System Requirements

Stakeholders

- **Doctors**: End users diagnosing inflammation and pathologies in hands using thermal imaging.
- **Patients**: Indirect beneficiaries of improved diagnostic tools and early pathology detection.
- **Hospitals**: Institutions leveraging the system for enhanced patient care and research.
- **Development Team**: Developers, project managers, and data scientists creating and maintaining the system.

Functional Requirements

1. Image Preprocessing

- The system must preprocess uploaded images to:
    - Image Registration - Isolate the hand from the background.
    - Segment the hand into areas divided by the joints.
    - Extract relevant thermal information from the image, including pixel-wise temperature values and spatial distribution, used as features for classification.

2. Inflammation Detection

- The system identifies areas of inflammation in the hand.
- Highlight inflamed regions on the processed image for user interpretation.

3. Pathology Detection

- Detect and flag anomalies as pathologies.
- Provide classifications or labels for flagged pathologies.

4. Reporting

- Display a summary of the analysis results within the web interface.
  Include visual indicators of inflammation regions and possible pathologies.

Non-Functional Requirements

1. Security

- Users that are not logged in are unable to view any results or images, and logged in users without the proper authorization will not be able to view other user's images or reporting results.
- User data and images must be encrypted during storage and transmission.

2. Performance

- Analysis results should be available:
    - 90% of the time within 30 seconds.
    - 99% of the time within 2 minutes.

3. Scalability

- The system should handle up to 300 concurrent users.

4. Reliability

- Maintain an uptime of 99%.
- Ensure graceful handling of unexpected errors.

5. Usability

- At least 90% of users should complete key tasks (e.g., uploading images) within the first two attempts.
- The average time to upload an image and view results should not exceed 2 minutes.

6. Accuracy

- The system will provide results with at least 80% accuracy and 80% specificity.

7. User Authentication

- Users can create an account by registering with a unique email and password.
- Provide secure authentication mechanisms (e.g., hashed passwords, OAuth).
- Users who are not logged in using their credentials are not able to view or upload any images.