Presentation on

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

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ACKNOWLEDGEMENT

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ABSTRACT

This project presents an innovative ICU Monitoring System leveraging YOLOv8, an advanced object detection model, to enhance patient care and monitoring in Intensive Care Units (ICUs). The system consists of two primary components: a people detection model to identify healthcare professionals and visitors, and a movement detection model to monitor patient activity. This dual functionality aims to assist healthcare providers in maintaining a vigilant watch over patients, thus improving safety and response times. The integration of these technologies is designed to reduce the workload on ICU staff while ensuring patients receive timely and efficient care.

PRESENTATION OVERVIEW

01 : PROBLEM STATEMENT

Intensive Care Units (ICUs) require constant monitoring of patients to ensure timely intervention and optimal care. However, the continuous presence of healthcare professionals is not always feasible due to resource constraints. There is a need for an automated system that can monitor ICU environments, detect the presence of medical staff and visitors, and alert for any patient movements, thereby assisting healthcare providers in maintaining high levels of care. This system should also be capable of operating in real-time and be easily integrated into existing hospital infrastructure.

02 : UNIQUE IDEA BRIEF (SOLUTION)

- Our ICU Monitoring System utilizes the power of YOLOv8 to detect and classify individuals in the ICU, distinguishing between doctors, nurses, family members, and patients. Additionally, the system monitors patient movements, triggering alerts when significant activity is detected. This solution aims to enhance patient safety, improve resource allocation, and provide real-time monitoring support to healthcare professionals.

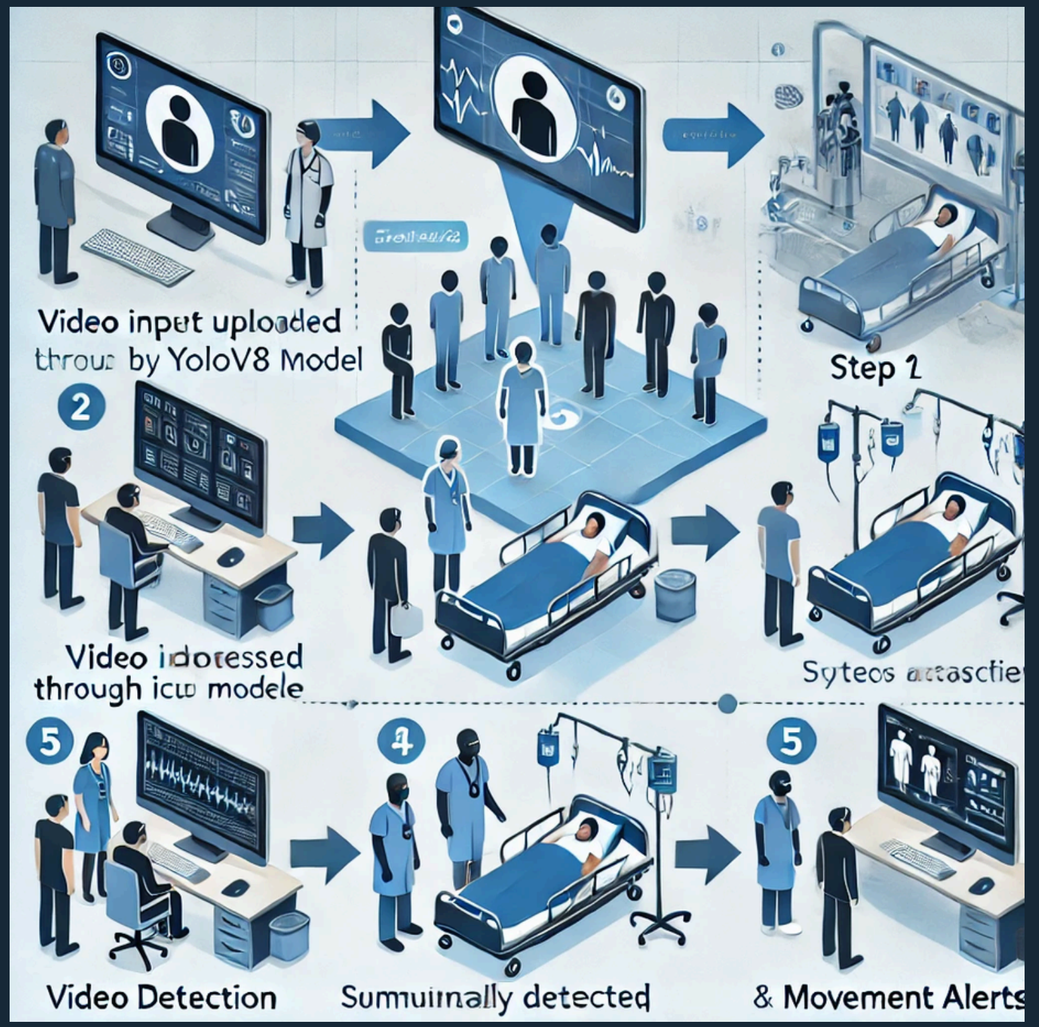
- By automating the monitoring process, our system allows medical staff to focus on critical tasks, thus improving overall efficiency and patient outcomes.

03 : FEATURES OFFERED

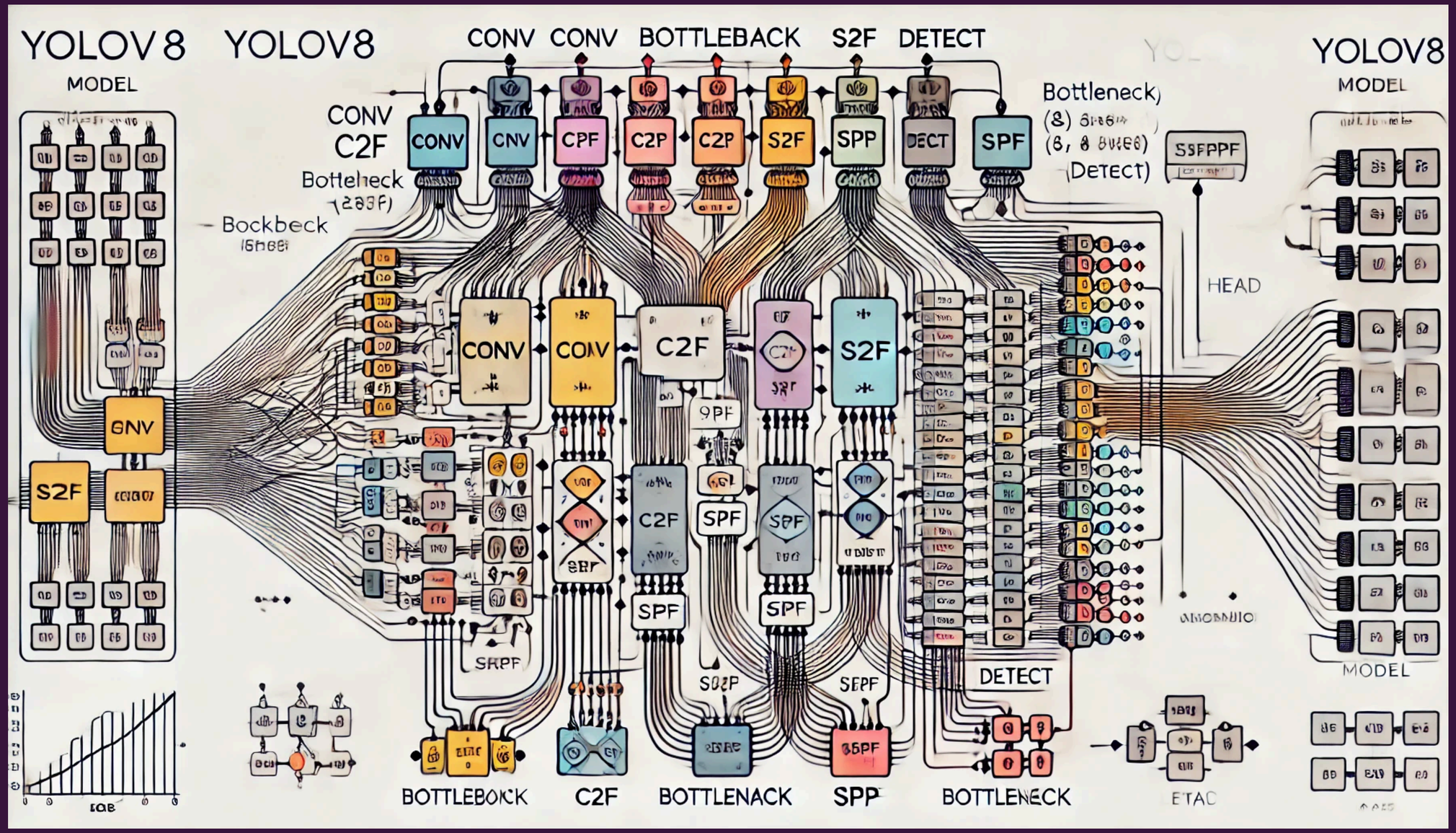
- **People Detection:** Identifies and classifies ICU occupants into categories such as doctors, nurses, family members, and patients. This helps in maintaining a record of who is present in the ICU at any given time.
- **Movement Detection:** Monitors patient activity and detects significant movements to alert healthcare providers. This feature is crucial for immediate response to potential emergencies, such as a patient attempting to leave the bed.
- **Real-Time Monitoring:** Provides real-time video analysis and monitoring capabilities. The system processes live video feeds and provides instant alerts and updates.
- **User-Friendly Interface:** Streamlit-based web application for easy video upload and analysis. The interface is designed to be intuitive, allowing users to quickly get insights without extensive technical knowledge.
- **Scalability:** Designed to integrate with existing ICU monitoring systems for enhanced functionality. The modular architecture allows for easy expansion and customization to meet the specific needs of different healthcare facilities.

04 : PROCESS FLOW

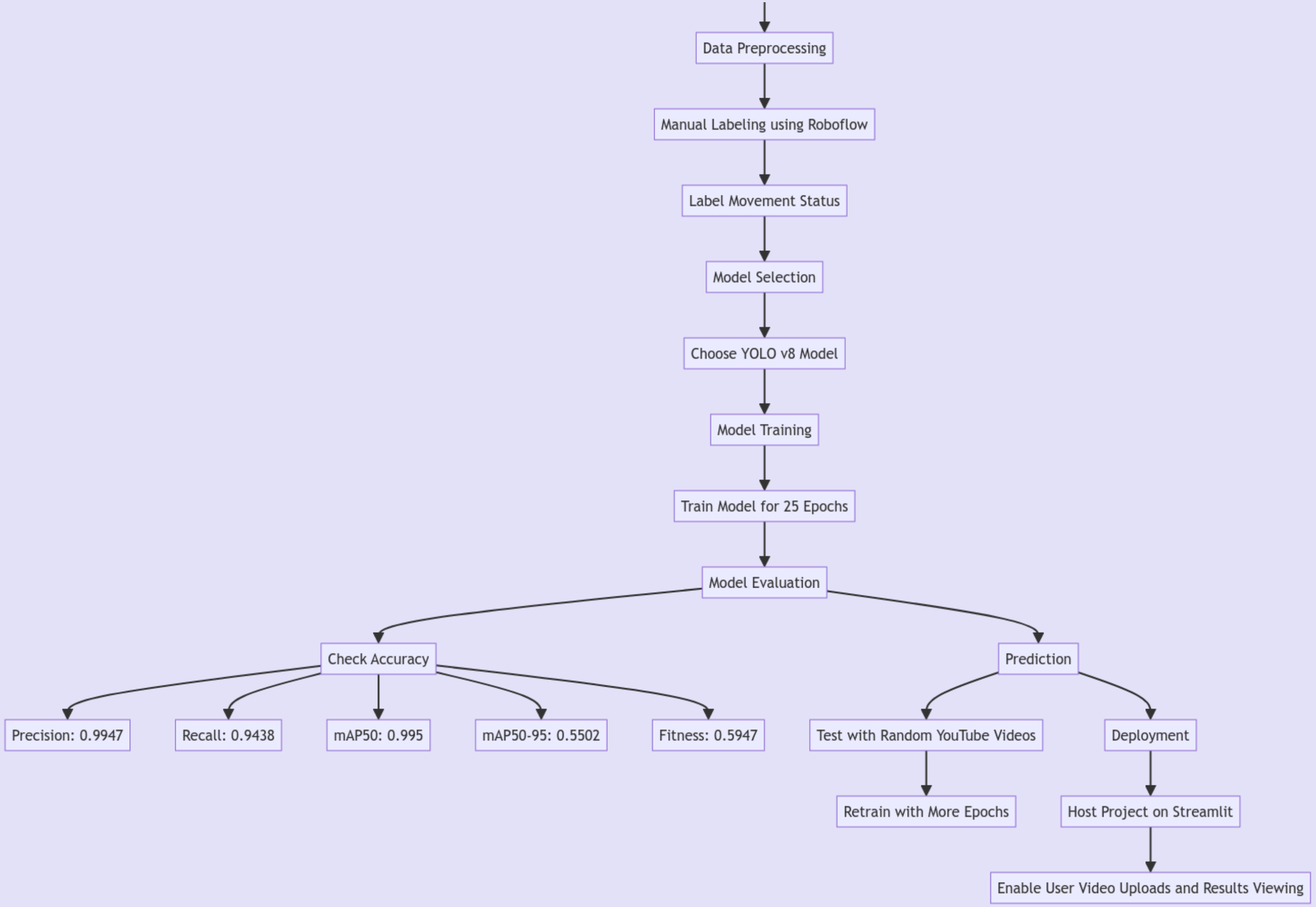
- **Step 1: Video input is uploaded through the web interface.**
- **Step 2: The video is processed by the YOLOv8 model for people detection.**
- **Step 3: The system identifies and classifies individuals in the ICU.**
- **Step 4: Simultaneously, the video is analyzed for patient movement.**
- **Step 5: The results are displayed, showing detected people and movement alerts.**



05 : ARCHITECTURE DIAGRAM

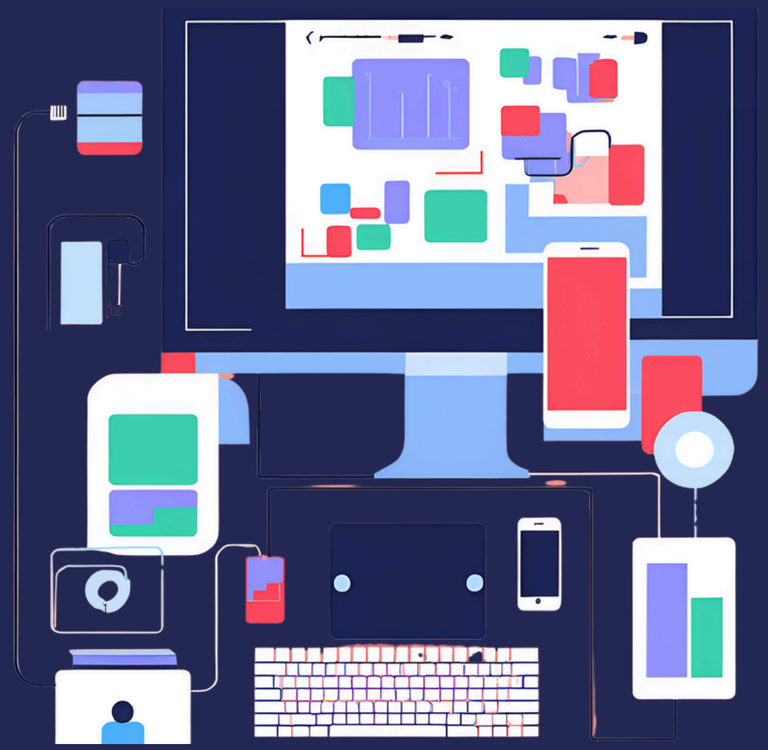


05 : MODEL FLOW DIAGRAM



06 : TECHNOLOGIES USED

- YOLOv8: Used for object detection and classification.
- Python: Core programming language for scripting and model development.
- OpenCV: Handled video processing tasks, including frame extraction and manipulation.
- NumPy: Facilitated numerical operations and data handling, providing a foundation for efficient calculations.
- Streamlit: Enabled us to create the web application interface, making it easy for users to interact with the system, and for Hosting also.
- PyTorch: Assisted in loading and running the YOLO models, providing the necessary deep learning infrastructure.
- Roboflow: Managed dataset labeling and organization, streamlining the data preparation process.



06 : TEAM MEMBER AND CONTRIBUTIONS

Hemant Kumar

- Conceptualized and designed the project.
- Developed the YOLOv8 models for people and movement detection.
- Implemented the data preprocessing and labeling.
- Built the Streamlit web application for video upload and analysis.
- Managed the entire project lifecycle, from ideation to deployment.
- Conducted extensive testing and validation to ensure the system's accuracy and reliability.

07 : CONCLUSION

Our ICU Monitoring System provides an innovative solution to enhance patient care through real-time monitoring and automated alerts. By leveraging advanced AI technologies, this system aims to support healthcare professionals in maintaining vigilant oversight of ICU environments, ultimately improving patient safety and healthcare outcomes. This project demonstrates the potential of AI in transforming healthcare and emphasizes the importance of continuous innovation in medical technologies.

08 : FUTURE WORK

- **Enhanced Detection Models:** We plan to integrate more advanced models or improve existing models to increase accuracy and reduce false positives.
- **Real-Time Monitoring**: We aim to implement real-time video processing to provide immediate alerts and notifications to healthcare professionals.
- **Expanded Dataset**: We intend to collect more diverse and comprehensive datasets to improve model robustness and adaptability to various ICU environments.
- **Mobile Application**: Develop a mobile app for healthcare providers to receive real-time alerts and updates on the go, ensuring they are always informed.
- **Integration with Hospital Systems**: We aspire to connect the monitoring system with hospital management systems for seamless data integration and better patient management.

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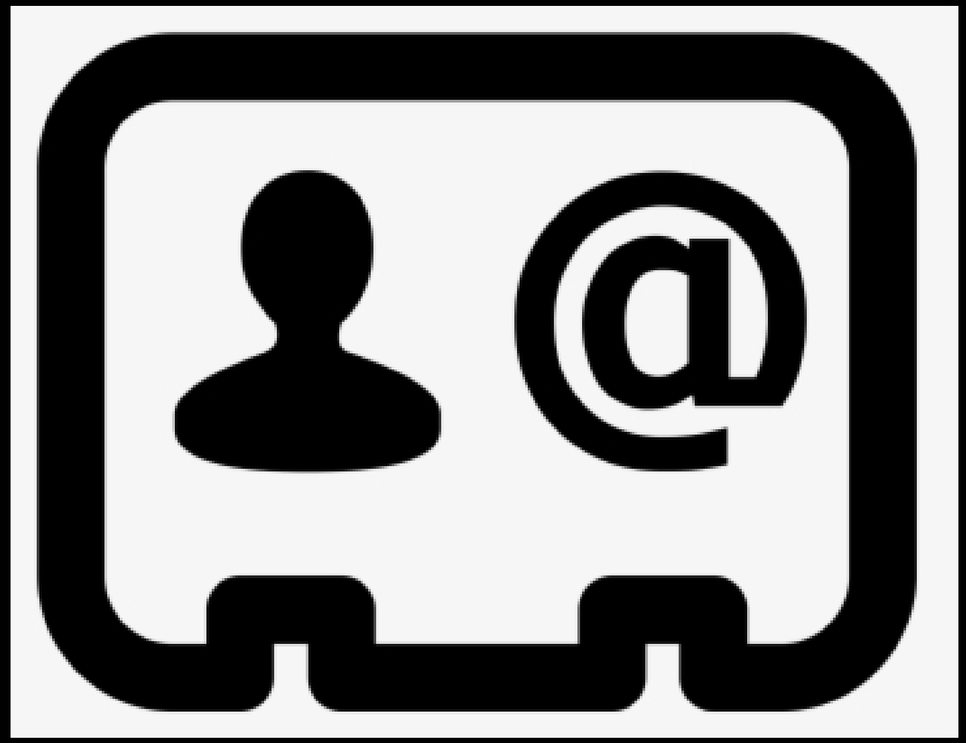
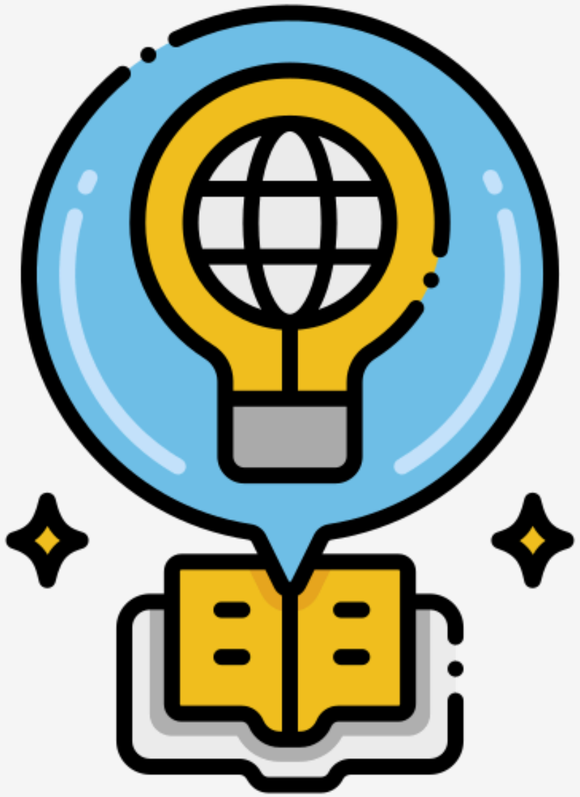


REFERENCES

1. **YouTube:** Various ICU scenario videos from YouTube were instrumental in creating a diverse and comprehensive dataset for training and testing the YOLOv8 models. These videos provided real-world examples of ICU environments, which were essential for accurate model training.
2. **YOLOv8 Documentation**: The official documentation and tutorials for YOLOv8 were crucial in understanding the model architecture and implementation details.
3. **Roboflow**: This tool was essential for data labeling and organization, streamlining the dataset preparation process.
4. **Streamlit**: The Streamlit documentation and community forums provided valuable insights into building and deploying the web application.
5. **Academic Papers and Articles**: Several research papers and articles on object detection and deep learning models provided theoretical insights and practical guidance.

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