



Work in the Health Domain

An introduction to the diverse landscape and scope of technology-focused projects within the health sector.

Development of a Chatbot for Accessibility to Medication Leaflets

Improving patient understanding and safety through accessible drug information.



Objectives

Key goals include a user-friendly interface, comprehensive database, NLP for understanding queries, personalized interactions, and ensuring security and privacy compliance.



Methodology

The approach involves user surveys, chatbot development (NLP, AI, UI), database integration, search algorithms, usability testing, and iterative improvements.



Expected Results

Anticipated outcomes are a functional multi-platform chatbot, enhanced patient understanding, reduced medication errors, and greater information accessibility for diverse users.

Develop an interactive chatbot to improve patient understanding and safety regarding medication use by providing accessible information from drug leaflets.

Development of a Voice Recognition System for Medical Appointments

Enhancing Clinical Documentation with Wispers Technology



Project Goal

Implement a voice recognition system using Wispers technology for automated transcription of medical appointments in Portuguese hospitals to improve efficiency and accuracy.



Key Objectives

Develop real-time transcription, adapt to Portuguese and medical vocabulary, integrate with EMR, ensure security, and conduct accuracy evaluations.



Methodology Outline

Needs assessment, voice model development, EMR integration, security implementation, and pilot testing with adjustments.



Expected Outcomes

A functional transcription system, reduced documentation time, improved clinical information quality, and increased professional and

The project aims to deliver a functional and accurate voice recognition system, significantly reducing documentation time and enhancing the quality of clinical records.

Development of a System for Generating Synthetic Medical Image Data

Leveraging GANs and Generative AI for Enhanced Medical Diagnosis and Research



System Development

Create a system using Generative Adversarial Networks (GANs) and generative AI to produce synthetic medical image data for training algorithms, enhancing medical diagnosis and research.



Objectives

Key goals include developing and optimizing GANs for realistic image generation, utilizing AI for data enrichment, validating synthetic data, and disseminating findings.



Methodology

This involves needs assessment, GAN model development and training, implementation of generative AI techniques like style transfer, and evaluation through metrics and expert validation.



Expected Results

Anticipated outcomes include an open-source synthetic data generation system, high-quality synthetic datasets, and improved availability and diversity of medical imaging data.

The project aims to deliver a robust system for generating synthetic medical image data, ultimately contributing to advancements in medical diagnosis and research through improved data availability and quality.



Project Overview

Development of a System for Extracting Information from Electronic Medical Records (EMRs)

Summary

Develop an innovative system using Natural Language Processing (NLP) to automate the extraction of relevant clinical data from EMRs, facilitating analysis, research, and clinical decision-making.

Objectives

- Develop NLP algorithms for automated EMR information extraction.
- Adapt NLP models for medical record language.
- Extract key clinical data (diagnoses, treatments, etc.).
- Integrate with existing EMR systems.
- Validate system accuracy and effectiveness.

Methodology

- EMR data analysis and key element identification.
- NLP model development and training (deep learning, etc.).
- Information extraction algorithm implementation.
- Integration with EMR systems (interoperability standards).
- Validation tests and adjustments.

Expected Results: Automated NLP-based information extraction system, improved efficiency and quality of clinical data analysis, seamless integration into existing EMR systems, reduced administrative burden on healthcare professionals.

All-in-one Security Approach

Critical eHealth Systems Protection



- **Proactive Defense**

Implement continuous, active cybersecurity monitoring of all equipment critical to clinical practice to detect and prevent threats before they impact patient care.

- **Comprehensive Incident Response**

Establish robust capabilities for swift detection, containment, investigation, and resolution of cybersecurity attacks targeting eHealth systems, ensuring minimal disruption to healthcare services.

João Ferreira's Projects Overview

1

Health Projects

Cybersecurity @ Hospitals

2

Non-Health Projects

Indoor Guidance System (Intelligent Systems), BIM Models, Energy Management System (Remote Monitoring)

3

Project Areas

Energy savings in buildings, Indoor guidance, Data-Driven approaches, Disaster Management, Illegal fishing control (Data analytics on VMS data), People2People & Things2People communication.

Dashboards and AI in Healthcare

Data Monitoring & Advanced Analytics

Real-time Data Monitoring

Comprehensive dashboards for continuous oversight.

AI-Powered Patient Risk Analysis

Proactive identification and management of patient risks.

Deep Learning for Pathology

Advanced AI models for accurate pathology image analysis.

Clinical AI Model Features

Enhancing diagnostic and treatment capabilities.

ETL at Hospital Santa Maria

Integration of 200Gb of data.

Key Working Areas

Classification and Knowledge processes in Health.

Working with Data Modalities



Image Data

Capabilities for processing and analyzing image-based information.



Text Data

Abilities to work with and understand textual content.

Home Care: Leveraging IoT and AI for Enhanced Solutions

Improving quality of life, safety, and independence through innovative technology integration.

- Remote Patient Monitoring

Utilize wearable devices and sensors to track vital signs, signs, activity levels, and health issues for proactive care. care.

- Smart Home Integration

Implement AI-powered devices for daily living assistance, enhanced safety (fall detection, and comfort.

- Predictive Analytics

Employ AI algorithms to analyze IoT data, identify potential health risks, and enable preventative measures. measures.

- Virtual Assistance & Companionship

Develop AI assistants for support, reminders, social interaction, and service access.

- Caregiver Support

Provide tools and insights from IoT/AI data to empower caregivers with real-time information and reduce burden.

AAL – Remote Primary Care as a Service using SLA

Exploring innovative remote primary care models



Hospital Load Reduction

Integrating new health stakeholders to alleviate pressure on existing healthcare facilities.



Advanced Diagnostics

Utilizing Computer Vision for objective pain assessment.



First-Level Interaction

Implementing a chatbot for initial patient engagement and information gathering.



Service Level Agreements (SLAs)

Defining clear service standards for different tiers of remote primary care support.

Potential Applications: Enhanced support for caregivers. Improved management of chronic diseases.

Application and Benefits

Process Mining at Hospitals

Application of Process Mining techniques to analyze and optimize hospital operations. This involves leveraging data from systems like EHRs, LIS, and PACS to understand patient journeys and streamline workflows.

- Identify inefficiencies through data-driven insights.

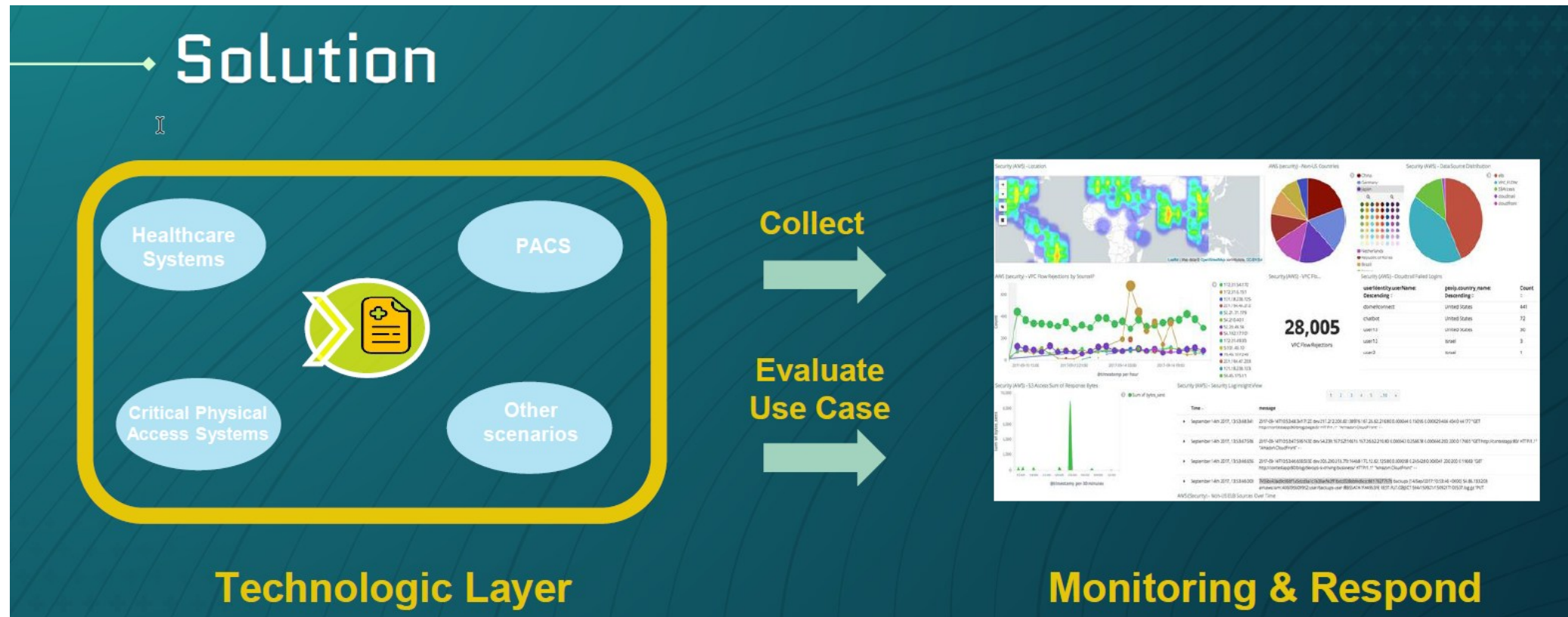
Optimized Hospital Processes

Streamlined. Efficient. Patient-Centered.



Key benefits include improved patient care, reduced operational costs, and enhanced resource allocation.

All-in-one security approach: Critical eHealth Systems Protection



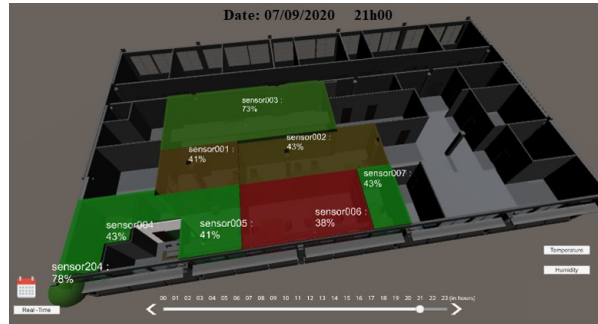
Construction of a system that allows:

- 1.to detect from the point of view of cybersecurity an active monitoring on equipment critical to clinical practice
- 2.facilitates detection, containment, investigation and resolution of cybersecurity attacks.

Joao Ferreira project

Project areas:

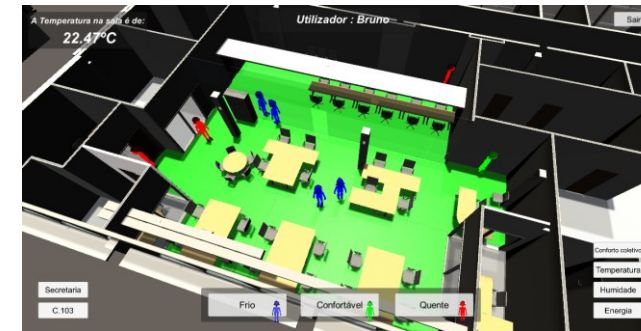
- Energy savings at buildings
- Indoor guidance
- Data Driven approaches
- Disaster
- Illegal fishing control



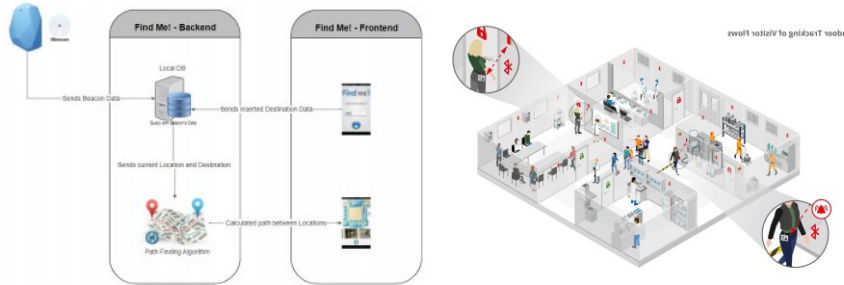
Things2People



BIM Models



People2People



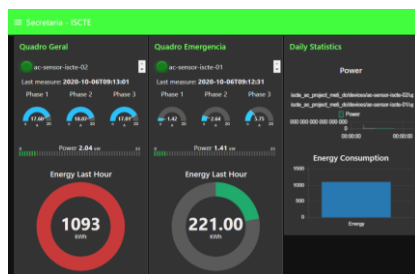
Indoor Guidance System



Cybersecurity@Hospitals



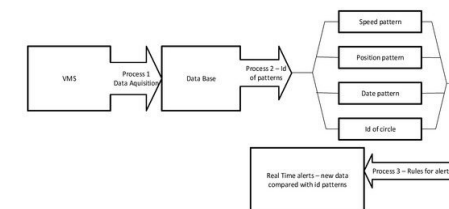
Intelligent Systems



Energy Management System

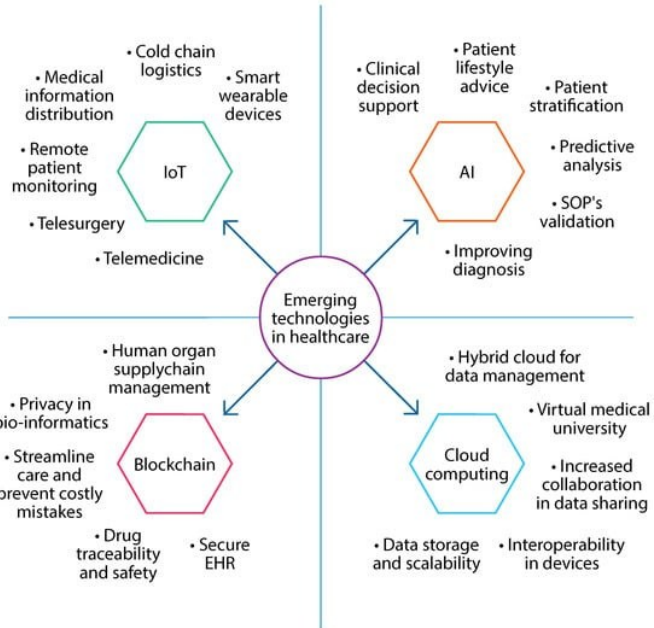


Remote Monitoring

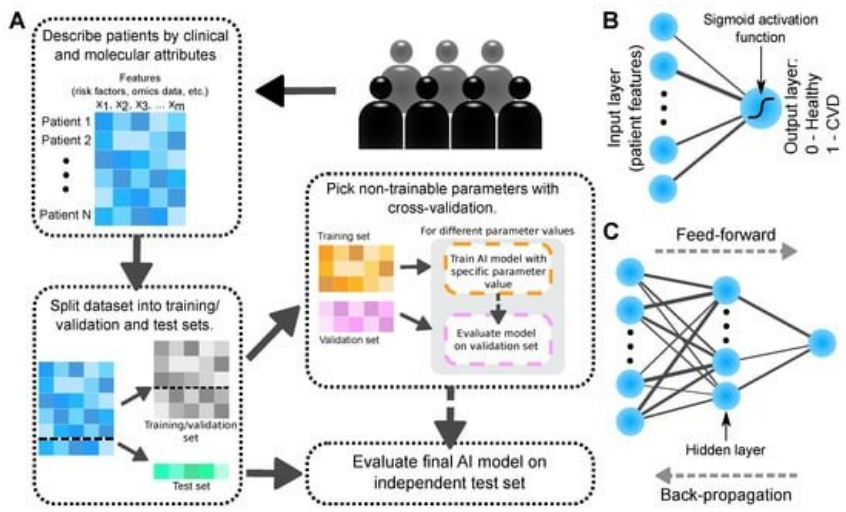


Fishing control process based On Data analytics over VMS data

Working areas in Health

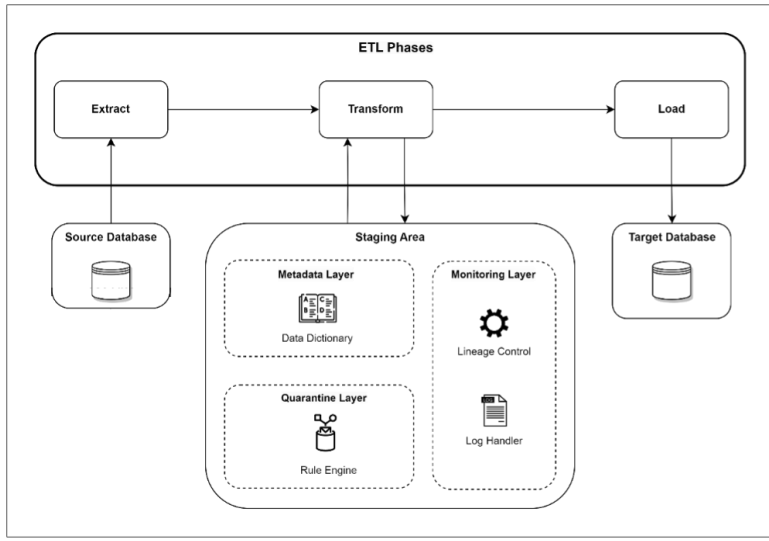


AI for Patient Risk Analysis

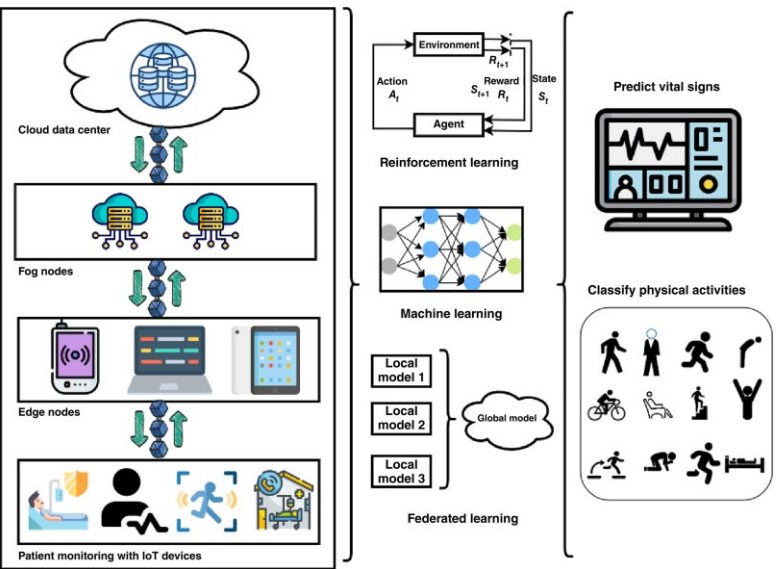


- The deep learning AI model provides fast and powerful image analysis assistance to pathologists in their diagnostic tasks
- Clinical AI Models

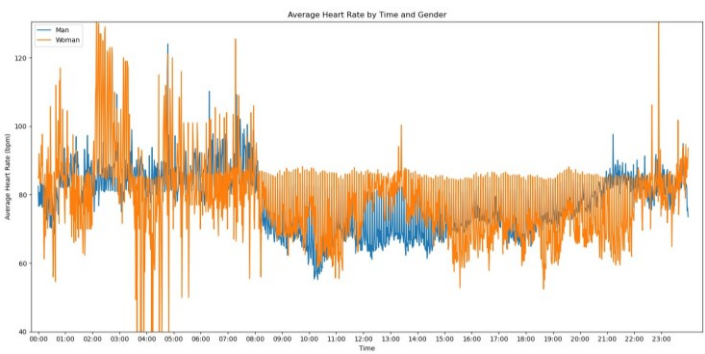
Data Integration at Hospital (ETL Process)



Classification and Knowledge process



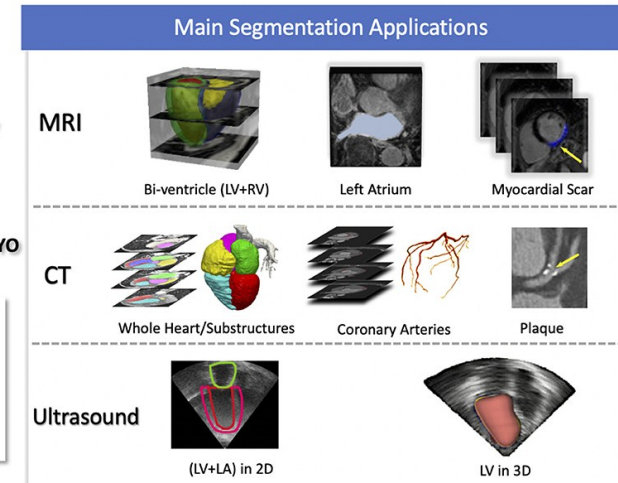
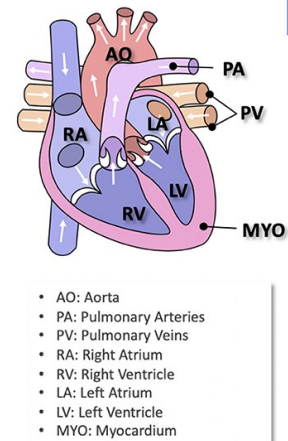
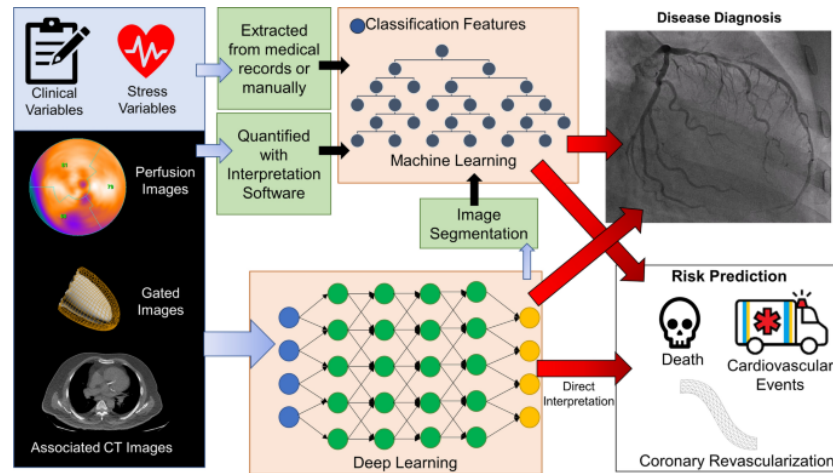
Dashboards for data Monitoring



ADMISSIONS	ENCOUNTERS	NOTES	PATIENT FOLLOW-UP
Number of tables: 13 Tables: ADMISSIONADVANCEDIRECTIVE ADMISSIONAMBULATORYSTATUS ADMISSIONCHEF COMPLAINT ADMISSIONDIAGNOSIS ADMISSIONS ADMISSIONTYPES ADVANCEDIRECTIVES AMBULATORYSTATUS BILLINGPHARMACY CHEF COMPLAINTS COUNTRIES DIAGNOSTICFUNCTIONALTYPE DISCHARGES	Number of tables: 3 Tables: ENCOUNTERTYPE ENCOUNTERTYPEBLOCK ENCOUNTERNOTETYPE ENCOUNTERS	Number of tables: 5 Tables: CUSTOM NOTES NOTES NOTETEMPLATES NOTETYPEBLOCKS NOTETYPES	Number of tables: 21 Tables: ANALYSES ANALYSTYPES ASSESSMENTITEMS CATEGORIES CATEGORYTYPES CNCODES COMBINEDORDERS FAMILIES FAMILYBEHAVIOR LABDATASTATUS LABRESULTS, LABSOURCES, LABTESTS ORDERS, ORDERTYPES ROUTES ROUTETYPES SCOREGROUPS SCOREITEMS SCHEDULES TREATMENTS
BOOY SYSTEM EXAMS	ENVIRONMENT	OTHER TABLES	STAFF
Number of tables: 4 Tables: BOOYSYSTEMEXAMITEMRESULT BOOYSYSTEMEXAMITEMS BOOYSYSTEMEXAMS BOOYSYSTEMEXAMTYPES	Number of tables: 13 Tables: ASATYPES CLINICALPRIORITIES DEPARTMENTS DEPARTMENTTYPES ENVIRONMENTLOCATION ENVIRONMENTMEDICALPROCEDURE ENVIRONMENTMENTS ENVIRONMENTTYPEGROUPS ENVIRONMENTTYPES LATERALITIES LOCATIONS MEDPROFUNCTIONALTYPE SITES	Number of tables: 15 Tables: ADTSTATES ANESTHESIA APPLICATIONVERSION CENTER COVID PATIENTS COMPLICATIONS FORMTYPES INTERFACENOTES KINTYPES NEARESTKIN ORDERTASKSTATUS OVERRIDEREASONS PHYSIOLOGICVARIABLETHRESHOLDS PHYSIOLOGICVARIABLES PCSDATA RTDATA	Number of tables: 14 Tables: ATTENDINGTYPES CLINICALROLEATTENDINGTYPE CLINICALROLES FACILITIES GROUPGROUP GROUPMAPPINGS GROUPS, GROUPSTAFF MEAS STAFF STAFFATTENDINGTYPE STAFFATTENDINGTYPEHWRON STAFFTYPES TIMEZONES
COMPONENTS	EVENTS	PATIENTS	TASKS
Number of tables: 4 Tables: COMPONENTS COMPONENTTYPES PARTCOMPONENT PARTS	Number of tables: 5 Tables: BILLINGPROFEE EVENTCATEGORIES EVENTDATA EVENTS EVENTTYPES	Number of tables: 22 Tables: ALLERGIES ALLERGYGROUPS BLOODGROUPS ETHNICITIES MARITALS PATIENTALLERGYREACTION PATIENTINSURANCECOMPANY PATIENTPRECAUTION PATIENTROLE PATIENTS PATIENTSUBSCRIPTION PERIODS PRECAUTIONS PRECAUTIONTYPES RACES REACTIONS REACTIONTYPES RELIGIONS SEXES	Number of tables: 2 Tables: COMBINEDTASKS TASKS
DIAGNOSES	MEDICAL PROCEDURES	MEDICATIONS	UNITS
Number of tables: 4 Tables: H_DIAGNOSES H_DIAGNOSISTYPES S_DIAGNOSES S_DIAGNOSISTYPES	Number of tables: 4 Tables: H_MEDICALPROCEDURES H_MEDICALPROCEDURESTYPES S_MEDICALPROCEDURES S_MEDICALPROCEDURESTYPES	Number of tables: 6 Tables: CURRENTMEDFREQUENCIES CURRENTMEDICATION CURRENTMEDICATIONSTATUS MEDICATIONS MEDICATIONTYPEMEDICATION MEDICATIONTYPES	Number of tables: 3 Tables: UNITS UNITTIMES UNITTYPES

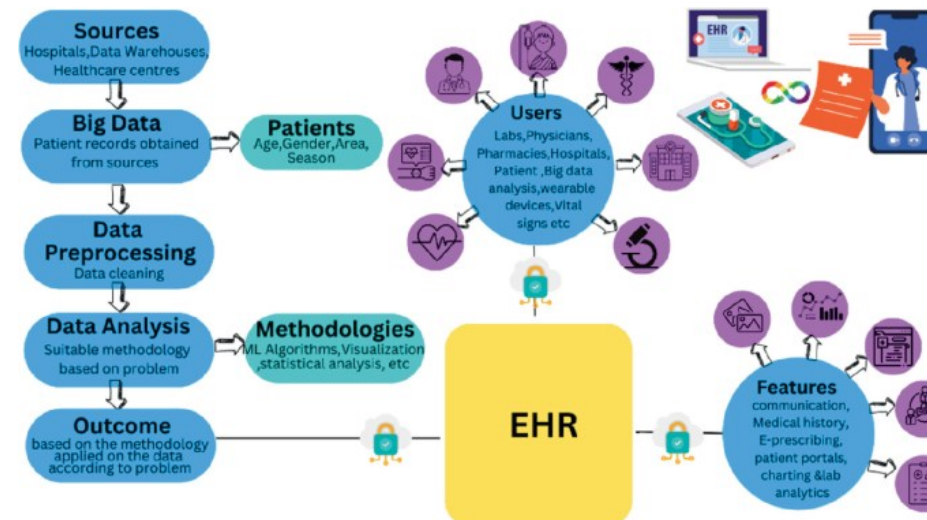
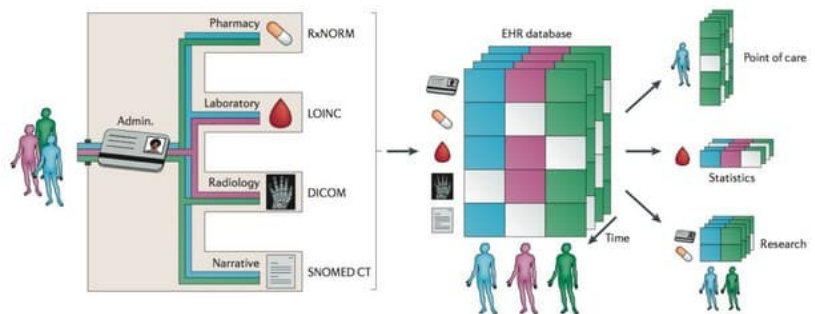
200Gb of Data from Hospital Santa Maria Portugal

Work with Image

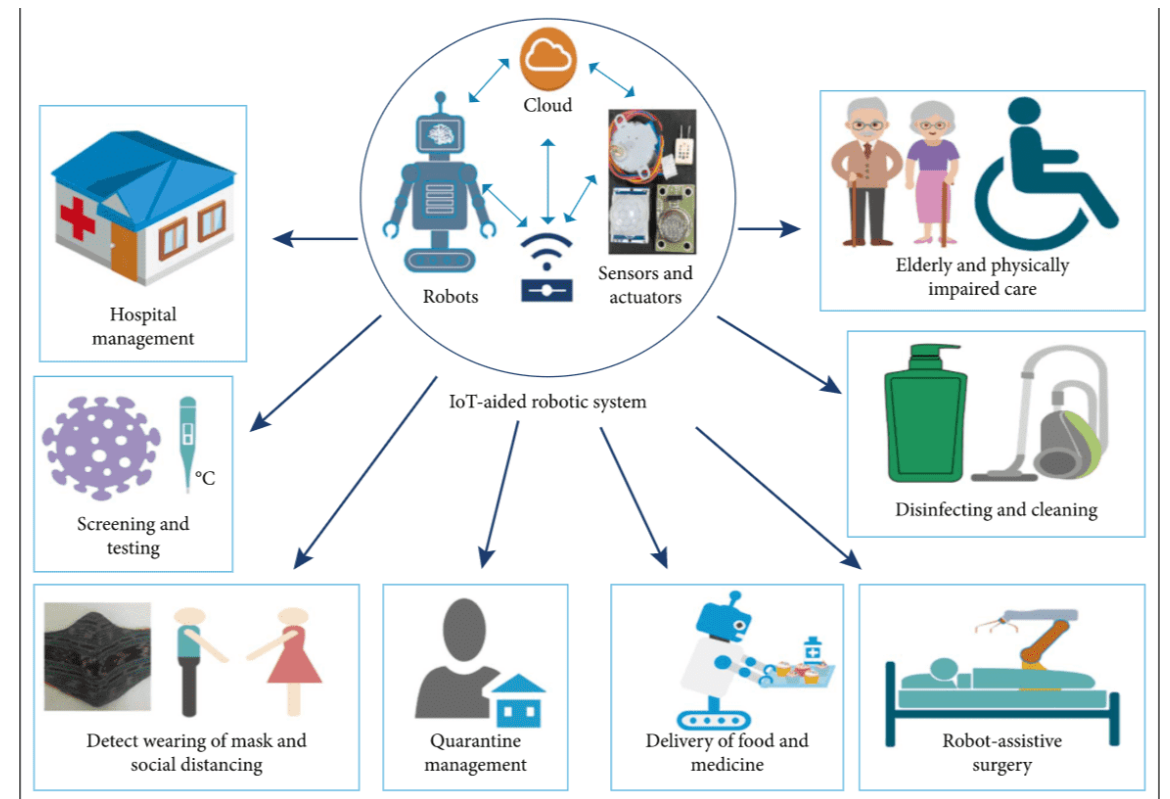
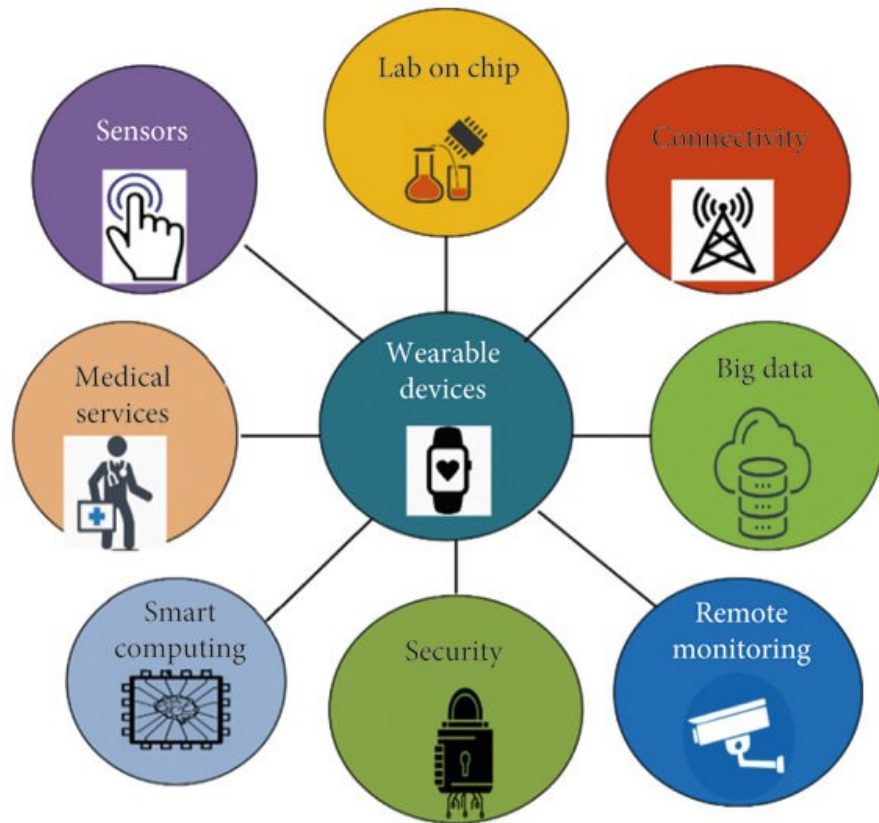


Work with Text

Medical data and text mining Linking diseases, drugs, and adverse reactions



Home care – solution based on IoT and AI



Visual Reporting: Enhancing Endoscopic and Colonoscopic Insights

- Beyond Text: Recognizing the limitations of static, purely descriptive reports.
- The Rise of Multimedia: Embracing the integration of images and videos for richer documentation.
 - Benefits for:
 - Diagnosis: More accurate and nuanced interpretations.
 - Patient Understanding: Clearer communication of findings and procedures.
 - Training: Effective educational tool for medical professionals.

UPPER GI ENDOSCOPY REPORT

PATIENT INFORMATION

John Doe

2345678

/15/1965

le

Date of Procedure: 05/28/2024

Endoscopist: Jane Smith, MD

Referring Physician: Robert Brown, MD

Indication: GERD, dysphagia

Sedation: Monitored Anesthesia Care

PROCEDURE PERFORMED

Gastroesophagoduodenoscopy (EGD)

INFORMED CONSENT

and consent was obtained from the patient after explanation of the procedure, benefits, and alternatives. All questions were answered.

PROCEDURE DESCRIPTION

ent was placed in the left lateral decubitus position. After achieving adequate h, the endoscope was inserted through the mouth and advanced under direct ion to the second portion of the duodenum. A careful inspection was ed during withdrawal, including retroflexion in the gastric fundus.

DIAGNOSIS

Esophagus:

Esophageal mucosa was normal in the proximal and mid esophagus. Grade B erosive esophagitis at the gastroesophageal junction. Irregular at 39 cm from the incisors. Evidence of esophageal stricture or mass.

Gastric Antrum:

Erythema of the gastric antrum. Ulcers or erosions. Retroflexion revealed a normal fundus and cardia.

Duodenum:

Duodenal bulb and second portion were normal.

BIOPSIES

Biopsies obtained from the gastric antrum for *H. pylori* testing.

Biopsies obtained from the distal esophagus for histology.

COMMENTS

The patient tolerated the procedure well.

IMPRESSION

Grade B erosive esophagitis. Gastric antral gastritis. Otherwise normal EGD.

RECOMMENDATIONS

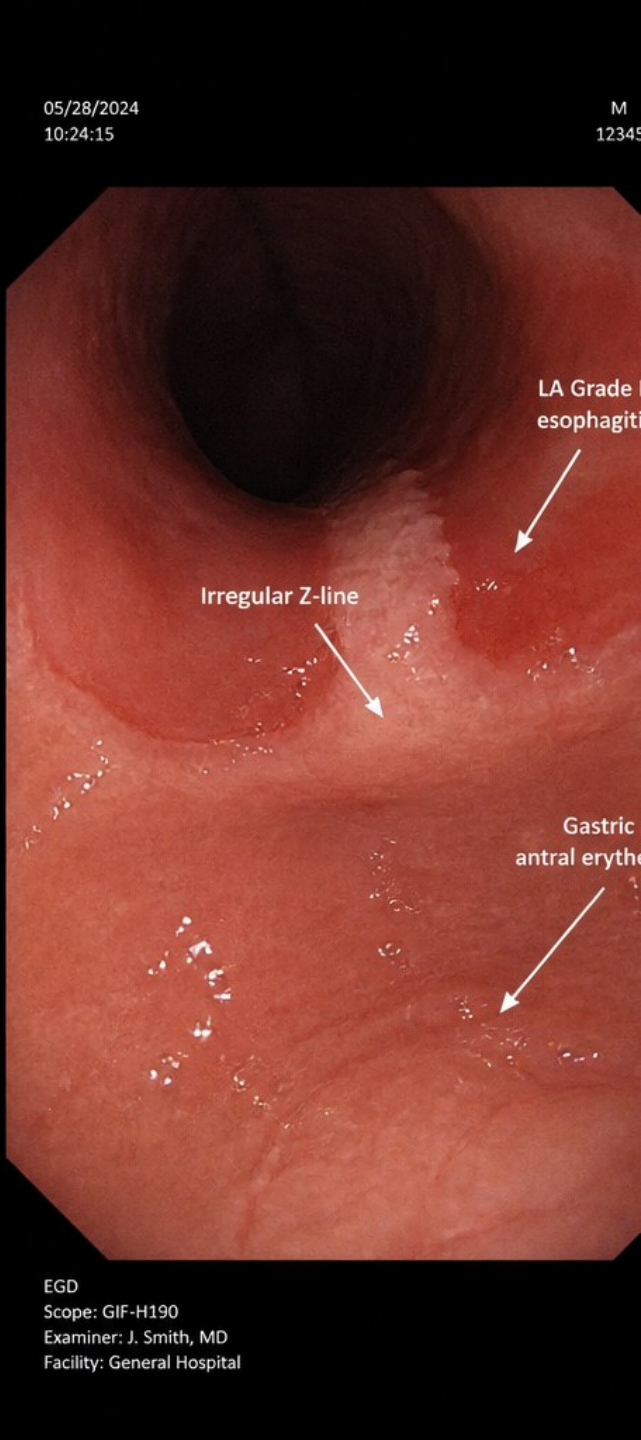
Continue PPI therapy.

Follow up on biopsy results.

Return to clinic in 8 weeks.

ENDOSCOPIST SIGNATURE

Jane Smith, MD

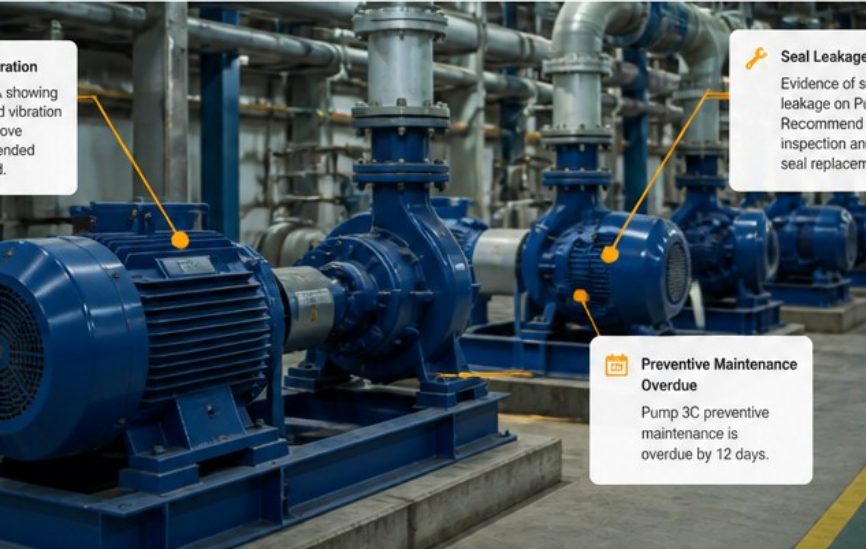


y Maintenance Review

ipment Reliability and Maintenance Efficiency

SUMMARY

is an assessment of the current maintenance practices and equipment reliability. Our analysis identified several areas for improvement that will enhance operational downtime, and extend equipment lifespan.



GS

High Vibration Levels
Monitored equipment is showing vibration levels above the recommended threshold, indicating potential operational issues.

Leakage Issues
Pumps inspected have seal leakage, which could increase downtime if not addressed promptly.

Preventive Maintenance Compliance
PM compliance rate is 78%. 22% of planned maintenance tasks are overdue.

Improvement Opportunity
The Mean Time Between Failures has decreased by 7% over the quarter compared to the previous period.

3. RECOMMENDATIONS

- ✓ Investigate and address high vibration on Motor 1A to prevent further wear.
- ✓ Schedule seal replacements for affected pumps during the next maintenance window.
- ✓ Improve PM compliance by optimizing scheduling and resource allocation.
- ✓ Implement condition monitoring enhancements to improve early detection of potential issues.

What is Image-Enhanced Reporting?

Introducing Image-Enhanced Reporting

- Definition: Incorporating high-quality images and short video clips directly into the final report.
- Key Components: Detailed annotations, measurements, and descriptive callouts.
- Goal: To provide an objective, easily understandable visual record of findings.

Case Study 1: Colonoscopy with Polyp Identification

Visualizing a Critical Find

Colonoscopy Observation

- Patient presents with changes in bowel habits.
- Suspicious lesion observed during colonoscopy.

Annotated Image & Impact

- High-resolution image of the polyp with size and location marked.
- Clear identification for biopsy, staging, and follow-up.

Accurate visualization and annotation are crucial for effective medical diagnosis and treatment planning.

Case Study 2: Endoscopy and Ulcer Diagnosis

Documenting Esophageal Pathology



- **Scenario**

Patient presenting with persistent heartburn.

- **Endoscopic Findings**

Moderate esophagitis characterized by visible erosions.

- **Visual Documentation**

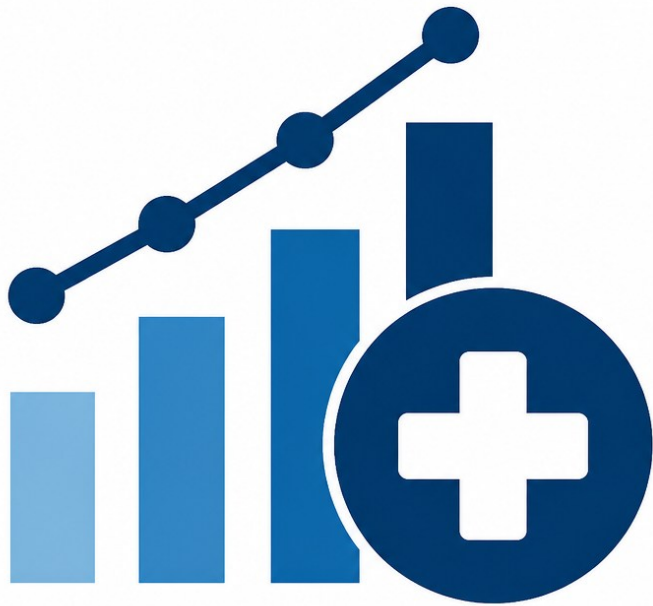
High-quality endoscopic images captured to illustrate the extent and severity of mucosal damage, meticulously labeled with specific anatomical locations.

- **Outcome**

Endoscopic findings confirm the diagnosis, guide treatment strategies, and establish a baseline for monitoring healing progress.

The endoscopic findings confirm the diagnosis, provide crucial information for guiding appropriate treatment strategies, and establish a baseline for monitoring the healing progress of the esophageal condition.

Data: Impact on Diagnostic Accuracy and Communication



- **Reduced Misinterpretation**
Studies show a 30% decrease in ambiguous findings.
- **Improved Turnaround Time**
Faster review and consensus among specialists.
- **Enhanced Patient Comprehension**
40% increase in patient understanding of their condition and treatment plan.
- **Training Edge**
Visual aids accelerate learning for new endoscopists.

Best Practices for Image Integration

Making Visuals Work for You



Image Quality

Ensure high resolution and clarity for all images.



Annotations

Effectively use clear labels, arrows, and measurements.



Relevance

Include only images that significantly add diagnostic value.



Standardization

Develop consistent formats for image capture and reporting.

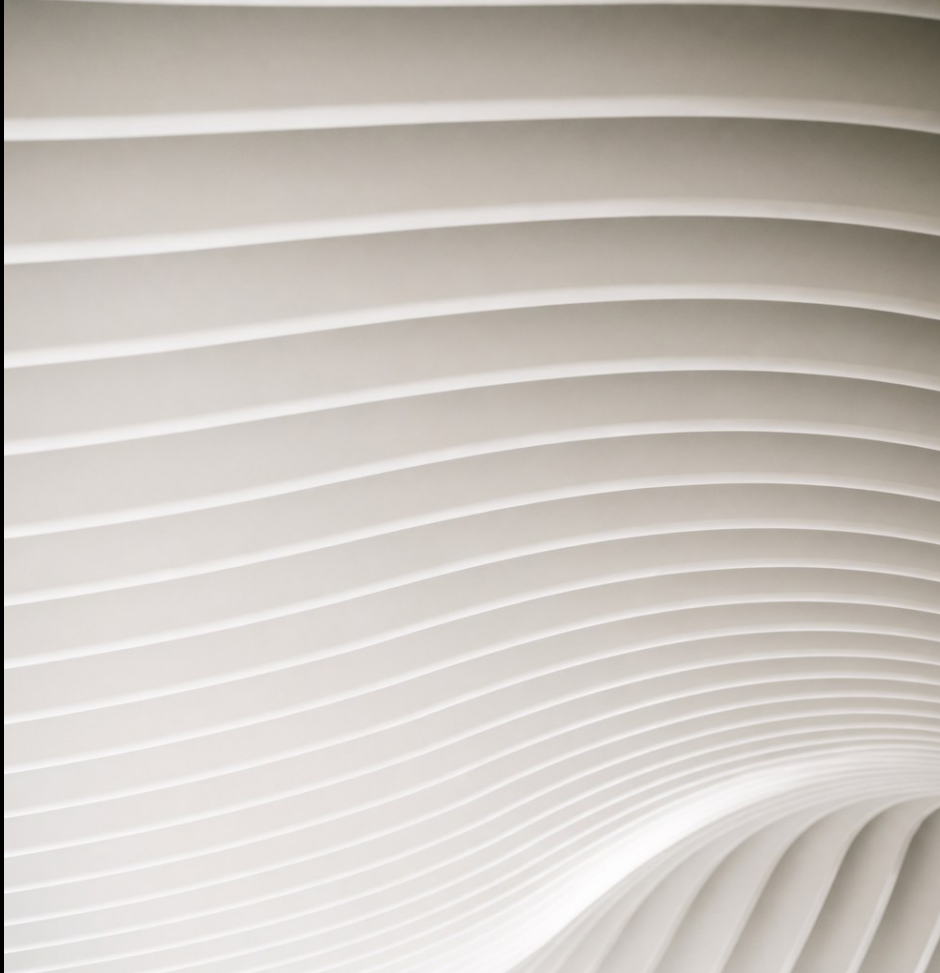


Integration

Seamlessly embed images within EMR/PACS systems.

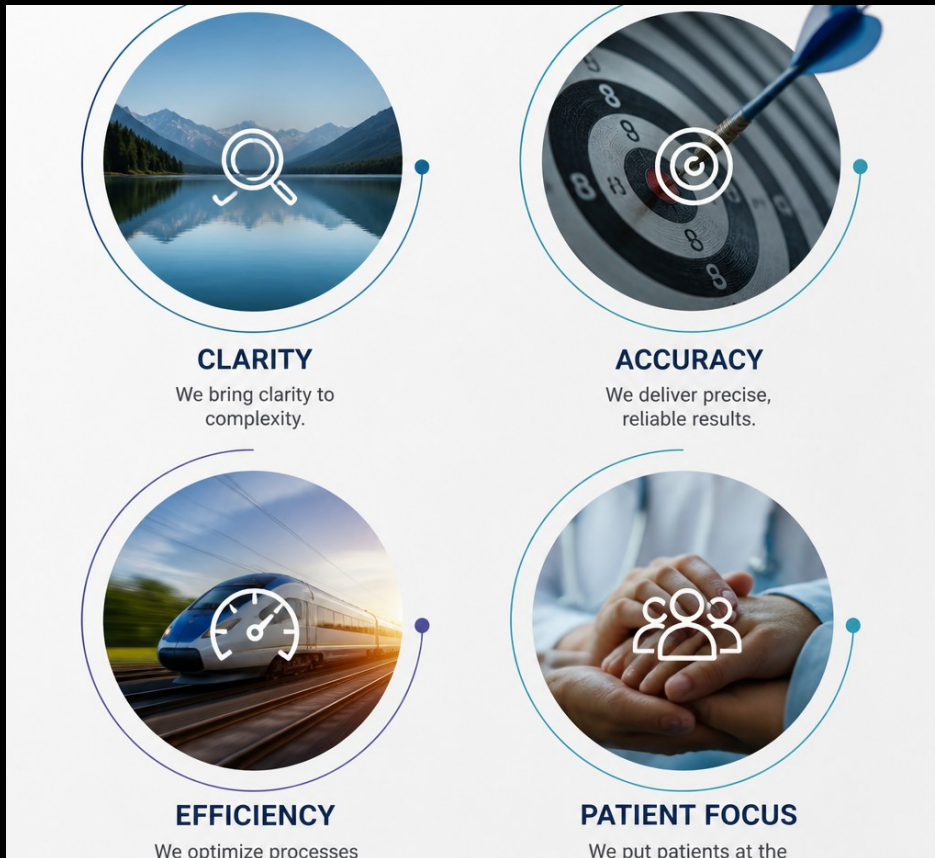
The Future of Visual Reporting

Evolving Technologies



- **AI Integration**
Automated lesion detection and annotation.
- **3D Imaging**
Enhanced spatial understanding.
- **Interactive Reports**
Embedded video clips and links.
- **Telemedicine**
Remote consultations powered by visual data.

The Visual Advantage: Key Takeaways



- **Clarity**
Images reduce ambiguity and enhance understanding.
- **Accuracy**
Objective visual data supports precise diagnosis.
- **Efficiency**
Streamlines communication and training.
- **Patient-Centric**
Empowers patients with better insight.

Visuals offer significant advantages in clarity, accuracy, efficiency, and patient engagement.

Call to Action

Embracing the Visual Standard



Adopt

Implement image integration into your reporting workflow.



Train

Educate your team on best practices.



Advocate

Champion the benefits of visual reporting.



Innovate

Explore new technologies for greater insight.