



Brain Tumor Detection

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Acknowledgement

I would like to express my sincere gratitude to Dr. Manoj Diwakar for their invaluable guidance and unwavering support throughout the course of this project. Their expertise and feedback have been instrumental in shaping the direction of my work.



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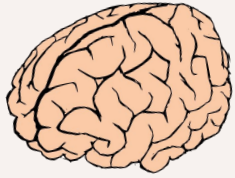
03 Summary



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01

Problem Statement





One of the most crucial tasks of neurologists and radiologists is early brain tumor detection. However, manually detecting and segmenting brain tumors from Magnetic Resonance Imaging (MRI) scans is challenging, and prone to errors. That is why there is a need of an automated brain tumor detection system for early diagnosis of the disease.



02

Introduction



But Wait, What is Brain Tumor?



About the Disease

A brain tumor is an abnormal growth of cells in the brain that can be benign or malignant, disrupting normal brain function. It can cause symptoms such as headaches, seizures, and cognitive changes.



Why Detection is necessary?

Timely identification enables medical professionals to implement appropriate therapies, potentially preventing the tumor from reaching an advanced and more challenging stage.



Tech Stack Used

OpenCV

Image processing

TensorFlow

ML framework for deep learning

Keras Util

CNN Layers

Scikit-learn

Splitting Dataset

NumPy

Array Manipulations

PIL

Image operations

Pathlib

Working with File paths

Flask

Web Application

Tailwind

UI interface



Building the Model



1. Data Preprocessing

Initially I constructed some custom functions for handling the dataset, and then organise them into appropriate categories. Subsequent step involves using OpenCV for resizing and PIL for standardized input size of 64x64 pixels of the images in the dataset.



3. Dataset Splitting and Normalization

For evaluation we split our dataset into training and testing sets (80%-20 %) using scikit-learn. Prior to feeding the data into the neural network, we normalize the pixel values using the normalize function from Keras. It is a crucial preprocessing step that ensures consistent and effective learning during the training phase.



2. Converting Lists to Array

With the dataset structured, I converted the lists of images into NumPy arrays for compatibility with deep learning frameworks, the labels indicating 'tumor' & 'non-tumor' are also converted into np arrays. At this point, our data is ready for model building.



4. Building CNN

The model architecture consists of convolutional layers with ReLU activation functions, max-pooling layers, and fully connected layers. The model is compiled using categorical cross-entropy loss and the Adam optimizer. Training is executed over 10 epochs, and the resulting model is saved in a .h5 format.



Creating the Web Application



Web Server Setup

Using Flask which is (a light-weight python framework, I established the backbone of the application. Crucially ,I created routes for handling prediction and static page requests. Such as 'model' , 'model/predict' and '/' .'

Prediction Logic

Within the '/predict' route, I integrated the pre-trained deep learning model. This backend logic processes user inputs, prepares them for inference, and generates predictions regarding brain tumor presence. This modular approach ensures adaptability for future model updates.

Front - End Design

I used GenAI Models, such as idegram.ai, to generate clean graphics and cartoons, enhancing the app's visual appeal. Additionally, I utilised Tailwind CSS to craft a modern and clean user interface.



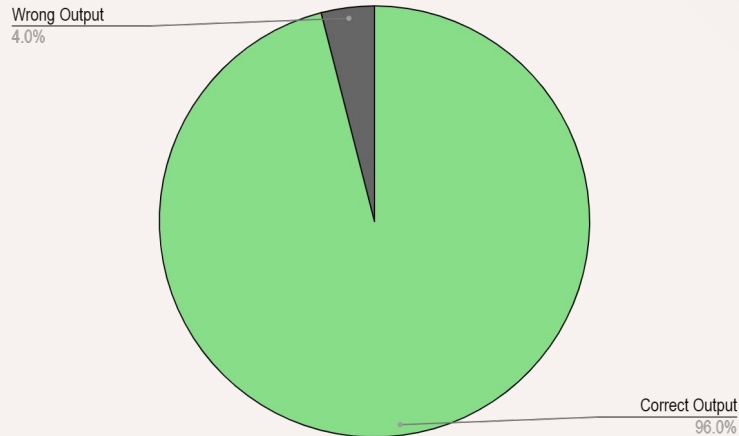


Results

Model Accuracy : 97%

**Supports Low-End
Devices**

**Integrated with Fully
Working and easily
Hostable Web
Application.**





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Summary

Project Highlights



Mini Project - Summary

- Machine Learning Focus: The project centers on leveraging advanced machine learning techniques for early brain tumor detection.
- Deep Learning Model: At the heart of the initiative is a highly trained deep learning model, specifically implemented with convolutional neural networks (CNNs).
- TensorFlow and Keras: The model is constructed using TensorFlow and Keras, leading frameworks for developing and training deep learning models.
- Precision and Sensitivity: The model emphasizes precision and sensitivity in analyzing medical images, crucial for accurate brain tumor detection.
- Distinguishing Features: Utilizing its deep learning capabilities, the model excels in distinguishing between brain tumor and non-tumor images.
- Critical Medical Contribution: The ultimate goal is to contribute significantly to early diagnosis in critical medical conditions, particularly those related to brain tumors.



Project Snippets


Neuralnight

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Privately Preserving Neuralnight:
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Draven, Unleashed, Unleashed! The vibrant world of brain wellness starts here today. Let's raise awareness, save lives.

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Model Specifications

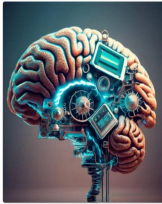
The brain tumor detection model is built on a state-of-the-art neural network architecture, leveraging deep learning techniques to analyze complex patterns within medical images. Below are some Training Details:

10Specs

96%Accuracy

HighPrecision

Br35HDataset



Overview
Technical Stack

Leveraging OpenCV and PyTorch for image processing, TensorFlow and Keras for neural network training, and NumPy for numerical data manipulation, this system ensures efficient handling of medical images and datasets. The core architecture is based on Convolutional Neural Networks (CNNs), capturing intricate patterns in medical images. Optimized using the Adam optimizer and monitored via TensorBoard, our system delivers precise, timely, and potentially life-saving results for medical professionals and patients.

About This Project

I built OpenNight, independently created this Midjourney for the third semester of my Computer Science Engineering program. I developed a brain tumor detection system using the expertise in image processing and machine learning. Through this project, my goal was to devise a practical and efficient solution for early tumor diagnosis, demonstrating my enthusiasm for technology and healthcare.

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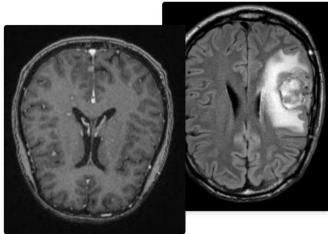
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Add MRI Scan Below

Click to upload or drag and drop
PNG, JPG or PDF (max. 50MB)

Use Correct MRI Images For Best Results

Ensuring accurate and reliable results in our system, begins with the quality of the input data. When it comes to detecting brain tumors using Magnetic Resonance Imaging technology, the selection of the right images is paramount.





Open for Contributions

I believe in the power of collaboration and welcome contributions from the community to make this project even better. This project is open-source, which means anyone can view, use, modify, and distribute the source code. I encourage developers, designers, and enthusiasts to get involved and contribute to the project.

GitHub Repo

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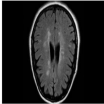
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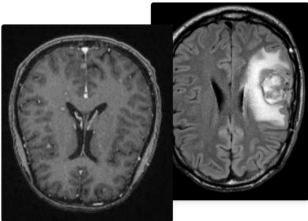
Add MRI Scan Below




Result: No Brain Tumor Detected

Use Correct MRI Images For Best Results

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* Thanks!

Do you have any questions?

removed for privacy

github.com/iamDyeus

Project Open Sourced on Github
github.com/iamDyeus/NeuralInsight