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# A ReliefF-SVM-based method for marking dopamine-based disease

## characteristics: A study on SWEDD and Parkinson's disease

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### Abstract

Parkinson's disease (PD) and scans without evidence of dopaminergic deficit (SWEDD) are two distinct neurological disorders that require different therapeutic approaches; therefore it's critical to classify the two disorders. The neuroimaging technology based on dMRI provided connectivity information and voxel features that can make it possible for researchers to analyze SWEDD and PD differences. In this work, a novel method of ReliefF-SVM-based dMRI analysis was presented to study the potential relations between PD and SWEDD. Some sensorimotor connections were found group-wise differences, and SVM was suggested to successfully classify PD and SWEDD. These results indicate that our method using connectivity information and voxel features may provide a new strategy for disease analysis with small sample data.

**Keywords:** dMRI; Tractography; Machine learning; Parkinson's disease; SWEDD;

### 1. Introduction

Parkinson's disease (PD), as the second most common long-term neurodegenerative disease, mainly affects the motor system and cognition<sup>1</sup>. Modern medicine suggests that PD is principally induced by the loss of brainstem dopamine neuron. However, in recent years, the clinical diagnosis has shown that approximately 10% of PD patients do not lose dopaminergic neurons in the brainstem, and these patients were classified as having scans without evidence of dopaminergic deficit (SWEDD)<sup>2</sup>. The clinical manifestations of PD and SWEDD include quiescent tremor, exercise retardation, muscle rigidity, postural gait disorders and cognitive disorders,

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