

PROPOSED SOLUTION

PROBLEM STATEMENT:

Parkinson's Disease Detection is the process of detecting whether a person is affected by Parkinson's disease or not. Based on speech recordings of PD patients the Parkinson's Disease detection is done. With these speech recordings as a dataset, the train test split method was implemented to evaluate the performance of the classifiers through the Support Vector Machine.

IDEA/SOLUTION DESCRIPTION:

Support vector machines classifier (SVM) in machine learning, is a set of related supervised learning methods widely used in pattern recognition, classification, voice activity detection and regression analysis.

A proposed system for classifying subtypes of Parkinson's disease is strongly linked to disease duration and severity.

The purpose of training a neural network is to obtain reliable results. Prediction is what the neural network returns after receiving input, for example, "given the number of drugs, the probability of tremor in a patient's hands becomes lower is 60%". Sometimes a neural network makes mistakes, but it can learn from them. If the predicted value is too high, it **will reduce weight in order to get a lower predicted value next time, and vice versa.**

NOVELTY/UNIQUENESS:

Novelty seeking can be a positive trait leading to creativity and innovation, but it is also related to increased risk of damaging addictive behaviour. We have assessed novelty seeking with a three armed bandit task, in which novel stimuli were occasionally introduced, replacing choice options from which the participants had been choosing. This allowed us to assess whether or not they would be prone to selecting novel stimuli. We tested 25 non impulsive patients with Parkinson's disease (PD) and 27 PD patients with impulsive compulsive behaviours (ICBs). Both patient groups were examined "on" and "off" dopaminergic medication in a counterbalanced order and their behaviour was compared with 24 healthy controls. We found that PD patients with ICBs were significantly more prone to choose novel options than either non impulsive PD patients or controls, regardless of medication status. Our findings suggest that attraction to novelty is a personality trait in all PD patients with ICBs which is independent of medication status.

SOCIAL IMPACT/CUSTOMER SATISFACTION:

Satisfaction with all aspects of consultation and treatment tended to be lower for patients with moderate-to-severe symptoms (self-reported $H\&Y \geq 3$) and physicians of patients with moderate-to-severe symptoms ($H\&Y \geq 3$) compared with mild symptoms ($H\&Y$ 1-2). Physicians of patients with moderate-to-severe symptoms ($H\&Y \geq 3$) reported significantly lower satisfaction (slightly satisfied, satisfied, and extremely satisfied) than patients (self-

reported H&Y ≥ 3) with the consultation (51.7% vs. 62.4%; $p < 0.01$) and overall treatment (43.2% vs. 53.9%; $p < 0.01$). For patients, there were no notable differences in satisfaction with the overall consultation between patients with mild (self-reported H&Y 1-2) and moderate-to-severe (self-reported H&Y ≥ 3) symptoms (75.6% vs. 62.4%, respectively). Of all the factors assessed, patients and physicians were least satisfied with exercise therapy/rehabilitation, irrespective of disease severity. There were no notable differences in the proportions of physicians and patients who were satisfied in the mild (H&Y 1-2, self-reported for patients) symptom groups, but there was a tendency toward lower rates of satisfaction among physicians compared with patients in the moderate to-severe (H&Y ≥ 3 , self-reported for patients) symptom group.

BUSINESS MODEL(Financial benefit):

The EBC Value of Treatment Initiative combined different stakeholders to identify unmet needs in the patients' journey according to Rotterdam methodology. The economic evaluation focused on three major topics identified as major gaps: start of treatment; best treatment for advanced disease; and adherence to treatment. Two separate healthcare systems (Germany and the UK) were chosen. Cost-effectiveness was determined by using decision-analytical modelling approaches. Effectiveness was expressed as quality-adjusted life-years (QALYs) gained and incremental cost-effectiveness ratio. Treatment intervention in PD was found to be cost-effective regardless of the initial health state of the patient receiving the treatment. Cost savings were between -€1000 and -€5400 with 0.10 QALY gain and -€1800 and -€7600 with 0.10 QALY gain for Germany and the UK, respectively. Treatment remains cost-effective within the National Institute for Health and Care Excellence thresholds. Availability of adequate treatment to more patients was also found to be cost-effective, with an ICER of €15,000–€32,600 across country settings. Achieving the target adherence to treatment would generate cost-savings of €239,000–€576,000 (Germany) and €917,000–€2,980,000 (UK) for every 1,000 patients treated adequately.

SCALABILITY OF SOLUTION:

UPDRS Subscale 1: Mentation, Behavior, and Mood

The examiner asks the patient about each of the following areas of cognitive function or mood and the rater scores the answers from 0 to 4, with 4 representing the greatest level of dysfunction, based upon the responses of the patient or a caregiver. The sum of these scores for this subscale can range from 0 (normal) to 16.

1. Intellectual impairment (the list of possible responses can be read to the patient and examples provided as needed). Possible ratings of patient response:
 - 0—none
 - 1—mild consistent forgetfulness with partial recollection of events and no other problems

- 2—moderate memory loss, with disorientation and moderate difficulty handling complex problems
 - 3—severe memory loss with disorientation with respect to time and often place; severe difficulty with complex problems
 - 4—severe memory loss with orientation preserved only to person; unable to make judgments or solve problems, cannot be left home alone
2. Thought disorder (read the possible responses for the patient). Possible ratings of patient response:
- 0—none
 - 1—vivid dreaming
 - 2—benign hallucinations with insight preserved, that is, the patient is able to distinguish that the hallucinations are not real
 - 3—occasional to frequent hallucinations or delusions with preserved insight; could interfere with activities of daily living
 - 4—persistent hallucinations, delusions or florid psychosis, not able to care for self

UPDRS Subscale 2: Activities of Daily Living

The examiner asks the patient to describe his or her function separately in the ON and OFF state. The responses for each of the 14 items on subscale 2 are therefore scored twice, once for ON and once for OFF. These ratings are done by the examiner based upon the responses of the patient or caregiver. The total score for subscale 2 ranges from 0 to 56.

1. Speech:
 - 0—normal
 - 1—mildly affected, with no difficulty being understood
 - 2—moderately affected, occasionally asked to repeat statements
 - 3—severely affected and frequently asked to repeat statements
 - 4—unintelligible most of the time
2. Salivation:
 - 0—normal
 - 1—slight but definite excess of saliva; may have nighttime drooling
 - 2—moderate excessive saliva; may have minimal daytime drooling
 - 3—marked excessive saliva; some daytime drooling
 - 4—marked drooling; requires constant use of tissue or handkerchief
3. Swallowing:
 - 0—normal
 - 1—rare choking
 - 2—occasional choking
 - 3—requires soft food
 - 4—requires nasogastric tube or gastroscopy tube for feeding

UPDRS Subscale 3: Motor Examination

Subscale 3 is an examiner rating of the motor manifestations of PD. This is the most commonly used subscale and has 14 different types of ratings, with many of these ratings done

independently for the different limbs. Each of the ratings ranges from 0 to 4. The original UPDRS included only integers, but some use 0.5 increments; however, use of these 0.5 increments has not undergone clinimetric testing or validation. The total score for subscale 3 ranges from 0 to 108, the sum of scores from 27 observations.