**Introduction:**

Unarguably, we are in the digital world, the era of technology, in which numerous diseases or illnesses in the human body can be detected using digital medical imaging. The images could be used for proper treatment and other purposes, particularly research.  Thousands of electronic medical images have been produced daily, for example, about a minimum of 12,000 and a maximum of 15,000 images were captured daily in the Radiology Department at the University Hospital of Geneva in 2002. [1]. Writing medical reports on such images by human experts manually could not be an easy task, as it is associated with inaccuracy, is time-consuming, and is error-prone. Therefore, with the advancement of computer aided diagnostic systems that could facilitate medical reporting and other associated research, Out of the medical images captured, a brain tumor was one of them. A brain tumor appeared to be one of the most serious and deadly diseases in the world. It is ranked as the 10th most common deadly disease in the US [2]. A report showed that about 700,000 people have suffered from brain tumors in the US [3]. According to the American Cancer Society in 2021, 78,980 adults have been diagnosed with a brain tumor yearly, of which 24,530 were cancerous and 55,155 were noncancerous [4].

Medical interventions for a brain tumor are based on the type of brain tumor. To use conventional computer-aided diagnosis systems, the tumor mass has to be identified and segmented before it can be classified into different types. Upon tumor mass segmentation, the segmented region is then subjected to feature extraction and classification. The World Health Organization (WHO) categorized a brain tumor as level one to four (LI–LIV). Slow-growing tumors are in category LI or LII, while malignant and worse-prognostic tumors are in categories LIII and LIV [5, 6]. A dataset from Kaggle provided four classes of tumors: glioma, meningioma, no-tumor, and pituitary, which this research will use for its deep learning prediction through classification technique.

There are different imaging techniques used for detecting abnormalities in the human body, among others are Computed Computed Tomography (CT), X-ray, Single-Photon Emission Computed Tomography (SPECT), Ultrasonography, Electro Encephalo Graphy (EEG), Positron Emission Tomography (PET), Magneto Encephalo Graphy (MEG), and Magnetic Resonance Imaging (MRI) [2]. MRI has emerged that not only exhibits the detailed and complete facets of brain tumors but also helps doctors accurately diagnose the tumor and determine the correct treatment mechanism [7]. Recently, MRI has appeared to be the most current imaging technique used for detecting abnormalities in the brain (e.g., tumors) [8] and spinal cord. Through MRI images, valuable information can be obtained about the genetics, histology, physiology, hemodynamics, and chemistry of various abnormalities present in the brain [9].

The world is yet to have a more precise and acceptable brain tumor diagnostic computer-aided device [10, 11]. Identification and segmentation of brain tumors using digital imaging could be more appropriate and accurate using artificial intelligence techniques, as it is currently a researchable area. Firstly, many machine learning algorithms, individually or in hybrid, have been attempted, such as Support Vector Machine (SVM), Decision Tree (DT), or K-Nearest Neighbor (KNN), discrete wavelet transformation (DWT), forward backpropagation artificial neural network (FP-ANN), curvelet transformation, shearlet transformation, and the AdaBoost algorithm for classification. Recently, the use of deep learning (DL) with convolutional neural networks (CNN) has yielded positive results in computer vision applications in terms of effectiveness and efficiency. So, a number of DL-CNN algorithms for feature extraction are tried to categorize complexity in brain tumors [12, 13]. For example, using the Fisher vector algorithm with classification accuracy between 71 and 94%, ResNet34 classified the image as either normal or abnormal with an accuracy of about 100% [14]. Others are GoogLeNet, and AlexNet,

This study is aimed at determining the best deep learning models for the classification of brain MRI into either four classes of tumors: glioma, meningioma, no-tumor, or pituitary.  efficientnet\_b0, EfficientNet\_B2, and MobileNet are CNN deep learning pretrain models that are fully automated. More on these models can be seen in other sections of this paper. The primary contribution of this work is coming up with a more precise and accurate probabilistic automated system that could easily identify the class of a brain tumor from RMI for appropriate medications, thereby avoiding time-consuming, inaccurate, and error-prone procedures. A dataset from Kaggle with four classes of tumors: glioma, meningioma, no-tumor, and pituitary was used for both training and testing the model on a GPU from Google Colab for powerful processing capability. We used PyTorch faramework to code and employed the PyTorch DataLoader module to transform the dataset into PyTorch format. Initially, we utilized the Compose method to apply a series of transformations to the dataset, including resizing, converting it to a tensor (using ToTensor), and normalization. We then utilized a batch size of 32. To visualize the images randomly, we utilized the Matplotlib and PIL modules.

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