**Functional Document**

1.**Introduction**

The Multiple Sclerosis (MS) Detection System leverages deep learning to automate diagnosis using MRI scans. This project implements lesion segmentation with U-Net and classification with EfficientNet, offering radiologists AI-assisted diagnosis for timely and accurate treatment.

**2.Product Goal**

To develop a hybrid deep learning model that combines semantic segmentation and classification for effective detection of MS lesions from MRI images.

**3.Demography (Users, Location)**

* **Users**: Radiologists, Neurologists, and Healthcare Professionals
* **Location**: Diagnostic labs, hospitals, and neurological centers globally

**4.Business Processes**

* **MRI Image Upload and Preprocessing**: Users upload MRI scans, which are resized and augmented.
* **Lesion Segmentation**: U-Net segments MS lesions with pixel-level accuracy.
* **Classification**: EfficientNet classifies MRI scans into Normal, MS Axial, or MS Sagittal.
* **Report Generation**: Results are displayed in the web app interface for clinical interpretation.

**5.Features**

**Feature 1**: **MS Lesion Segmentation**

* **Description**: Semantic segmentation of lesions using U-Net
* **User Story**: As a radiologist, I want to view segmented MRI scans to identify MS-affected areas precisely.

**Feature 2**: **MRI Classification**

* **Description**: Classification of MRI scans using EfficientNet into three classes.
* **User Story**: As a clinician, I want to automatically classify MRI types to speed up diagnosis.

**Feature 3**: **Web Application Interface**

* **Description**: Django-based web portal for uploading MRI scans and viewing results.
* **User Story**: As a doctor, I want to upload scans and get real-time results through a simple web interface.

**6.Authorization Matrix**

| **Role** | **Access Level** |
| --- | --- |
| Admin | Full access to system operations and reports |
| Radiologist | Upload and analyze scans, view segmentation/classification |
| Guest User | Limited view for demo scans and public reports |

**7.Assumptions**

* Sufficient GPU resources are available for model inference.
* Radiologists have access to digital MRI scan datasets.
* The system will use pre-trained models and benchmark datasets.