acceptance Criteria Coverage

1. **Accuracy Improvement**: The proposed system must demonstrate a higher accuracy rate in tumor detection compared to the existing system.
2. **Robustness**: The system should be able to accurately detect tumors across different MRI image qualities, including variations in resolution and noise levels.
3. **Scalability**: The system should be scalable to handle large datasets efficiently, accommodating future growth in data volume.
4. **Automation**: The system should require minimal manual intervention, automating the tumor detection process as much as possible.
5. **User-Friendly Interface**: The system should have an intuitive and easy-to-use interface for medical professionals, facilitating efficient interpretation of results.

# Team Member Details

**Team Leader Name - Member 1: AGNIDEEP PODDAR**

Branch : CSE-SE Stream : B.TECH. Year – 2ND YEAR

**Team Member 2 Name: ANISH RAJ HOTA**

Branch : CSE-CC Stream : B.TECH. Year – 2ND YEAR

**Team Mentor Name: PARTH VYAS**

Category: MEMBER OF NEXT GEN-AI