**Functional Document**

**Stroke Segmentation Model Requirements Document**

**1. Introduction**

This document outlines the requirements for a segmentation model designed to detect stroke-affected regions. The goal is to ensure clinical reliability, accuracy, and interpretability in medical decision-making.

**2. Product Goal**

The segmentation model aims to:

* Validate its performance using expert-annotated ground truth data to ensure clinical accuracy.
* Optimize segmentation performance through hyperparameter tuning and loss function selection.
* Generate visual heatmaps for better interpretability and validation in clinical settings.

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

**Users:**

* Radiologists
* Neurologists
* Medical Researchers
* AI/ML Engineers

**Location:**

* Hospitals
* Research Institutions
* Diagnostic Centers
* AI Development Labs

**4. Business Processes**

1. Data Collection & Annotation
2. Model Training & Validation
3. Performance Optimization
4. Clinical Testing & Evaluation
5. Deployment & Integration into Healthcare Systems
6. Continuous Monitoring & Improvement

**5. Features**

**5.1 Feature 1: Stroke Region Segmentation**

**1. Description**

The model identifies and segments stroke-affected regions in brain scans to assist medical professionals in diagnosis and treatment planning.

**2. User Story**

* As a medical researcher, I want to validate the segmentation model using expert-annotated ground truth data, so that I can ensure clinical reliability and accuracy in detecting stroke-affected regions.
* As an AI engineer, I want to optimize segmentation performance by fine-tuning hyperparameters and loss functions, so that the model can achieve higher accuracy and robustness in identifying stroke-affected regions.
* As a radiologist, I want the model to generate visual heatmaps of stroke-affected areas, so that I can easily interpret and validate the results for better clinical decision-making.

**6.Authorization Matrix**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Role** | **Data Access** | **Model Training** | **Validation** | **Report Generation** |
| Radiologist | Yes | No | Yes | Yes |
| Neurologist | Yes | No | Yes | Yes |
| Medical Researcher | Yes | Yes | Yes | Yes |
| AI/ML Engineer | Yes | Yes | Yes | No |

**7. Assumptions**

* The ground truth data is annotated by experienced medical professionals.
* The model training pipeline follows best practices in AI/ML for medical imaging.
* The model is validated against industry benchmarks for stroke detection.
* The generated visual heatmaps are interpretable and clinically relevant.
* The deployment environment complies with medical regulatory standards.