**IBM Team 16**

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**Domain Name**: Applied Data Science

**Use case Name**: Detecting Parkinsons Disease using Machine Learning

***Paper 1***

*Authors:*WU WANG , JUNHO LEE , FOUZI HARROU , (Member, IEEE), AND YING SUN

*Year :* 2020

*Title:*Early Detection of Parkinson’s Disease UsingDeep Learning and Machine Learning

*Methodology:*This paper examines A comparison between the proposed deep learning model and twelve machine learning andensemble learning methods based on relatively small data including 183 healthy individuals and 401 earlyPD patients shows the superior detection performance of the designed model .

*Advantage:*. Besides detecting the PD,It also provides the feature importance on the PDdetection process based on the Boosting method.

*Disadvantage:*Designed using deep learningwith small PD data that are collected from 584 individuals(183 healthy and 401 early PD).

***Paper 2***

*Authors:*Timothy J. Wroge, Yasin Ozkanca , Cenk Demiroglu, Dong Si, David C. Atkins and Reza Hosseini Ghomi

*Year :* 2019

*Title:*Parkinson’s Disease Diagnosis Using Machine Learning and Voice

*Methodology:*This paper explores the effectiveness of using supervised classification algorithms, such as deep neural networks, to accurately diagnose individuals with the disease

*Advantage:*.In this experiment, deep neural networks encoded the latentinformation within the audio features and interpret the PDdynamics that underlie the audio features to classify thepatients0

*Disadvantage:* The decision tree used in this system performs poorly. It performed with an accuracy of 75% and 72% on the AVEC and GeMaps features respectively. The decision tree performed poorly on metrics often scoring less than 70% and as low as an average recall score of 46% on the GeMaps features.

***Paper 3***

*Authors:* Kaninika, Akash Dayal

*Year :* 2019

*Title:* Determination of Parkinson’s disease utilizing Machine Learning Methods

*Methodology:*This paper explores the methods used to determine Parkinson’s Disease using Machine learning methods.

*Advantage:*.The variation and jitter in the data can help detect Parkinson’s disease. A strategy dependent on principal component analysis is done, for diagnosing and finding the characteristics of sound individuals and individuals with Parkinson was examined.

*Disadvantage:* In some cases, the variation and Jitter in the data is difficult to find and analyze.

***Paper 4***

*Authors:* Deepa Shenoy, Vibhudendra simha G G., P L Rrashmi , K R Venugopal, Sandhya Joshi, L M Patnaik.

*Year :* 2010

*Title:* Classification of Alzheimer’s Disease and Parkinson’s Disease by Using Machine Learning and Neural Network Methods

*Methodology:* The objective of this paper was to classify the Alzheimer’s disease and Parkinson’s disease based on the most influencing risk factors using different classifier techniques

*Advantage:*. The classification model was validated with the test cases and the model achieved a high classification accuracy of 99.25% with Random forest tree and the Multilayer Perceptron.

*Disadvantage:* The classification accuracy varies greatly with the change in the identification of the important risk factor with another and hence the model needs to be trained again.

***Paper 5***

*Authors:* Vasileios Skaramagkas, George Andrikopoulos, Zinovia Kefalopoulou, Panagiotis Polychronopoulos

*Year :* 2020

*Title:* Towards Differential Diagnosis of Essential and Parkinson’s Tremor via Machine Learning

*Methodology:* In this paper, the challenge of identifying between Essential and Parkinson’s tremor is addressed. To this goal, a clinical analysis was performed, where a number of volunteers including Essential and Parkinson’s tremor-diagnosed patients underwent a series of pre-defined motion patterns, during which a wearable sensing setup was used to measure their lower arm tremor characteristics from multiple selected points.

*Advantage:*. The SVM and Bagged Trees algorithms managed to provide good prediction rates under most measurement points and arm poses, reaching up to 100% prediction success rates for both i) metacarpal measurements with the arm extended and ii) forearm measurements with the arm moving while holding an object.

*Disadvantage:* The prediction algorithms had the lowest prediction percentages in the measurements when the arm was in a resting position.

***Paper 6***

*Authors:* Iqra Nissar, Waseem Ahmad M ir, Izharuddin, Tawseef Ayoub Shaikh

*Year :* 2021

*Title:* Machine Learning Approaches for Detection and Diagnosis of Parkinson’s Disease- A Review

*Methodology:* The main purpose of this paper is to contemplate the survey work of the machine learning techniques and deep learning procedures used for Parkinson’s disease classification. Deep learning and machine learning techniques have been used as a part of the discovery for the efficient classification of PD.

*Advantage:*. The voice measurements are non-invasive, therefore speech processing has been widely used in many diverse applications and has incredible potential in the classification and diagnosis of PD for many years and hence speech processing helped in the prediction of Parkinson’s disease.

*Disadvantage:* Voice measurements cannot be the only factor that can be used to predict parkinson’s disease. Other factors are also required to predict Parkinson’s disease consistently.

| **S.No** | **Author** | **Title of the Paper** | **Methodology** | **Pros (Advantage)** | **Cons**  **(Disadvantage)** |
| --- | --- | --- | --- | --- | --- |
|  | WU WANG , JUNHO LEE , FOUZI HARROU , (Member, IEEE), AND YING SUN (2020)  **(IEEE paper 1)** | Early Detection of Parkinson’s Disease UsingDeep Learning and Machine Learning | This paper examines A comparison between the proposed deep learning model and twelve machine learning andensemble learning methods based on relatively small data including 183 healthy individuals and 401 early PD patients shows the superior detection performance of the designed model. | Besides detecting the PD,It also provides the feature importance on the PDdetection process based on the Boosting method. | Designed using deep learningwith small PD data that are collected from 584 individuals(183 healthy and 401 early PD). |
|  | Timothy J. Wroge, Yasin Ozkanca , Cenk Demiroglu, Dong Si, David C. Atkins and Reza Hosseini Ghomi **(IEEE paper 2)** | Parkinson’s Disease Diagnosis Using Machine Learning and Voice | This paper explores the effectiveness of using supervised classification algorithms, such as deep neural networks, to accurately diagnose individuals with the disease | In this experiment, deep neural networks encoded the latentinformation within the audio features and interpret the PDdynamics that underlie the audio features to classify thepatients0 | The decision tree used in this system performs poorly. It performed with an accuracy of 75% and 72% on the AVEC and GeMaps features respectively. The decision tree performed poorly on metrics often scoring less than 70% and as low as an average recall score of 46% on the GeMaps features. |
|  | Kaninika, Akash Dayal  (2019)  **(IEEE paper 3)** | Determination of Parkinson’s disease utilizing Machine Learning Methods | This paper explores the methods used to determine Parkinson’s Disease using Machine learning methods. | The variation and jitter in the data can help detect Parkinson’s disease. A strategy dependent on principal component analysis is done, for diagnosing and finding the characteristics of sound individuals and individuals with Parkinson was examined. | In some cases, the variation and Jitter in the data is difficult to find and analyze. |
|  | Deepa Shenoy, Vibhudendra simha G G., P L Rrashmi , K R Venugopal, Sandhya Joshi, L M Patnaik. (2010)  **(Paper 4)** | Classification of Alzheimer’s Disease and Parkinson’s Disease by Using Machine Learning and Neural Network Methods | The objective of this paper was to classify the Alzheimer’s disease and Parkinson’s disease based on the most influencing risk factors using different classifier techniques | The classification model was validated with the test cases and the model achieved a high classification accuracy of 99.25% with Random forest tree and the Multilayer Perceptron. | The classification accuracy varies greatly with the change in the identification of the important risk factor with another and hence the model needs to be trained again. |
|  | Vasileios Skaramagkas, George Andrikopoulos, Zinovia Kefalopoulou, Panagiotis Polychronopoulos (2020)  **(Paper 5)** | Towards Differential Diagnosis of Essential and Parkinson’s Tremor via Machine Learning | In this paper, the challenge of identifying between Essential and Parkinson’s tremor is addressed. To this goal, a clinical analysis was performed, where a number of volunteers including Essential and Parkinson’s tremor-diagnosed patients underwent a series of pre-defined motion patterns, during which a wearable sensing setup was used to measure their lower arm tremor characteristics from multiple selected points. | The SVM and Bagged Trees algorithms managed to provide good prediction rates under most measurement points and arm poses, reaching up to 100% prediction success rates for both i) metacarpal measurements with the arm extended and ii) forearm measurements with the arm moving while holding an object. | The prediction algorithms had the lowest prediction percentages in the measurements when the arm was in a resting position. |
|  | Iqra Nissar, Waseem Ahmad M ir, Izharuddin, Tawseef Ayoub Shaikh (2021)  **(Paper 6)** | Machine Learning Approaches for Detection and Diagnosis of Parkinson’s Disease- A Review | The main purpose of this paper is to contemplate the survey work of the machine learning techniques and deep learning procedures used for Parkinson’s disease classification. Deep learning and machine learning techniques have been used as a part of the discovery for the efficient classification of PD. | The voice measurements are non-invasive, therefore speech processing has been widely used in many diverse applications and has incredible potential in the classification and diagnosis of PD for many years and hence speech processing helped in the prediction of Parkinson’s disease. | Voice measurements cannot be the only factor that can be used to predict parkinson’s disease. Other factors are also required to predict Parkinson’s disease consistently. |