(12) PATENT APPLICATION PUBLICATION

(19) INDIA

(22) Date of filing of Application :03/07/2024

(21) Application No.202441051003 A

(43) Publication Date : 12/07/2024

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(54) Title of the invention : A COMPREHENSIVE MODEL FOR EARLY DETECTION AND REAL-TIME MONITORING OF PARKINSON'S DISEASE USING MACHINE LEARNING TECHNIQUES

(51) International classification	:G06K0009620000, G16H0050700000, G16H0010600000, A61B0005000000, G16H0050200000
(86) International Application No Filing Date	:NA :NA
(87) International Publication No	: NA
(61) Patent of Addition to Application Number Filing Date	:NA :NA
(62) Divisional to Application Number Filing Date	:NA :NA

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(57) Abstract :

Abstract: The present invention relates to a comprehensive model for the early detection and real-time monitoring of Parkinson's Disease (PD) using advanced machine learning techniques. The model integrates Logistic Regression, Support Vector Machines (SVM), Extra Trees Classifier (ETC), and an ensemble method combining ETC, SVM, L1, L2 regularization, and AdaBoost to enhance diagnostic accuracy. Achieving an impressive 91% accuracy, this integrated approach significantly improves the reliability of early PD detection. The invention also features a real-time monitoring framework that continuously tracks patient data, providing dynamic insights and allowing for adaptive interventions tailored to the patient's evolving condition. To enhance data interpretability, the model incorporates t-Distributed Stochastic Neighbor Embedding (t-SNE) visualization, offering clear, actionable insights into complex patient data. Comparative analyses of algorithmic strengths, feature selection techniques, and parameter tuning strategies are employed to optimize model performance. This invention provides a valuable tool for clinicians, enabling early diagnosis and personalized management of Parkinson's Disease, and sets the stage for future innovations in personalized healthcare.

No. of Pages : 11 No. of Claims : 8