

# Common Approaches to Using Computer-Aided Technology to Study Brain Diseases

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## Description

The most common and dangerous diseases that affect humans are those that affect the brain. Since 2016, more than ten million people have died annually from brain diseases, as reported in the World Health Organization's World Health Statistics 2020. One of the biggest threats to humanity today is brain disease. Cerebral Vascular Accidents (CVAs), brain tumors, sleep disorders, multiple sclerosis, and dementia are among the various diseases of the brain. These brain disorders manifest in a variety of brain structures and are caused by various factors. For instance, brain vessel blockage or rupture is the root cause of CVA, which is also known as a stroke. Intracranial hemorrhage refers to a stroke that occurs within the brain. When it occurs between the brain's inner and outer layers, it is referred to as a subarachnoid hemorrhage. When a brain disease strikes, we want to know where it strikes, the type of brain disease it is, how bad it is, and even what the outcome will be. Numerous approaches to lesion segmentation, detection-based diagnosis, grade or subtype classification, and outcome prediction have been presented by scientists to answer these questions. These are the most common approaches to using computer-aided technology to study brain diseases.

## Denoising Preprocessing Techniques

Medical imaging techniques are typically used by doctors and scientists to investigate brain conditions due to the complexity and leniency of brain structure. The four most widely used medical imaging techniques are Magnetic Resonance Imaging (MRI), Computed Tomography (CT), Magnetic Resonance Angiography (MRA), and Computed Tomography Angiography (CTA). For clinical and research purposes, these medical imaging modalities can be used to depict the inner structure of brains and draw lines on the three-dimensional model. However, we cannot ignore the fact that these imaging methods typically include non-standardized intensity distributions, unbalanced sample distributions, irrelative tissue background, and noise.

Further brain image analysis, including segmentation, detection, and classification, will be hindered by these factors. As a result, numerous preprocessing techniques are proposed to alleviate these drawbacks. Denoising preprocessing techniques, for instance, aim to reduce the noise in original medical images. The image quality is improved by these denoising preprocessing techniques in this manner. Non-brain tissue is removed from brain MRI images using skull-stripping preprocessing techniques. It would make it possible to improve segmentation accuracy in subsequent analysis tasks like segmentation. Preprocessing brain images is now a crucial area of research in the study of brain diseases.

## Methods for Brain Image Analysis

Face recognition, translation, transportation, and medical image analysis are just a few of the many applications of artificial intelligence. Lesion segmentation, illness detection, and survival prediction have all been proposed by scientists using artificial intelligence, particularly the deep learning model, based on medical imaging techniques like MRI, CT, and X-rays. The Convolutional Neural Network (CNN) is one of the deep learning models with the greatest potential. Convolution layers in a CNN give it a strong capacity for extracting deep features from input images. Another typical deep learning model is a Fully Convolutional Network (FCN). An FCN's up sampling layer distinguishes it from a CNN and makes it suitable for three-dimensional extraction and segmentation. Another well-known deep learning model is the Generative Adversarial Network (GAN), which is utilized in numerous fields. Due to its distinctive architecture, U-Net has emerged as one of the most widely used techniques for medical image segmentation. The study of brain disorders has important implications for human health. The use of medical imaging techniques like MRI, CT, CTA, and MRA in the study of brain diseases cannot be eliminated. Recent years have seen the rise of methods for brain image analysis that are based on deep learning. We believe that there will be three directions for development in the future.