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 [ijircce@gmail.com](mailto:ijircce@gmail.com)

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# Crowd Monitoring System with Object Detection

**Madhura R, Meghana M V, Maanasa N, Dr. Suma R**

UG Students, Department of I.S.E., SSIT, Sri Siddhartha Academy of Higher Education, Tumkur, Karnataka, India

Assistant Professor, Department of I.S.E., SSIT, Sri Siddharth Academy of Higher Education, Tumkur,  
Karnataka, India

**ABSTRACT:** The system employs advanced object detection techniques, specifically YOLO, to achieve real-time monitoring capabilities. The primary objectives include the identification of helmet and mask-wearing individuals, crucial for mitigating fraudulent activities, and the detection of multiple persons to ensure a secure environment within the Machine.

The proposed system encompasses a user-friendly web interface with login and registration functionalities, providing a seamless experience for users. The main page serves as a comprehensive repository of project details, while an intuitive interface facilitates the initiation of real-time monitoring. Alerts are generated promptly upon detecting helmet and mask-wearing individuals or the presence of more than one person, ensuring swift responses to potential security threats.

**KEYWORDS:** Dark net, YOLO (You Only Look Once), CNN (Convolutional Neural Network), Deep learning.

## I. INTRODUCTION

In the evolving landscape of public safety and health awareness, the development of a Crowd Monitoring System emerges as a critical technological solution. This project aims to create a comprehensive system that combines computer vision, deep learning, and web technologies to effectively monitor crowds in various scenarios. The system comprises two distinct components: real-time monitoring and image/video analysis, each addressed by dedicated YOLO (You Only Look Once) models.

The first YOLO model is trained to discern whether individuals within a crowd are wearing masks or not. This capability holds paramount importance in current times, fostering adherence to health protocols. The second aspect involves a dual-purpose YOLO model designed for simultaneous detection of the number of people and their gender. This innovative approach streamlines model deployment, offering enhanced efficiency while reducing computational overhead.

## II. RELATED WORK

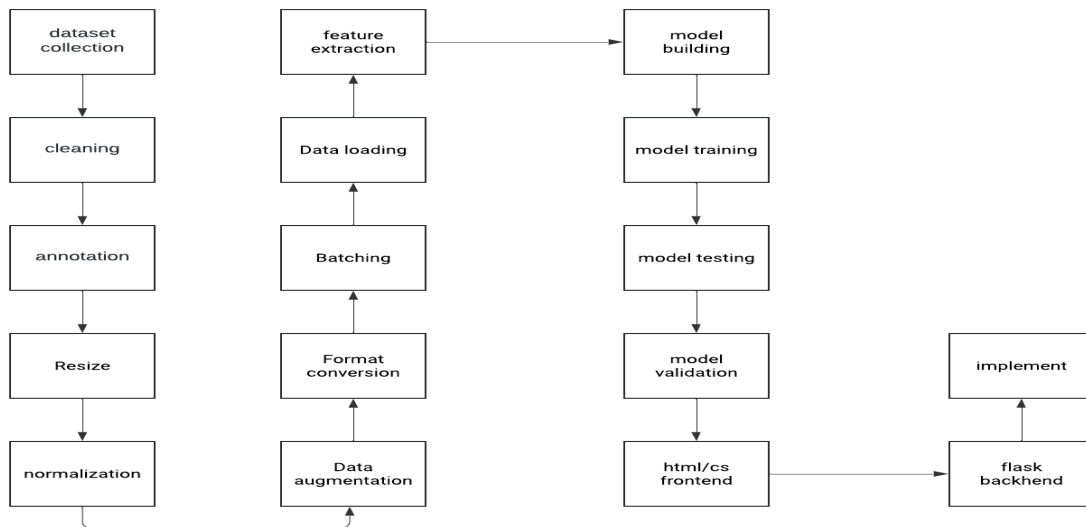
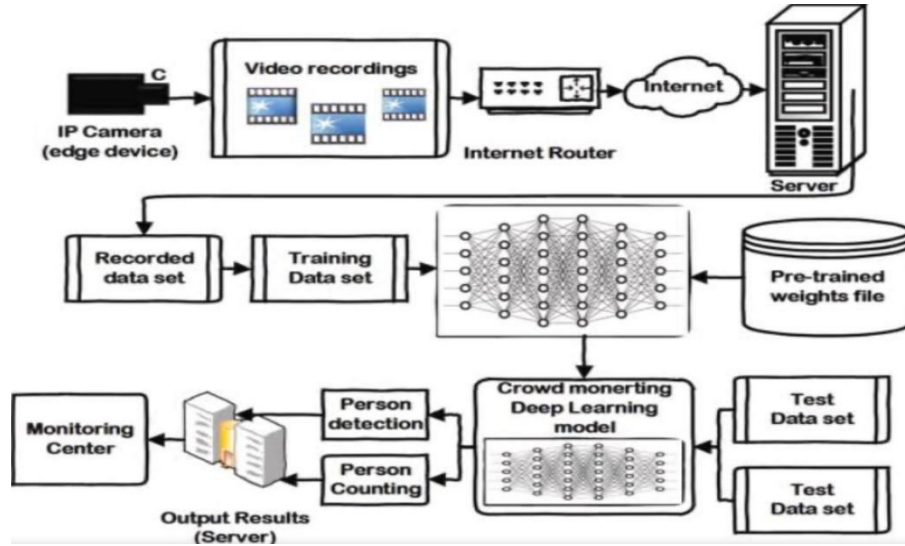
To provide a user-friendly interface, the system integrates a frontend developed using HTML and CSS, complemented by a Flask-powered backend. The frontend encompasses essential features such as a login and registration page for user authentication. The home page serves as the central hub, providing project details and offering two primary functionalities: real-time monitoring and image/video upload.

## III. PROPOSRD WORK

The proposed Monitoring System represents a paradigm shift in security, introducing advanced object detection techniques to address contemporary challenges. Leveraging the You Only Look Once (YOLO) algorithm, the system is designed to detect and raise alerts for individuals wearing helmets and masks in real-time. This feature is crucial in identifying potential fraudulent activities where perpetrators attempt to conceal their identities.

Additionally, the proposed system incorporates a multi-person detection capability, providing alerts when more than one person is present within the Machine. This functionality enhances security by signaling potential security breaches, unauthorized access, or activities that may compromise the safety of users.

**MODEL OF PROPOSED WORK  
BLOCK DIAGRAM**



Creating a detailed algorithm for the entire Crowd Monitoring System involves multiple components, including frontend and backend interactions, webcam handling, YOLO model integration, and response generation. Below is a high-level algorithm that outlines the key steps involved in the real-time monitoring aspect of the system:

**Real-Time Monitoring Algorithm:**

1. User Authentication:
  - Verify user credentials during login.
2. Home Page Display:
  - After successful login, display the home page containing project details and options for real-time monitoring and image/video upload.
3. Real-Time Monitoring Initialization:
  - If the user selects "Monitor in Real Time," activate the webcam.
4. Webcam Frame Capture:
  - Continuously capture frames from the webcam.
5. YOLO Model Initialization:
  - Load the pre-trained YOLO model for mask detection and people counting.
6. Frame Processing:

- For each captured frame:

IV. PSEUDO CODE

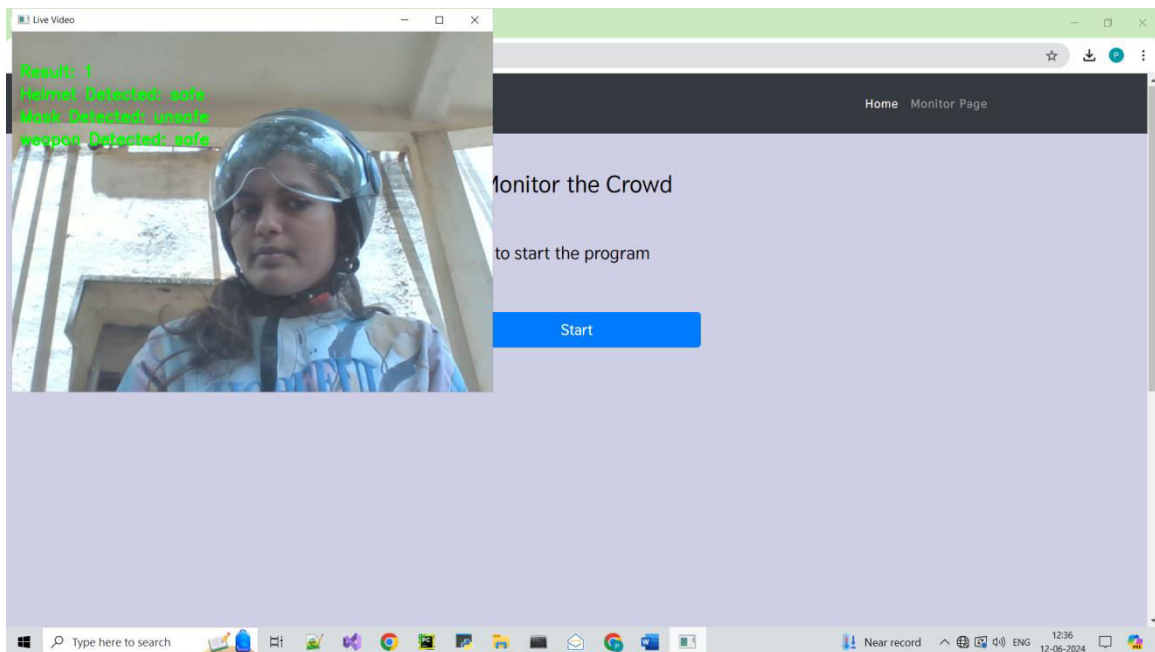
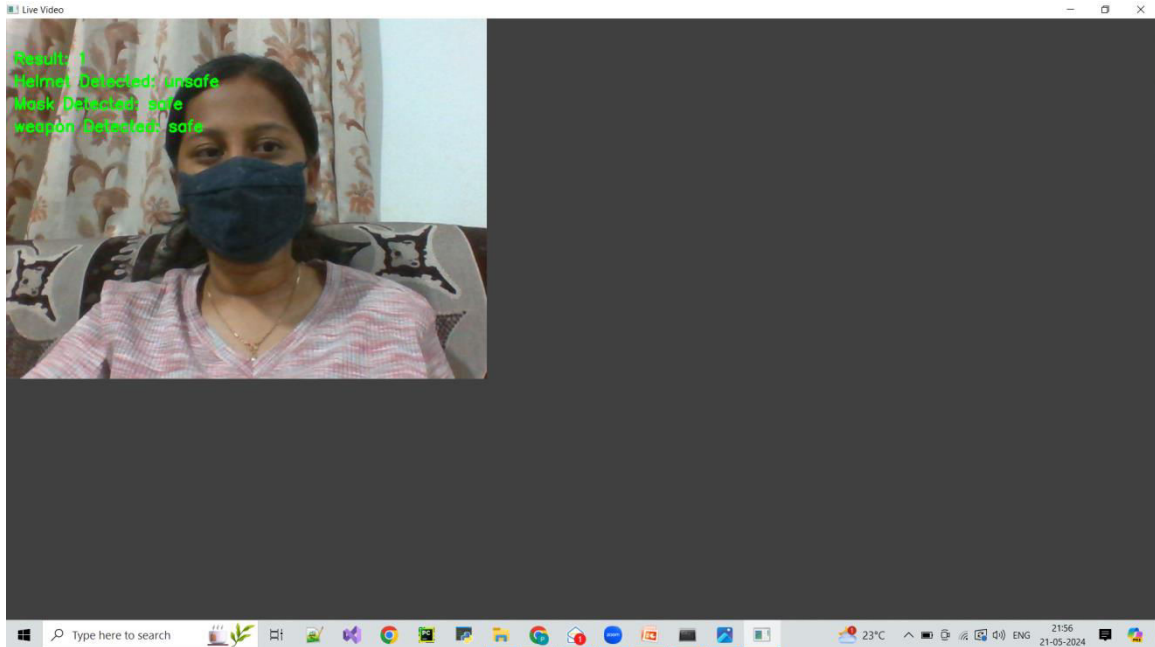
```

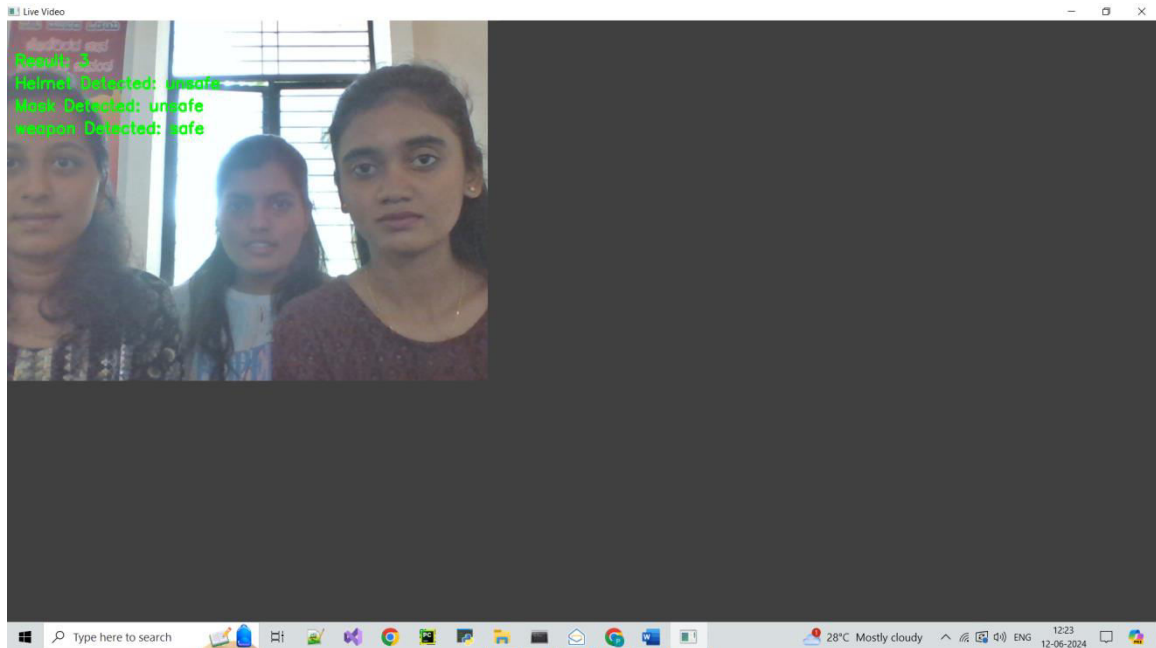
1  # Importing essential libraries and modules
2
3  from flask import Flask, render_template, request, Markup
4  import numpy as np
5  import pandas as pd
6
7  import requests
8  #import config
9  import pickle
10 import io
11 from PIL import Image
12 import os
13 from monitor_main import monitor
14
15 from werkzeug.utils import secure_filename
16
17 from dummy_code import a_val
18 import pathlib
19 temp = pathlib.PosixPath
20 pathlib.PosixPath = pathlib.WindowsPath
21 app = Flask(__name__)
22
23 # render home page
24 # Define the upload folder
25 UPLOAD_FOLDER = 'uploads'
26 app.config['UPLOAD_FOLDER'] = UPLOAD_FOLDER
27
28 # Ensure the upload folder exists
29 os.makedirs(app.config['UPLOAD_FOLDER'], exist_ok=True)
30
31 # Set allowed extensions for file uploads
32 ALLOWED_EXTENSIONS = {'png', 'jpg', 'jpeg', 'gif'}
33
34
35 def allowed_file(filename):
36     return '.' in filename and filename.rsplit('.', 1)[1].lower() in ALLOWED_EXTENSIONS
37
38 @app.route('/')
39 def home():
40     title = 'Crowd Monitor System'
41     a_val()
42     filename = 'dummy_code.py'
43
44     # Read the content of the file
45     with open(filename, 'r') as file:
46         content = file.read()
47
48     # Modify the content
49     content = content.replace('a=3', 'a=2')
50
51     # Write the modified content back to the file
52     with open(filename, 'w') as file:
53         file.write(content)
54
55     print(f"Content of {filename} has been updated.")
56     return render_template('index.html', title=title)
57
58 # render crop recommendation form page
59
60 @app.route('/ATM-predict', methods=['GET', 'POST'])
61 def ATM_prediction():
62     title = 'Real Time ATM Monitor System'
63
64     if request.method == 'POST':

```



### V. SIMULATION RESULT





## VI. CONCLUSION AND FUTURE WORK

In conclusion, the development of the Crowd Monitoring System represents a significant stride toward leveraging advanced technologies for the enhancement of public safety, health management, and event planning. Through the integration of real-time monitoring and image/video analysis, this system provides a versatile solution with broad applications across diverse domains.

The deployment of YOLO models for precise mask detection, efficient people counting, and gender identification sets the foundation for robust and accurate crowd analytics. By offering dual functionalities in a single model—counting people and discerning gender—the system optimizes computational resources, demonstrating a commitment to efficiency and innovation.

The system's applications span a wide range of sectors, including public health, event management, transportation, retail, security, and emergency response. Its adaptability to various scenarios underscores its potential as a valuable tool for authorities, organizations, and planners seeking to optimize crowd dynamics and ensure safety in different environments.

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