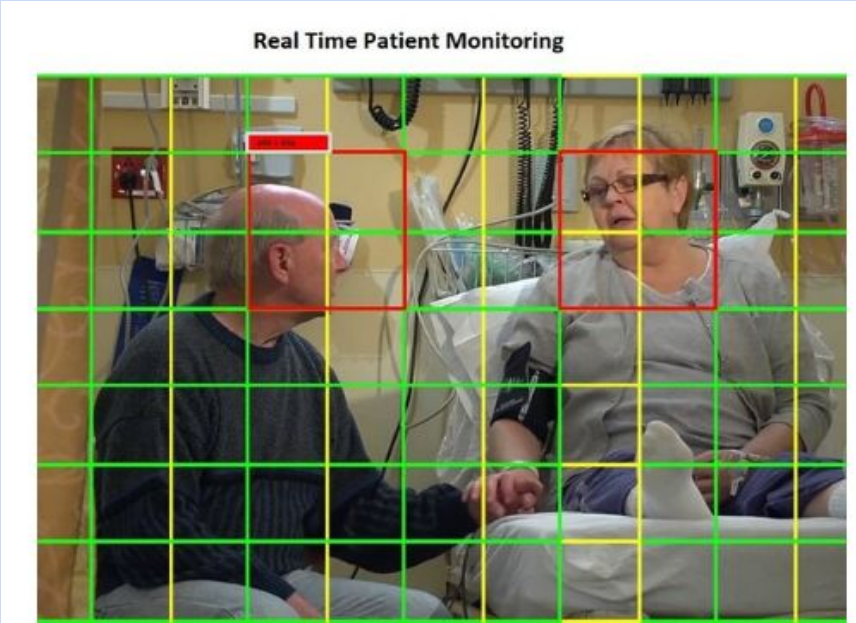
Intel Unnati Industrial Training Program 2024

Problem Statement :

PS-7 Innovative Monitoring System for TeleICU Patients Using Video Processing and Deep Learning



Team Members:
Anushka Mukherjee : 21BAI1073
Gracika Jain : 21BAI1008
Ronit Debnath : 21BAI1065

Faculty Mentor:
Dr. Prakash P

Unique Idea Brief (Solution):

The "Innovative Monitoring System for TeleICU Patients Using Video Processing and Deep Learning" project focuses on classifying people in an ICU environment into precise classes: medical doctor, visitor, workforce, patient, and empty room. By analyzing actual-time video and picture feeds from cameras, the machine uses deep studying algorithms to correctly become aware of and classify all and sundry based on their appearance, attire, and behavior. This class facilitates manage ICU environments more efficiently, making sure that only legal people get entry to affected person regions, and streamlining the monitoring procedure for scientific workforce. The gadget complements safety and operational performance within the ICU placing through computerized, correct individual class.

Features Offered:

***Real-time Classification**:*

- *Continuously monitors and classifies individuals in the ICU as doctor, visitor, staff, patient, or empty space.*

***Deep Learning Algorithms**:*

- *Utilizes advanced neural networks to ensure accurate and reliable identification of individuals.*

***Alerts and Notifications**:*

- *Provides real-time alerts to healthcare personnel if unauthorized individuals are detected in restricted areas.*

***Data Analytics**:*

- *Collects and analyzes data on ICU traffic patterns, helping optimize staffing and visitor policies.*

***Scalability**:*

- *Designed to be easily scalable for deployment across multiple ICUs within a hospital or healthcare network.*

Process Flow:

*I**mage Capture:** Cameras set up inside the ICU seize actual-time snap shots of the environment, together with individuals gift within the location.*
***Image Preprocessing:** Captured pics are preprocessed to enhance excellent, normalize lighting situations, and prepare them for analysis.*
***Feature Extraction:** Preprocessed pictures are analyzed to extract applicable features that assist in figuring out individuals.*
***Deep Learning Model:** This preprocessed pix with extracted capabilities are fed right into a deep gaining knowledge of model skilled to categorise people. The version has been educated on a diverse dataset containing classified photos of medical doctors, visitors, personnel, patients, and empty areas.*
***Classification:** The deep mastering version processes the pics and classifies each detected person into one of the predefined categories.*

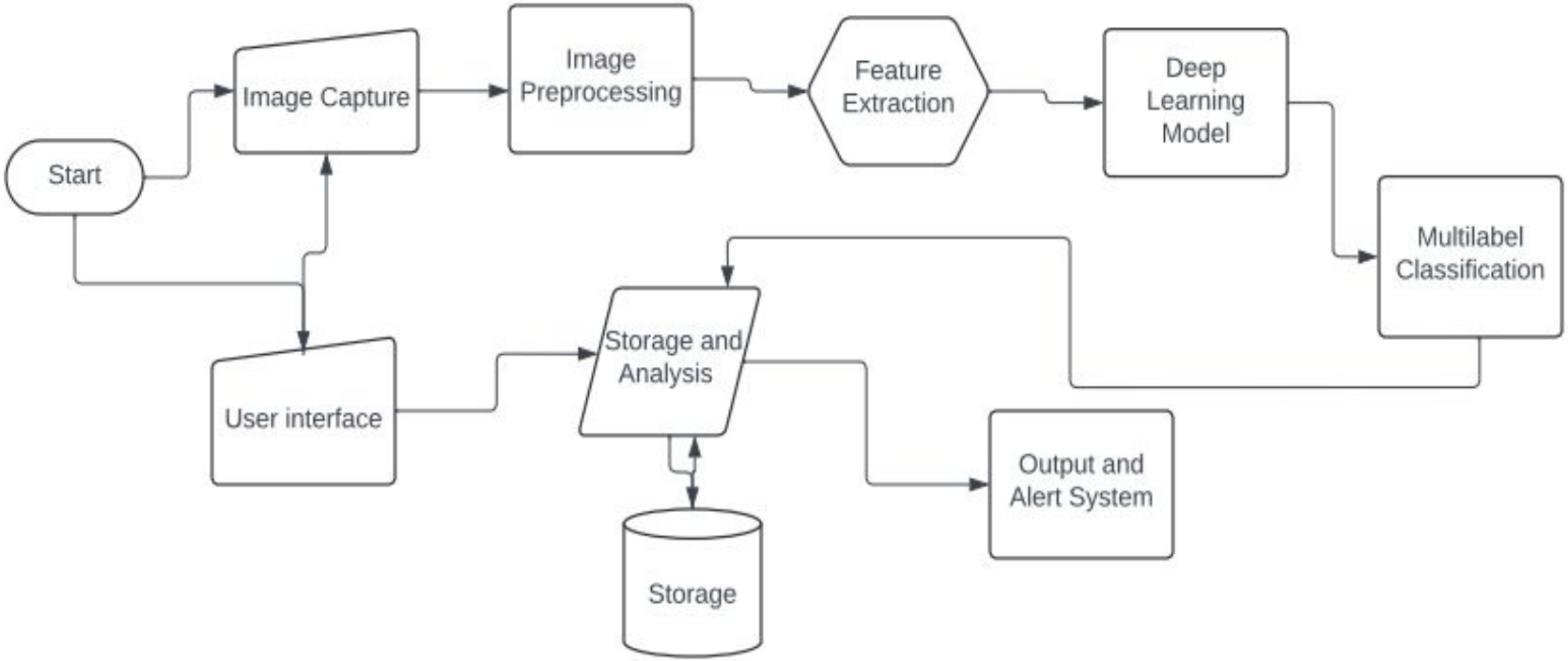
Process Flow:

Output and Alert System: *The type outcomes are outputted, and if any unauthorized person (e.G., a tourist in a restrained vicinity) is detected, the system triggers an alert to notify healthcare employees.*

Data Storage and Analytics: *Classified statistics is stored in a database for similarly evaluation. This records may be used to generate reports on ICU site visitors styles and improve operational efficiency.*

User Interface: *A person interface (UI) is furnished for healthcare staff to view real-time monitoring results, signals, and historical facts. The UI helps in easy management and oversight of the ICU environment.*

Architecture Diagram:



Technologies Used:

Front end:

React.js: A popular JavaScript library for building user interfaces, particularly single-page applications.

CSS (Cascading Style Sheets): **Description**: A style sheet language used for describing the presentation of a document written in HTML or XML.

JavaScript: JavaScript is used for adding interactivity to the web application. It enables dynamic content updates and user interactions.

Vercel: A cloud platform for static sites and serverless functions

Back end:

Node.js: An open-source, cross-platform, back-end JavaScript runtime environment.

Render: A cloud platform for deploying web applications and services.

Deep Learning Model Technologies:

PyTorch: An open-source machine learning library based on the Torch library, primarily developed by Facebook's AI Research lab.

OpenCV: An open-source computer vision and machine learning software library.

YOLO: YOLO (You Only Look Once) is a real-time object detection algorithm . It is a single-stage object detector that uses a convolutional neural network (CNN) to predict the bounding boxes and class probabilities of objects in input images.

Team Members and Contribution:

The development of the project involved several stages, with each team member contributing to different aspects of the project. Here is an overview of the stages and individual contributions of Ronit, Anushka, and Gracika:

Stage 1: Project Planning and Requirement Analysis: All Members Collaboratively defined the project scope and objectives.Identified key requirements and features needed for the system.

Stage 2: Front-end Development : Anushka and Gracika : Designed the UI components using React.js. Implemented responsive design with CSS to ensure the application works well on various devices. Developed the interactive features using JavaScript.

Stage 3: Back-end Development: Ronit and Anushka : Set up the server using Node.js and Express.js. Created APIs to handle data requests and responses.

Stage 4: Deep Learning Model Development: Ronit and Gracika : Developed and trained the YOLO model for object detection and classification.Preprocessed the images using OpenCV for better accuracy. Fine-tuned the model to optimize performance and accuracy. Integrated the model with the back-end server to enable real-time classification.

Stage 6: Testing and Quality Assurance: Ronit and Anushka : Conducted thorough testing to identify and fix bugs.Ensured the system met all functional and non-functional requirements. Performed user acceptance testing to validate the system's performance in real-world scenarios.

Stage 7: Documentation and Presentation: Gracika : Documented the project, including the system architecture, technologies used, and individual contributions.

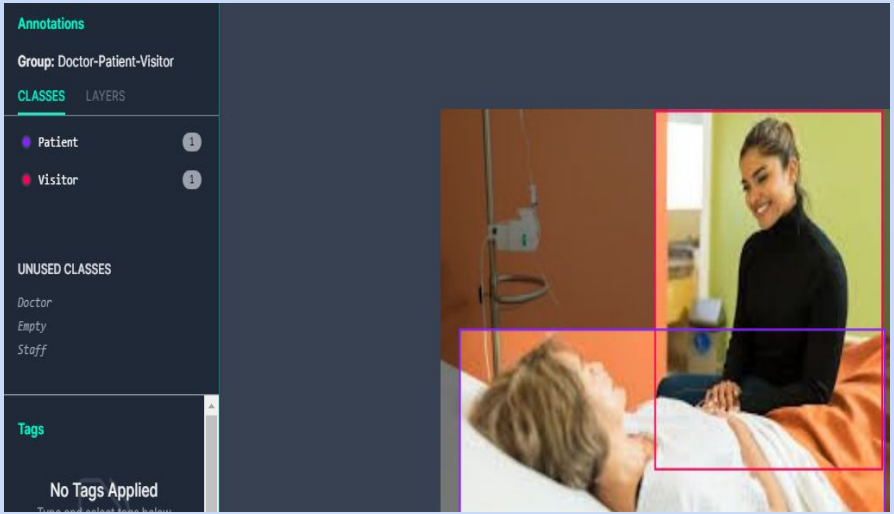
Our project mentor, Dr. Prakash P, guided us through all stages, helping us overcome various challenges we encountered along the way.

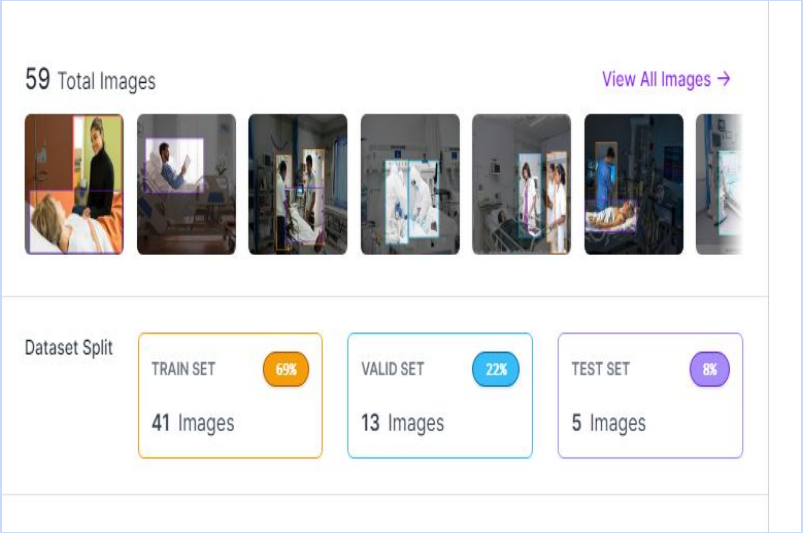
Conclusion and Screenshots:

The "PS-7 Innovative Monitoring System for TeleICU Patients Using Video Processing and Deep Learning" project has been a significant achievement, showcasing the power of integrating advanced technologies to address real-world challenges in healthcare monitoring. Through the dedicated efforts of the team, the project successfully achieved its objectives, delivering a robust and efficient system for classifying individuals in an ICU environment.

The project not only demonstrates technical excellence but also highlights the importance of teamwork and innovation in solving critical healthcare challenges. The system's successful deployment and performance affirm its potential to make a significant impact in teleICU patient monitoring, ultimately contributing to improved patient outcomes and healthcare efficiency.

Dataset and Images: For our dataset and images, we gathered ICU pictures from the internet and various sources. We then used Roboflow to organize these images into a structured dataset.





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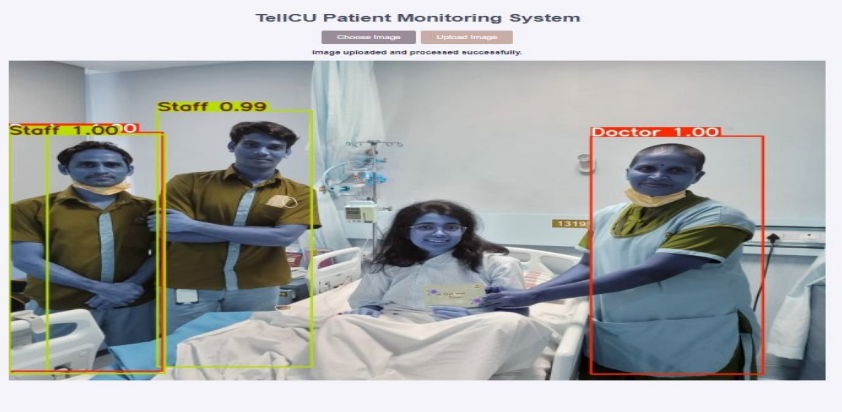

GitHub Repository: https://github.com/Masterkrusher5/TeleICU_Monitoring_System
Video Explanation:
https://drive.google.com/file/d/1I3yW8kNCq6d0gHJ2hLuZTNMqPXuVBjK0/view?usp=sharing

THANK YOU