A PROJECT REPORT

ON

"INNOVATIVE MONITORING SYSTEM FOR TELEICU PATIENTS USING VIDEO PROCESSING AND DEEP LEARNING"

SUBMITTED AS PART OF

Intel Unnati Industrial Program,2024

BY

PRN:2101106074 ALFIYA JAFFAR SHAIKH

PRN:2101106047 SHRUTI SUNIL THOKALE

PRN:2101106082 RUPSHA SARKAR

PRN:2101106087 VASHI GHATOLE

A report submitted in partial fulfillment of the requirements for the Award of Degree of

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE AND INFORMATION TECHNOLOGY(CYBERSECURITY)

UNDER GUIDANCE OF

Mr.Kazi Haque/Mrs.Neha Chankhore

SCHOOL OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

Symbiosis Skills & Professional University

Kiwale, Adjoining Pune Mumbai Expressway, Pune - 412101

Table of Contents

"INNOVATIVE MONITORING SYSTEM FOR TELEICU PATIENTS USING VIDEO PROCESSING AND DEEP LEARNING"

By--

Alfiya Jaffar Shaikh 2101106074

Shruti Sunil Thokale 2101106047

Rupsha Sarkar 2101106082

Vashi Ghatole 2101106087

INTRODUCTION:

❑ TeleICU is concept for monitoring ICU patients from remote locations to reduce the burden of on-site intensivist.

❑ The proposed solution should work to reduce the burden of remote health care professional so, one remote health care professional can monitor 5 or more patients at single time.

1.1 Problem Statement→

INNOVATIVE MONITORING SYSTEM FOR TELEICU PATIENTS USING VIDEO PROCESSING AND DEEP LEARNING

1.2 Unique Idea Brief→

Our Approach:

- We have taken 2-3 videos of the ICU Room .
- To work on the video and to detect the functionality of the patient , we first created the dataset using ROBOFLOW - which mainly include set of data's for (Doctors, Nurse and Patient)
- Now we have used three different deep learning and video processing techniques and models to build our project

➢ Object Detection Model

➢ Motion detect(yes or no) model

➢ Keypoint detection + alerting model

- Then we have integrated the three models in order to simplify user experience.

- Then we have also included the GUI where the user need to select the saved video and then process that video to get the integrated model working on the video.

1.3 Aims and Objectives→

Objectives

The primary objective of this project is to develop a robust and accurate monitoring system for TeleICU settings, focusing on two key aspects:

- Object Detection:
  Train a deep learning model to accurately identify various individuals present in the ICU room, including Nurses, Doctors and Patients. This will help in ensuring proper care and monitoring of patient interactions.

- Patient Motion Recognition:
  Develop a deep learning model to recognize and categorize different activities of the patient when they are alone. This includes monitoring for signs of distress, abnormal movements, and other critical activities that require immediate attention.

Aims

- Enhance patient safety through continuous and automated monitoring.
- Assist healthcare providers in timely intervention and decision-making.
- Improve the overall efficiency and effectiveness of ICU operations.

METHOLODOGY:

2.1 Prerequisites→

Install libraries

pip install ultralytics
pip install jupyterlab
pip install mediapipe
pip install opencv-python
pip install pygame
pip install numpy

Download high resolution ICU Room video.

- we have created a folder in our Desktop then saved the downloaded videos from youtube.

Dataset Creation:

- We used Roboflow platform for building, training and deploying different models.

- We have created a folder of different images of Doctors, Nurse and Patients --> then we upload the folder then through auto labelling we created the three classes for Doctors, Nurse and Patients .

- We have annotate the classes with unique features--→ then we fine tuned the model → then we labelled all the images, then create a Dataset of all the approved images.

- After generating the Dataset we get Zip code which include the API Key, Data.yaml file, train valid and test folders.

Best.pt File:

Download the Dataset in yolov8 model format → then created a basic code in python -→ there we have trained our Data.yaml file using yolov8 model to obtain our best.pt file .

6

Models:

➕ **Object Detection Model:**

- Using of YOLOV8 and opencv2 library

- Load the yolov8 model-> then mention the path of video as well as the output path where the detected frames will be saved.

- Through this model ,we have identified different objects such as Doctors, Nurse and Patient within each frame of video and then the detected frames are saved in the specified folder.

➕ **Patient Motion Detected Yes or NO:**

- Using opencv2, Numpy, Mediapipe, Pygame and YOLOV8 library.

- It only detects the "Patient" in the video using YOLOV8 and Mediapipe is used for tracking the motion of patient within the patients bounding box by comparing consecutive video frames.

- If motion of the patient is detected then it raises an alert by playing an alert sound.

➕ **Keypoint Detection + Alerting:**

- Using of opencv2, Numpy, Mediapipe and YOLOV8 library.

- It detects different objects(Doctor's, Nurse's, Patient's) in the video using YOLOV8 and mediapipe is used for tracking the facial and hand landmarks to monitor specific movements of patient.

- It detects and alerts for movements like mouth opening, eyes opening, head movements, and hand movements within the detected patient's bounding box.

- Then the detected frames / video get saved into the output folder.

➕ **GUI:**

- Using the Tkinter library.

- We have provide two buttons → upload video button and process video button.

- Using upload video button we upload the selected video for processing

- Using the process video button we select the folder where the detected frames will be saved.

- Then the video start's processing.

TOOLS AND TECHNOLOGIES:

- Object Detection Models: YOLOv8

- Development environment (IDE): Pycharm, Jupyter

- Motion Recognition/ tracking: mediapipe

- Data Annotation Tools: roboflow

- Video Processing Libraries: OpenCV

- GUI: Tkinter

- Other: Pygame, numpy, os

CONCLUSION:

The Innovative Monitoring System for TeleICU Patients project demonstrates the power of integrating video processing and deep learning techniques to enhance patient care in ICU settings. By developing models for object detection, motion detection, and keypoint detection, we have created a comprehensive system capable of real-time monitoring and analysis. The integration of these models, along with a user-friendly GUI, ensures seamless operation and valuable insights for healthcare providers. This project not only improves patient safety and care but also optimizes the efficiency of medical staff, paving the way for future advancements in teleICU technology.