Presentation Summary

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Deep Learning Based Assessment of Physiological Measurements for Neurological Disorders:

A Case Study on Gait in Parkinson's Disease

Parkinson's disease (PD) belongs to a group of conditions called motor system disorders, which are the result of the loss of dopamine-producing brain cells. The four primary symptoms of PD are tremor, or trembling in hands, arms, legs, jaw, and face; stiffness of the limbs and trunk; slowness of movement; and postural instability, or impaired balance and coordination. Gait disorders are considerable cause of falls in patients with neurological diseases. Grasping these disorders allows prevention and better awareness into underlying diseases. Mobile and wearable sensor technologies can serve as affordable and practical tools to assess the severity of neurological conditions. As these symptoms become more pronounced, patients may have difficulty walking, talking, or completing other simple tasks. PD usually affects people over the age of 60. In some people the disease progresses more quickly than in others. As the disease progresses, the shaking, or tremor, which affects most people with PD may begin to interfere with daily activities. There are currently no blood or laboratory tests that have been proven to help in diagnosing PD. Therefore, the diagnosis is based on medical history and a neurological examination. The disease can be difficult to diagnose accurately. Doctors may sometimes request brain scans or laboratory tests to rule out other diseases. In the study, we are reviewing a look at a patience’s swing stride as it relates to the control group without the disease to help determine if the patience with PD show a significant difference in walking ability. In this study, we analyze gait-related measurement signals on the study of Parkinson’s disease (PD). The dataset is obtained from PhysioBank, a digital recording archive bank of physiologic signals related data for use by the biomedical research community. PD affects approximately 1 million Americans (estimates range between 4 to 6.5 million people worldwide) and about 1% of older adults. Solely in the US, there are 60,000 new cases diagnosed each year. The database contains 93 patients with PD and 73 healthy controls. The database includes the vertical ground reaction force records of subjects as they walked at their usual, self-selected pace for approximately 2 minutes on level ground. Underneath each foot were 8 sensors that measure force as a function of time sampled at 100 Hz. We apply deep learning techniques (LSTM, auto-encoders, transfer learning) to classify subjects as healthy or with Parkinsonism. These tools can help automate monitoring the debilitating gait symptoms of the patients with neurological diseases and thus help predict patients with severe gait disturbances that make them prone to falls. Minimizing the cost and the weight of the sensors to be worn makes the approach more practical for the patients. The prognosis: at present, there is no cure for PD, but a variety of medications provide dramatic relief from the symptoms. In some cases, surgery may be appropriate if the disease doesn't respond to drugs. A therapy called deep brain stimulation (DBS) has now been approved by the U.S. Food and Drug Administration.