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DETECTION OF PARKINSON DISEASE THROUGH MACHINE LEARNING

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Abstract

Parkinson 's disease (PD) is considered a malison for mankind for several decades. Its detection with the help of an automated system is a subject undergoing intense study. This entails a need for incorporating a machine learning model for the early detection of PD. For discovering a full proof model, the cardinal prerequisite is to study the existing computational intelligent techniques in the field of research used for PD detection. Many existing models focus on singular modality or have a cursory analysis of multiple modalities. This encouraged us to provide a comparative literature study of four main modalities signifying major symptoms used for early detection of PD, namely, tremor at rest, bradykinesia, rigidity, and, voice impairment. State- of-the-art machine learning implementations namely Logistic Regression (LR), Support Vector Machine (SVM), Decision Tree (DT), K-nearest neighbors (KNN), Stochastic Gradient Descent (SGD) and Gaussian Naive Bayes (GNB) are executed in these modalities with their respective datasets. Furthermore, ensemble approaches such as Random Forest Classifier (RF), Adaptive Boosting (AB) and Hard Voting (HV) are implemented

1 . INTRODUCTION

Parkinson's disease (PD) is a long-termed, neurological disorder that causes a person to lose control over several body functions including speech. It is the second most common neurodegenerative disease after Alzheimer's disease [1]. Dr. James Parkinson was the first to describe this condition called 'paralysis agitation' or 'the shaking palsy' [2]. In the 21st century, PD is a ubiquitous issue. In 2015, PD affected 6.2 million people and resulted in about 1,17,400 deaths globally. This accounts for various researches [3] [4] [5] to be undertaken to study and eventually cure the disease. The loss of nerve cells in the part of the brain called the substantia nigra causes PD. These nerve cells or neurons create an organic chemical named dopamine which

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acts as a neurotransmitter between the parts of the brain and central nervous system that helps to control and co-ordinate body movements. Although this disease can be diagnosed at an early stage [6], its long term treatment is not yet discovered. The clinical diagnosis of the patient by the doctor was focused on his/her sense and experience, based on his/her knowledge and studying previous cases of PD from large databases in the hospitals. But with the advent of strong tools like Artificial Intelligence and Machine Learning, this took a subtle turn [7], various state-of-the-art machine learning tools and techniques analyzed the high dimensions of data in the datasets which made the work of prediction simple.

Fig 1.1 Effected person

2 The primary symptoms of PD were the motor dysfunctions, which involved tremors of limbs, hand, legs, and jaws, bradykinesia or slowness of movement, rigidity in limbs which is observable in the PD affected patient's gait and postural instability [8] [9]. Furthermore, there are several other symptoms like loss of memory and depression which are termed as non-motor symptoms [10] [11]. PD can be diagnosed, but its effective treatment is a challenging task. There is no definitive cure discovered for PD or either to show its progression, but there are various rating methods like Unified Parkinson's Disease Rating Scale (UPDRS) and MDSUPDRS [12], which helps to estimate the severity of the disease. Sometimes there is a possibility that patients do not cooperate with the doctors while examination [13] which causes imprecise and inaccurate results. So, the usage of automated tools like machine learning would ease the task of clinicians and would improve the diagnosis accuracy

2. LITERATURE SURVEY

Akmak, Y. O¨.; O¨ lc¸ek, S.C.; O¨ zsoy, B.; Go¨kc¸ay, D." Quantitative Measurement of Bradykinesia in Parkinson's Disease Using Commercially Available Leap Motion." Biosignals, Proceedings of the 11th International Joint Conference on Biomedical Engineering Systems and Technologies; Funchal: Madeira, Portugal, 2018; Volume 3, pp. 227–232. 2018. The levels of these symptoms are clinically assessed by a scoring system based on

Unified Parkinson's Disease Rating Scale Adams, WR.

"The detection of hand tremor through the characteristics of finger movements while typing." Posted August 5, 2018. bioRxiv 385286; doi:https://doi.org/10.1101/385286. Accessed online September 17, 2018., 2018. Parkinson's Disease (PD) is a neurodegenerative movement disease affecting over 6 million people worldwide.

Lonini, L., Dai, A., Shawen, N. et al. "Wearable sensors for Parkinson's disease: which data are worth collecting for training symptom detection models." npj Digital Med 1, 64 (2018) doi:10.1038/s41746-018-0071-z., 2018. Machine learning algorithms that use data streams captured from soft wearable sensors have the potential to automatically detect PD symptoms and inform clinicians about the progression of disease. Yao, L., Brown, P., Shoaran, M., "Resting Tremor Detection in Parkinson's Disease with Machine Learning and Kalman Filtering.", 2018 IEEE Biomedical Circuits and Systems Conference (BioCAS). doi:10.1109/biocas.2018.8584721, 2018.
Adaptive deep brain stimulation (aDBS) is an emerging method to alleviate the side effects and improve the efficacy of conventional open-loop stimulation for movement disorders. Di Biase, Lazzaro et al.,

"Quantitative Analysis of Bradykinesia and Rigidity in Parkinson's Disease.", Frontiers in neurology vol. 9 121. doi:10.3389/fneur.2018.00121, 2018. The specific aims are: identify the most sensible place where to locate sensors to monitor PD bradykinesia and rigidity, and identify objective indexes able to discriminate PD OFF/ON motor status, and PD patients from healthy subjects (HSs).Methods Fourteen PD patients (H&Y stage 1–2.5), and 13 age-matched HSs, were enrolled. Five magneto-inertial wearable sensors, placed on index finger, thumb, metacarpus, wrist, and arm, were used as motion tracking systems.

Sensors were placed on the most affected arm of PD patients, and on 4 dominant hand of HS. Three UPDRS part III tasks were evaluated: rigidity (task 22), finger tapping (task 23), and prono-supination movements of the hands (task 25). A movement disorders expert rated the three tasks according to the UPDRS part III scoring system. In order to describe each task, different kinematic indexes from sensors were extracted and analyzed. Results Four kinematic indexes were extracted

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Baldereschi M, Di Carlo A, Rocca WA, Vanni P, Maggi S, Perissinotto E, et al. "Parkinson's disease and parkinsonism in a longitudinal study: Two-fold higher incidence in men. ILSA Working Group. Italian Lon- gitudinal Study on Aging." Neurology. 2000;55:135863. C. G. Goetz, et al.

"Movement disorder society-sponsored revision of the unified Parkinson's disease rating scale (MDSUPDRS): Scale presentation and clinimetric testing results." Mov. Disord., Vol. 23, no. 15, pp. 2129–70, 2008. B. Post, M. P. Merkus, R. M. de Bie, R. J. de Haan, and J. D. Speelman "Unified Parkinson's disease rating scale motor examination: Are ratings of nurses, residents in neurology, and movement disorders specialists interchangeable?" Movement Dis., Vol. 20, pp. 1577–84, 2005.

3 . SYSTEM DESIGN

3.1 SYSTEM ARCHITECTURE

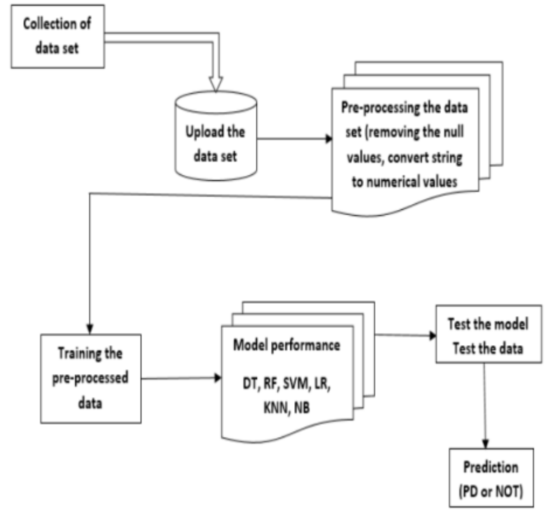

Fig 3.1 System Architecture

3.2 UML DIAGRAMS UML

stands for Unified Modeling Language. UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group. The goal is for UML to become a common language for creating models of objectoriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML. The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems. The UML represents a collection of best engineering

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practices that have proven successful in the modeling of large and complex systems. The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

GOALS:

The Primary goals in the design of the UML are as follows: 1. Provide users a ready-to-use, expressive visual modeling Language so that they can develop and exchange meaningful models. 2. Provide extendibility and specialization mechanisms to extend the core concepts. 3. Be independent of particular programming languages and development process. 4. Provide a formal basis for understanding the modeling language. 5. Encourage the growth of OO tools market. 6. Support higher level development concepts such as collaborations, frameworks, patterns and components. 7. Integrate best practices.

3 .2.1 USE CASE DIAGRAM

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.

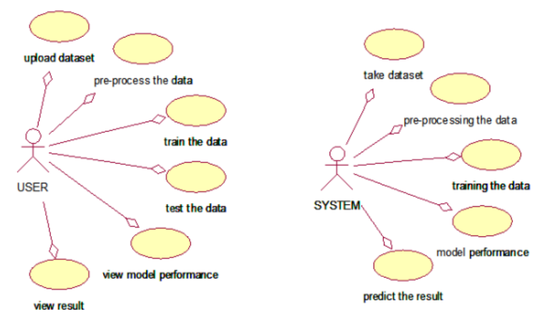

Fig 3.2 Use Case Diagram

4 . OUTPUT SCREEN

Fig 4.1 output screen

By taking analysis of the data such as patient name, patient age, gender details etc .we get the output whether the patient is effected or not.

5 . CONCLUSION

Artificial Intelligence and medical sciences have developed a relationship that helps to cure pervasive diseases like PD. Various symptoms like Bradykinesia, Tremor at rest, Rigidity and Voice Impairment can be detected for early detection of PD. There is no definite medical procedure/diagnosis to cure parkinsonism of a person, which even applies to bioinformatics. But, strong tools like Machine Learning have abridged the process of detecting PD by making it economically viable and effective. Based on the researches discussed in this paper, machine learning can assist doctors in detecting PD. Simple electronic devices, like a mobile phone for voice recording, using software like Tappy for detecting slowness in movement, and many more can be utilized for detection. According to the results shown in section V, the detection of bradykinesia and tremor leads to the concrete results for the early detection of this disease. Moreover, noticed the accuracy of detection could be increased in two ways, by implementing ensemble approaches like bagging, boosting, voting, and by increasing the size of the dataset.

6 . FUTURE ENHANCEMENT

After the success of our model, in future any enthusiastic would like to extend this project by using finger moments of the user to know whether he/she affected by Parkinson’s disease or not with more accuracy. Early detection of Parkinson's disease and systematic early and accurate detection of motor fluctuations (and other motor symptoms) using artificial intelligence may

7 . REFERENCE

[1] D. B. Calne “Is idiopathic parkinsonism the consequence of an event or a process” Neurology, Vol. 44, no. 15, pp. 5–5, 1994.

[2] J. Parkinson “An Essay on Shaking Palsy. London: Whittingham and Rowland Printing 1817.

[3] Surathi, P., Jhunjhunwala, K., Yadav, R., Pal, P. K. ”Research in Parkinson’s disease in India: A review : Annals of Indian Academy of Neurology” 19(1), 9–20. doi:10.4103/0972- 2327.167713, 2016.

[4] Muthane UB, Chickabasaviah YT, Henderson J, Kingsbury AE, Kilford L, Shankar SK, et al. “Melanized nigral neuronal numbers in Nigerian and British individuals” Mov Disord. 2006;21:123941.

[5] Baldereschi M, Di Carlo A, Rocca WA, Vanni P, Maggi S, Perissinotto E, et al. “Parkinson’s disease and parkinsonism in a longitudinal study: Two-fold higher incidence in men. ILSA Working Group.

Italian Lon- gitudinal Study on Aging." Neurology. 2000;55:135863.

[6] Steven T. DeKosky, Kenneth Marek "L+ooking Backward to Move For- ward: Early Detection of Neurodegenerative Disorders" The American Association for the Advancement of Science Vol. 302, Issue 5646, pp. 830-834 DOI: 10.1126/science.1090349, 2003.

[7] Farhad Soleimanian Gharehchopogh, Peyman Mohammadi and Parvin Hakimi "Application of Decision Tree Algorithm for Data Mining in Healthcare Operations: A Case Study." International Journal of Com- puter Applications, Vol: 52, No:6, PP:21-26, 2012.

[8] A. Schrag, C. D. Good, K. Miszkiel, H. R. Morris, C. J. Mathias, A. J. Lees, and N. P. Quinn "Differentiation of atypical parkinsonian syndromes with routine MRI." Neurology, Vol. 54, pp. 697–702, 2000.

[9] R. Angel, W. Alston, and J. R. Higgins. "Control of movement in Parkinson's disease." Brain, Vol. 93, no. 1, pp. 1–14, 1970.

[10] S. L. Wu, R. M. Liscic, S. Kim, S. Sorbi, and Y. H. Yang "Nonmotor symptoms of Parkinson's disease." Parkinson's Dis., 2017. DOI:10.1155/2017/4382518, 2017.

[11] T. Yousaf, H. Wilson, and M. Politis "Imaging the nonmotor symptoms in Parkinson's disease." Int. Rev. Neurobiol., Vol. 133, pp. 179–257, 2017. have significant therapeutic implications leading to improvements research methodologies and most importantly in PD patient care.