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Cloud Based Framework for Parkinson's Disease Diagnosis and Monitoring System for Remote Healthcare Applications

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Abstract-*Speech signal processing and its recognition system have gained a lot of attention from last few years due to its widespread application. In this paper, a novel approach is proposed to diagnosis and monitoring the Parkinson's Disease (PD) which is the second most severe neurological disease in the world. PD is a neurodegenerative disease which impairs person's balance, motor skills, speech, and other characteristics such as decision making process, emotions, and sensation. Here, we proposed a cloud based framework for detecting and monitoring Parkinson patients that will enable healthcare service in low resource setting. In the developing countries, where most of the people do not get proper healthcare services and are not well aware of Parkinson's disease, let alone detecting and getting healthcare for PD, this system can be very practical and useful. For this system, the patients of rural areas, patients from the regions where doctors are not available, can communicate to the doctors only if they have internet connections in their smart phones to access the cloud. Doctors can check and detect patient's PD by checking their voice disorders or Dysphonia over cloud. With this system, a PD patient can be easily detected and diagnosed by giving their voice samples through their phones, regardless of their location. Based on the evaluation, our proposed systems are avail to achieve 96.6% accuracy in the cloud environment for detecting PD. It is expected that the proposed framework will have great potential to enable healthcare service for PD patients, who live in remote areas, especially in developing countries.*

Index Terms-*PD detection, Dysphonia, Cloud computing, ML classifiers*

1 Introduction

Neurodegenerative diseases like Alzheimer's, Amyotrophic Lateral Sclerosis, Parkinson's, and Huntington's are disorders in which the standard structure or general functions of neurons are degraded. Such diseases cause degenerations or death of neurons. Generally, neurodegenerative diseases are not completely curable. Both non-invasive (using medicines) and invasive (brain surgeries) treatments are used to control the severity of these diseases. In this paper, we are describing a cloud based framework for diagnosis and monitoring of Parkinson's disease by detecting voice disorders that will specially create support and intervention platform in developing countries where resource are very limited or not available.

1.1 Parkinson's Disease

Parkinson's disease (PD), named after British scientist James Parkinson, was described for the first time in 1817 [1]. It is also recognized as hypokinetic rigid syndrome (HRS), idiopathic or primary parkinsonism, or paralysis agitans. It is considered as the second most common neurodegenerative disease of the central nervous system after Alzheimer's. It mostly affects the motor systems of people aged 65 years or above and the risk to be affected is one in every hundred persons [2]. The main reason of Parkinson's is Dopamine deficiency in neurons. The dopamine producing neurons in the substantia nigra (anarea in midbrain) damage, degenerate or die and cause dopamine insufficiency which leads to Parkinson's. The lacks of dopamine in the nerve cells make them lose control over their functions and hence the motor systems disorders occur.

Four major symptoms of PD with motor features are: Tremor (uncontrolled wavering of hands, arms, legs or jaws), rigidity (inflexibility of limbs and trunks), bradykinesia (slowness of movements) and postural instability (weaken