Artificial Intelligence in the Early Detection of Multiple Sclerosis Symptoms : Integrating Clinical, Imaging, an*d* Patient-Generated Data via Immune Intel Platform

Fatima Zohra Ouali :0009-0004-0836-0358

**2025/8 VOL.8.,ALL RIGHTS RESERVED. © 2024 FATIMA ZOHRA OUALI**

***Abstract***

Early detection of multiple sclerosis (MS) remains essential to prevent irreversible neurological decline. While conventional methods rely on MRI and clinical evaluation, artificial intelligence (AI) techniques including machine learning (ML), deep learning (DL), and explainable models offer enhanced sensitivity and predictive power. This paper reviews recent AI applications in MS detection, and introduces Immune Intel, a novel AI-powered digital platform that integrates immunological biomarkers, imaging data, and patient-reported inputs for early detection and monitoring. We discuss algorithmic approaches, model interpretability, clinical workflow integration, and platform architecture, emphasizing innovations contributing to precision neurology.

***Key words***

* Multiple sclerosis**,** Artificial intelligence**,** Machine learning**,** Deep learning**,** Early diagnosis**,** Symptom detection**,**Medical imaging**,** Predictive modeling.

***Introduction***

MS is a chronic autoimmune condition affecting the central nervous system, often leading to demyelination, cognitive impairment, and motor dysfunction. Diagnosis frequently depends on clinical examination and MRI findings, yet subtle early-stage changes may be overlooked, delaying therapeutic intervention. AI methods especially ML and DL are proving transformative in detecting these early alterations :

* A systematic review reported sensitivities ranging from 76.9% to 100% and specificities between 74% and 100%, with accuracy up to 100%, across 38 studies using MRI, OCT, serum/CSF markers, and motor data .
* ML models using clinical biomarkers achieved high performance—one model attained 94.74% accuracy, 97.26% recall, and a high AUC of 0.94—while remaining explainable through SHAP analysis .

These findings underscore that AI approaches are maturing to support earlier, data-driven detection of MS.This article proposes a novel AI-based platform for the detection of early MS symptoms, integrating clinical and immunological insights with patient-generated data.

***2025/8 VOL.8.,ALL RIGHTS RESERVED. © 2024 FATIMA ZOHRA OUALI***

***N.B:The present text represents a section of a full scientific manuscript available with the author***

***Author-mail: fatima\_zohra.ouali08@yahoo.com***