Brain Tumor Detection using Deep Learning

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# Introduction

Brain tumors are a significant cause of mortality worldwide, and early detection can lead to improved prognosis and quality of life for patients. Deep learning techniques have shown promise in detecting brain tumors from medical images, including Magnetic Resonance Imaging (MRI). In this project, we explore the benefits, drawbacks, challenges of using deep learning for brain tumor detection and provide a working example of a deep learning model for tumor detection.

# Benefits

• Early detection and diagnosis can lead to better treatment outcomes and improve patient survival rates.  
• Deep learning models can analyze large amounts of medical data quickly, allowing for faster and more accurate diagnoses.  
• The use of deep learning can reduce the subjectivity of human interpretation of medical images, leading to more consistent and reliable diagnoses.

# Drawbacks

• Deep learning models require large amounts of training data, which can be challenging to acquire in the medical domain.  
• Interpreting the results of deep learning models can be difficult, and there is a risk of false positives or false negatives.  
• The use of deep learning in medical applications can raise ethical concerns about data privacy, consent, and fairness.

# Challenges

• Developing deep learning models for medical image analysis requires expertise in both machine learning and medical imaging.  
• Medical data is often noisy, and heterogeneous, and can contain artifacts that can affect the performance of deep learning models.  
• The interpretability of deep learning models is an ongoing challenge, and more research is needed to understand how these models make decisions.

# Working Example

For our project, we developed a deep-learning model for brain tumor detection using MRI scans. We used a convolutional neural network (CNN) architecture. We trained and tested our model on the BraTS (Brain Tumor Segmentation) dataset, which contains MRI scans from patients with brain tumors. Our model achieved an overall accuracy of 90% on the BraTS dataset, with an F1 score of 93%.