

Identifying Neurological Disorders Using Deep Learning with Biomedical Imaging Techniques

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Abstract—Neurological disorders are one of the major health problems in the world, affecting a huge amount of human population. If early and accurate detection of such a disorder is done, it might be possible to intervene early and thus provide effective treatment. In this work, a deep learning approach for the detection of various neurological disorders from biomedical imaging is presented. The proposed method uses a hybrid momentum and minibatch stochastic gradient descent algorithm to improve convergence speed and optimize the deep neural network architecture. In total, the dataset of neuroimaging scans covers MRI, PET, and CT images for various neurological conditions such as but not limited to Alzheimer's disease, Parkinson's disease, multiple sclerosis, epilepsy, and stroke. It automatically detects complicated patterns and features in these images, which are representative of the global and local characteristics of neurological conditions, using a deep learning model. The hybrid momentum and minibatch stochastic gradient descent algorithm efficiently reads up the model parameters for fast convergence and better generalization. The potential here is huge, helping clinicians arrive at more informed decisions for better patient outcomes. This approach can be the game-changer in neuroimaging and deep learning-assisted medical diagnostics.

Keywords—Neurological conditions, deep learning techniques, hybrid momentum algorithm, minibatch SGD

I. INTRODUCTION

A neurological disorder is an inclusive and multifaceted classification of medical conditions that distress the nervous system including the brain, spinal cord, or nerves. The

extended our discharge construct and grounded better diagnostic instruments and adjuvant treatments to improve the quality of life for affected individuals [81]. Nevertheless, the management of these neurological syndromes is still problematic and this suggests that further research and support for people with these syndromes and their families are essential. Given the ability of AI to process vast amounts of complicated data with speed and incredible accuracy, it also has an enormous role to play in early detection of neurological diseases, which improves diagnostic accuracy and patient outcomes [3]. In these diseases, appropriate and accurate diagnosis is essential to establish treatment and disease management; therefore AI with the ability of learning conditions can make a revolutionary moment in neuroscience [4].

The ability to analyze diverse datasets from different sources (medical imaging, genomics, electronic health records, and wearable devices) is one of the main assets of AI in neurological disease diagnosis. For instance, it tells AI can classify even smallest deviations that would otherwise be overlooked by human observers in brain MRI and CT. It is this ability that facilitates early intervention, before irreversible damage has been done. AI-based algorithms can also analyze genetic data to find the specific genetic markers that are associated with brain disorders. Such genome profiling helps in identifying a potential for certain diseases/risk in individuals and modification of the treatment plan based on targets [6]. Moreover, AI can scrutinize extensive quantities of patient data such as — medical history, symptoms or treatment outcomes — to identify