

## Functional Requirements

### Project Title: Thermal Imaging for Knee Pain Detection

#### 1. Overview

This document outlines the functional requirements for a system that utilizes thermal imaging and data science techniques to detect and analyze knee pain. The system aims to provide accurate, non-invasive diagnostics and actionable insights for healthcare professionals.

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## 2. Functional Requirements

### 2.1 Identify Key Functions and Features

#### 1. Core Functions:

- Thermal Image Processing: Analyze images for abnormalities.
- Diagnostic Report Generation: Provide actionable insights and recommendations.
- User Management: Manage accounts and access levels.
- Data Storage: Securely store patient and imaging data.

#### 2. Advanced Features:

- AI-Powered Analysis: Use machine learning to improve detection accuracy.
- Historical Data Comparison: Allow users to monitor patient progress.
- Alerts and Notifications: Notify stakeholders of critical findings.

### 2.2 Use Case Documentation

#### 1. Use Case 1: Upload and Analyze Thermal Images

- **Pre-Conditions:** User has a valid account and access to the system.
- **Basic Flow:**
  1. User uploads thermal images.
  2. System preprocesses and analyzes images.
  3. Results are displayed with insights.

- **Alternate Flows:**
  - Image upload fails due to incompatible format.
  - Analysis is delayed due to server issues.
- **Post-Conditions:** Analysis results are saved and accessible to the user.

## 2. Use Case 2: Generate Diagnostic Report

- **Pre-Conditions:** Analysis is complete, and user requests a report.
- **Basic Flow:**
  1. User selects "Generate Report."
  2. System compiles data and creates a formatted report.
  3. Report is downloaded or emailed to the user.
- **Post-Conditions:** Report is saved in the system for future reference.

## 2.3 User Stories

### 1. Healthcare Professional:

- "As a healthcare professional, I want to analyze patient images quickly so that I can provide timely diagnoses."
- **Acceptance Criteria:**
  - Upload and analysis completed within 5 seconds.
  - Results include clear visuals and insights.

### 2. Patient:

- "As a patient, I want to view my diagnostic results securely so that I can track my treatment progress."
- **Acceptance Criteria:**
  - Results are accessible via a secure portal.
  - Historical data is easy to compare.

## 2.4 Prioritization and Effort Estimation

### 1. High Priority:

- Thermal Image Analysis (8 hours).

- Diagnostic Report Generation (6 hours).
  - 2. Medium Priority:
    - Historical Data Comparison (10 hours).
    - Alerts and Notifications (5 hours).
  - 3. Low Priority:
    - Multilingual Support (15 hours).
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### **3. Stakeholder Identification**

1. **Primary Stakeholders:**
    - Healthcare professionals.
    - Patients.
  2. **Secondary Stakeholders:**
    - System administrators.
    - Developers.
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### **4. Stakeholder Engagement Process**

1. Conduct interviews with healthcare professionals to gather detailed requirements.
  2. Organize workshops with developers to brainstorm technical implementations.
  3. Distribute surveys to patients to collect preferences on usability.
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### **5. Existing Documentation Review**

- Review business plans and project charters to align goals.
  - Analyze similar systems to identify common requirements and gaps.
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## **6. Functional and Non-Functional Requirements**

### **1. Functional Requirements:**

- Image upload and analysis.
- Report generation.
- User management.

### **2. Non-Functional Requirements:**

- Performance: Analyze images within 5 seconds.
  - Security: End-to-end encryption for data.
  - Usability: Intuitive interface for non-technical users.
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## **7. Use Case Analysis**

1. Develop detailed use cases to describe interactions.
  2. Include pre-conditions, basic and alternate flows, and post-conditions for each use case.
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## **8. Deliverables**

1. Fully functional thermal imaging analysis system.
  2. Comprehensive use case documentation.
  3. User manuals and training materials.
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