OralOptix

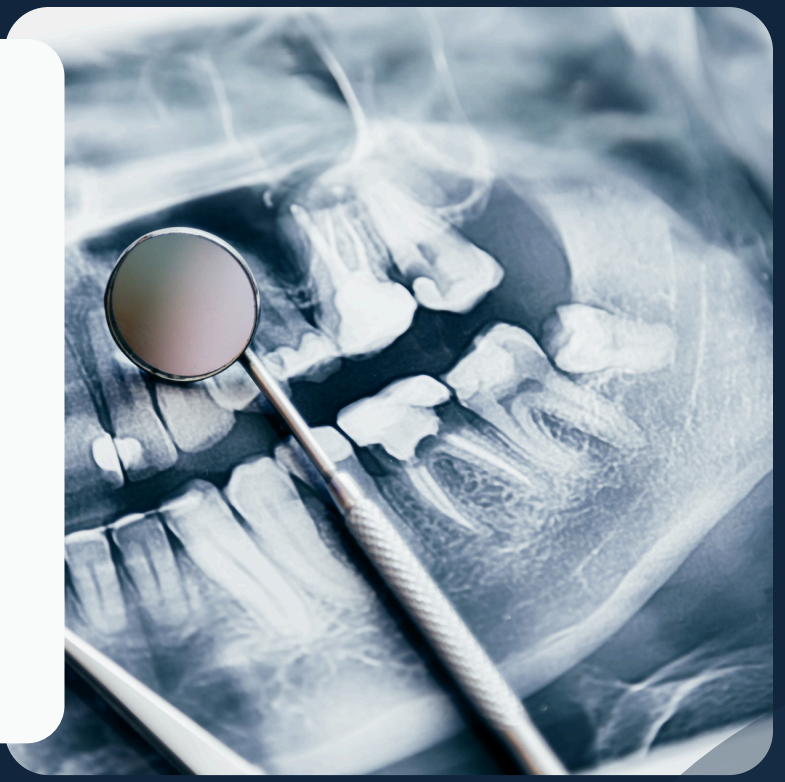
INTELLIGENT ASSESSMENT OF INTRA-ORAL RADIOGRAPH QUALITY

SUPERVISED BY

Problem Definition

manual review is :

- time-consuming
- requires significant expertise.
- can lead to inefficiencies



Objectives

Create a Database of Errors

Rapid Error Detection

Design a simple and effective user interface

Increase the level of diagnostic accuracy

Educational tool for dental students

Aims

The project aims to create an AI-based system that automatically assess the quality of radiographic images, whether they are accepted or rejected, depending on the acceptance of intra-oral radiographs standers. In addition, it identifies the common technical errors, such as incorrect positioning, inappropriate density and contrast, and scanner-related issues.

10cm

Target users

- Dentist
- dental Hygienists
- Oral Sergeons

MOTIVATION

Healthcare Improvements in Saudi Arabia

- Better outcomes, fewer complications
- Reduces human error, improves accuracy

Impact

- More efficient healthcare, reduced costs, better outcomes
- Decreased redundant radiographic exposures, improving diagnostic efficiency and patient safety.

Vision 2030 Alignment

Supporting Vision 2030's focus on promoting preventive care, reducing medical errors, and utilizing advanced technologies to improve healthcare outcomes in Saudi Arabia.

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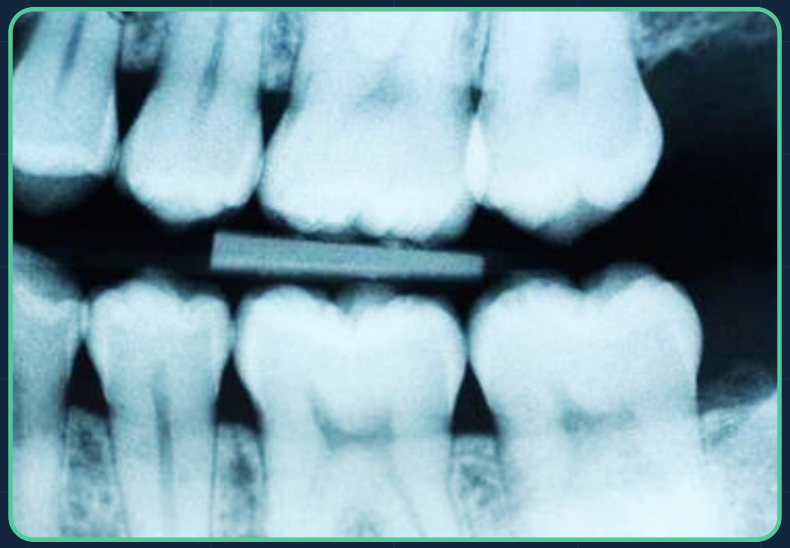
SCOPE

The scope of "OralOptix" is dedicated to improving Bitewing X-rays, a specific type of dental X-ray essential for viewing areas between teeth that aren't visible during standard exams. These X-rays are vital for detecting cavities and monitoring bone health.



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Problem Solution

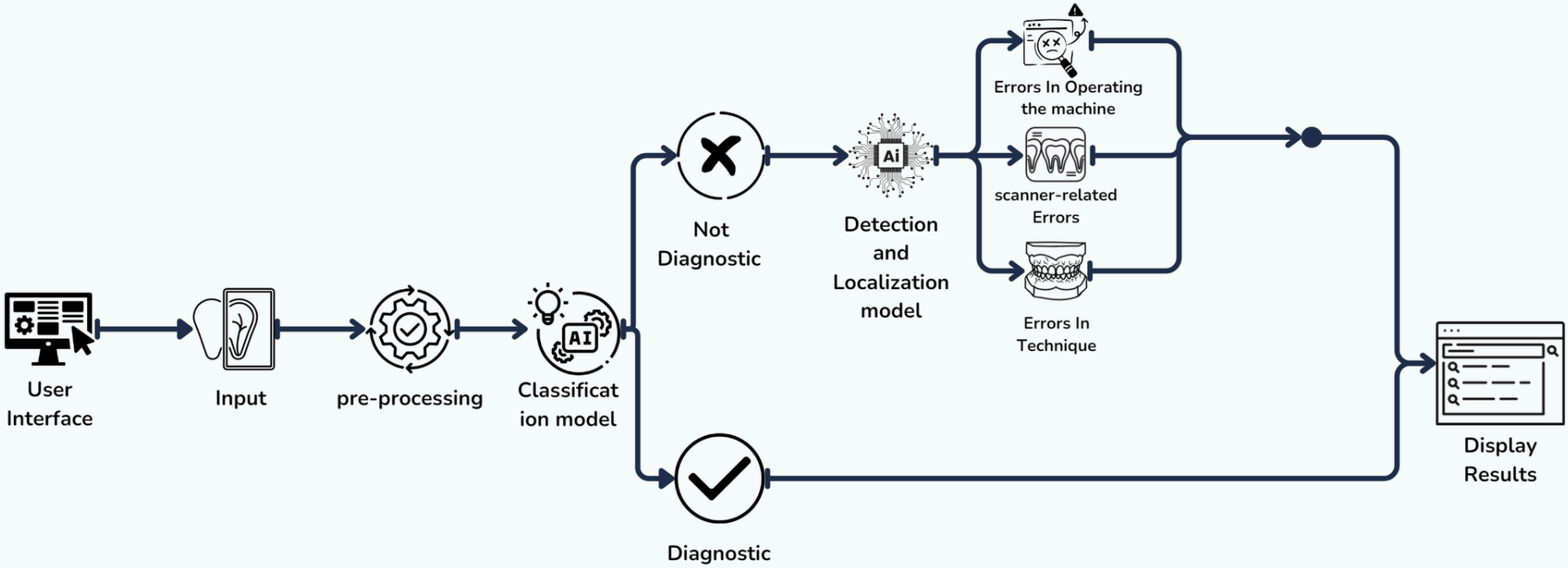
automated system that leverages machine learning and deep leraning to :

increase accurately.

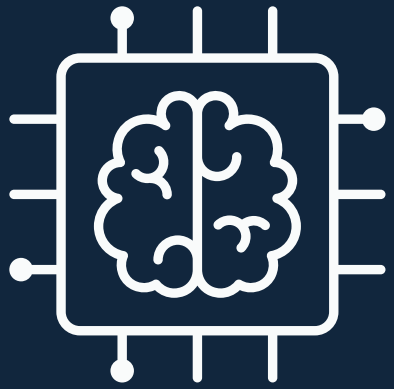
classify X-rays as diagnostic or non-diagnostic

locate the exact location of the problem

Problem Solution



Literature Survey:



Machine Learning

Deep Learning

Computer Vision

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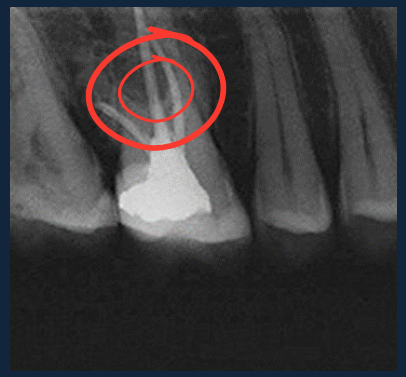
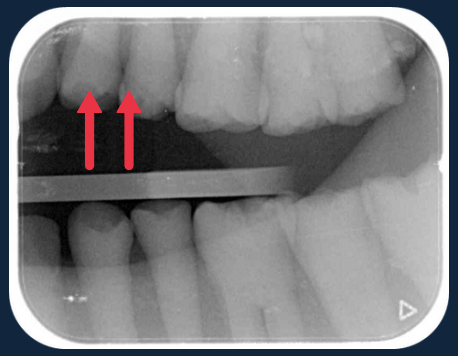
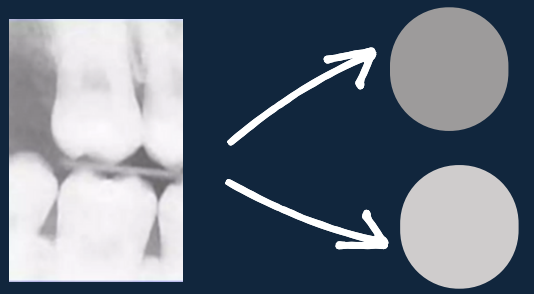
Image Processing techniques used:



Object Detection



Distance estimation



Feature Extraction

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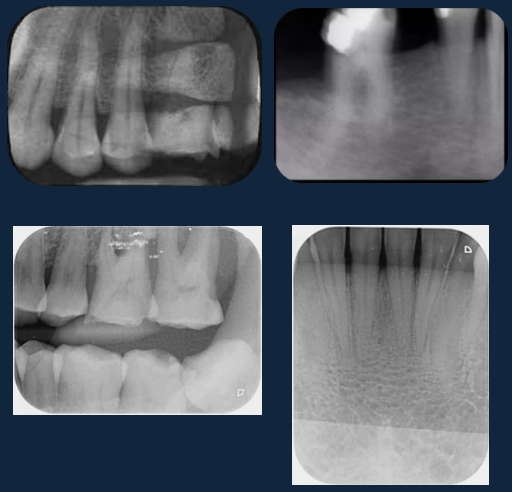
Data Collection

Diagnostic



non-Diagnostic + Type of Error

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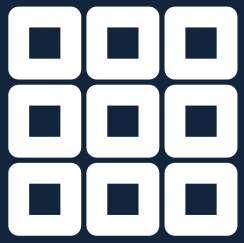
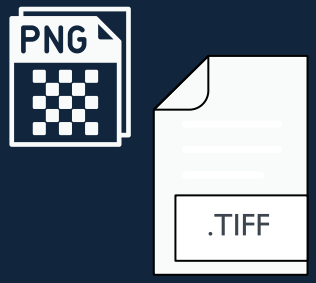
Data Pre-Processing

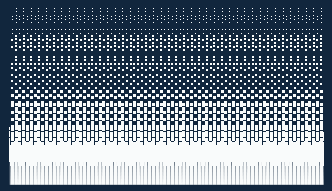


1-Labeling:



2-Image Standardization:

3-Rotation and Alignment:



4-Normalization:

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Data Gathering:

Questionnaire

A survey of 41 dental professionals found that many regularly encounter unusable bitewing radiographs due to technique and scanner-related errors, spending 1-5 minutes per radiograph on quality checks. Poor-quality X-rays lead to retakes and diagnostic delays, emphasizing the need for improved quality-checking methods. Sixty-five percent of participants found an automated system "Extremely helpful," with a strong preference for saving time and reducing patient exposure to radiation.

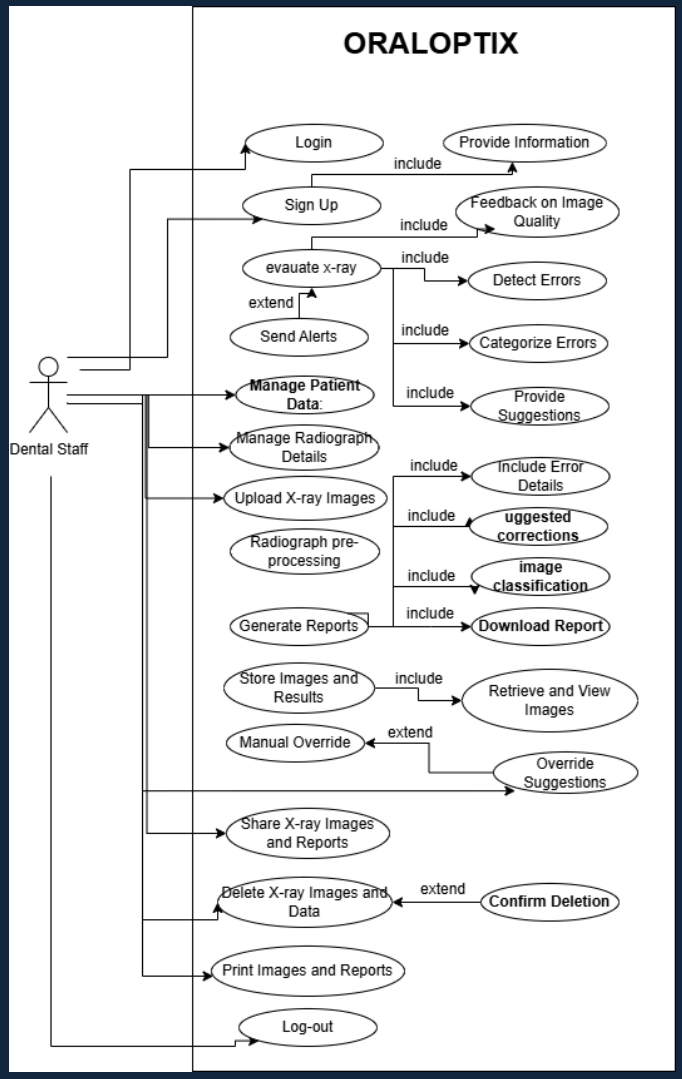
Data Gathering:

Interview

In an interview, Dr. Najla Neamatalla Turkestani, an Assistant Professor in the Department of Restorative and Esthetic Dentistry, explained that checking bitewing radiographs by hand takes a lot of time and can lead to mistakes, especially with less experienced dental students; she recommended an automated system to improve accuracy, lower patient X-ray exposure, and enhance overall patient care and satisfaction.

Use-Case Diagram

The ORALOPTIX use case diagram shows how dental staff interact with a system for managing patient X-ray data. Key functions include logging in, signing up, evaluating and categorizing X-ray errors, and generating reports. Staff can upload, process, and classify images, as well as share, print, or delete data. Additional options include sending alerts, overriding system suggestions, and confirming deletions. The diagram emphasizes a structured workflow for evaluateing radiographic details, and send feedback to the user.



Functional Requirements

FR.1: The system shall detect errors .

FR.1.1: The system shall provide corrective suggestions to the technician to adjust the X-ray positioning or other parameters before exposure.

FR.3: The system shall allow users to print X-ray images and quality assessment reports.

FR.5: The system shall allow authorized users to share X-ray images and corresponding quality assessment reports securely

FR.2: The system shall generate detailed analysis reports for each radiograph image.

FR.2.1: The report shall include detected errors, suggested corrections, and the image classification.

FR.4: The system shall allow users to input and manage patient data.

FR.6: The system shall allow users to upload multiple X-ray images at once for analysis and automatically process each image.

Non-functional Requirements

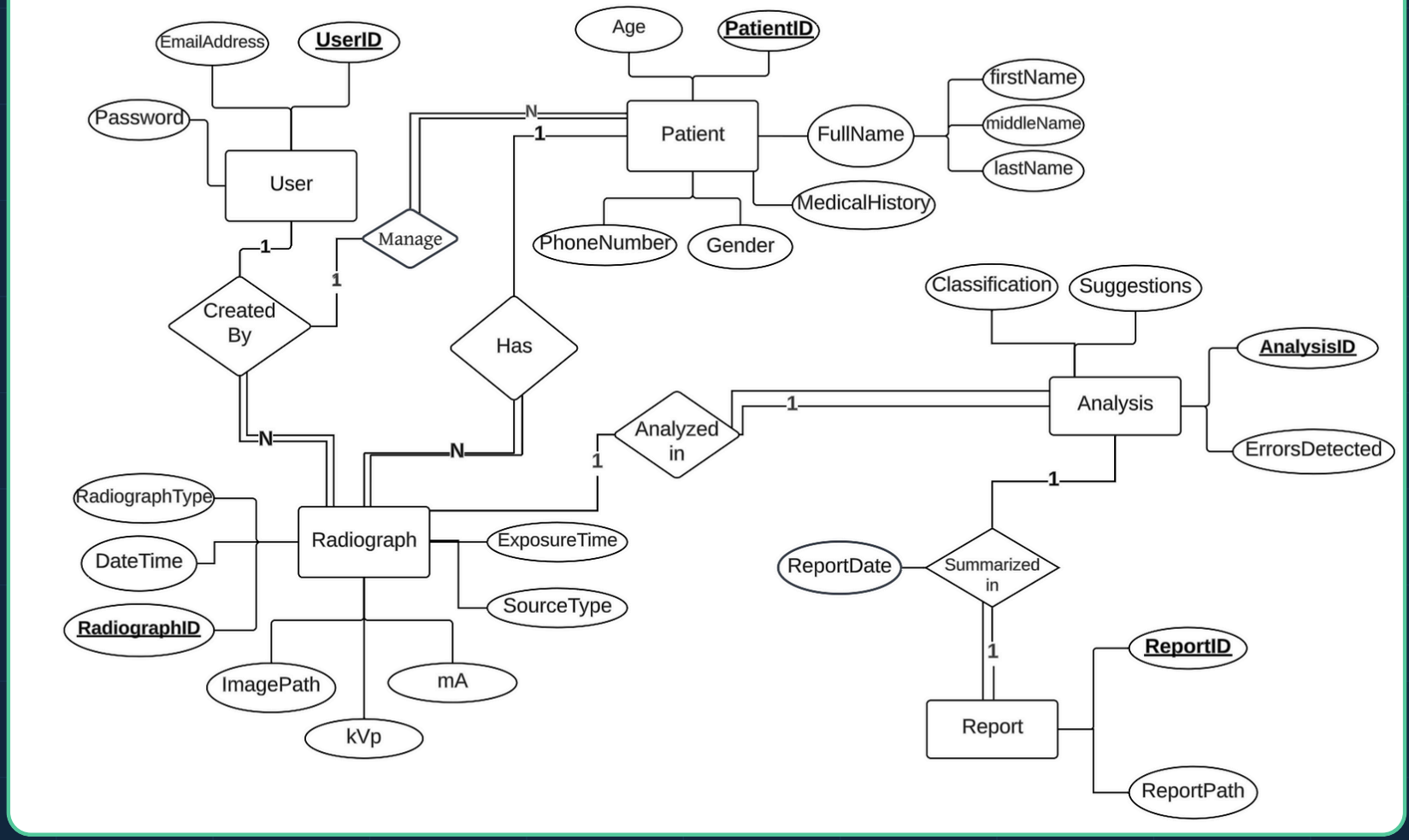
FR.1: The system must provide a user-friendly interface.

FR.2: The system should support the English language

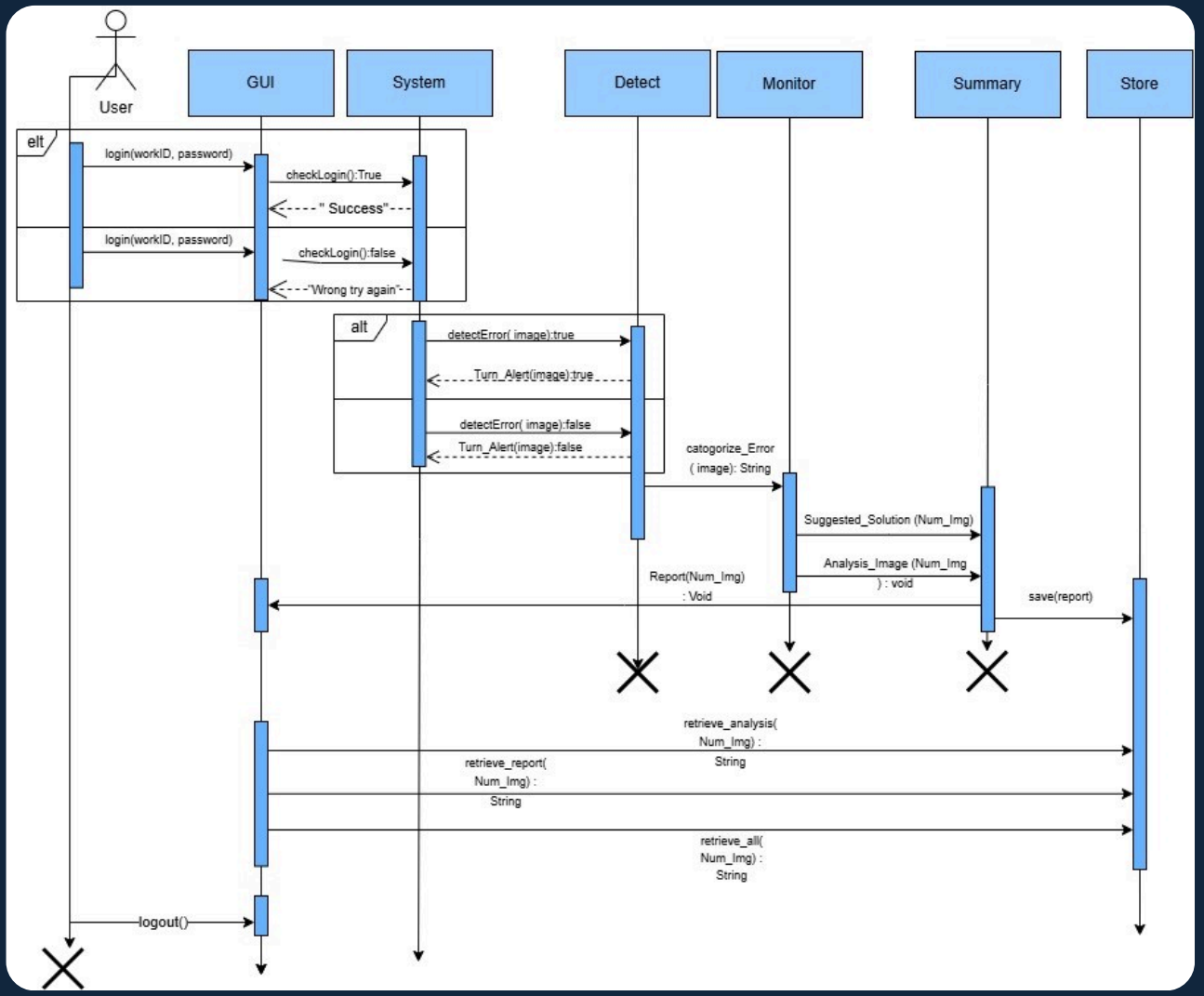
FR.3: The system shall ensure data security and privacy.

FR.4: The system should respond within an acceptable timeframe.

The Entity Relationship Diagram



Sequence Diagram



Thanks

Do you have any questions ?