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DEPARTMENT OF INFORMATION TECHNOLOGY

IT3811 – Project work

PEOPLE COUNTING SYSTEM USING MOBILENET, SSD ALGORITHM BY DEEP LEARNING

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Project Guide:

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PROBLEM STATEMENT

- In many environments such as shopping malls, public transport stations, office buildings, and event venues, monitoring and analyzing crowd density is essential for ensuring safety, optimizing resources, and improving customer service. Traditional methods of people counting, such as manual counting or sensor-based systems (IR sensors, turnstiles), are often costly, inflexible, or inaccurate in dynamic scenarios.
- In concise what it says:
- Use publicly available datasets like PASCAL VOC, or Open Images Dataset that contain human annotations, Preprocess video streams to resize frames to 300x300 pixels (required by MobileNet-SSD).

ABSTRACT

- In today’s fast-paced and densely populated environments, efficient crowd management is essential for public safety, operational efficiency, and data-driven decision-making.
- Traditional people counting techniques, such as manual tallies and infrared sensors, often fall short in terms of accuracy, scalability, and real-time performance.
- This project presents a robust, real-time **People Counting System** based on deep learning, utilizing the **MobileNet-SSD (Single Shot MultiBox Detector)** architecture.
- MobileNet serves as a lightweight yet effective feature extractor, enabling the system to run on resource-constrained devices, while SSD facilitates rapid object detection in a single forward pass.

EXISTING SYSTEM

- Traditional people counting systems rely on a range of methods including manual counting, infrared (IR) sensors, pressure mats, and simple camera-based motion detection.
- While these methods offer basic functionality, they suffer from several limitations. Manual counting is labor-intensive and prone to human error, while IR sensors and pressure mats can only count individuals at fixed entry or exit points and are incapable of handling overlapping objects or occlusions.
- Additionally, these systems are often unable to distinguish between people and non-human objects, leading to inaccurate counts.

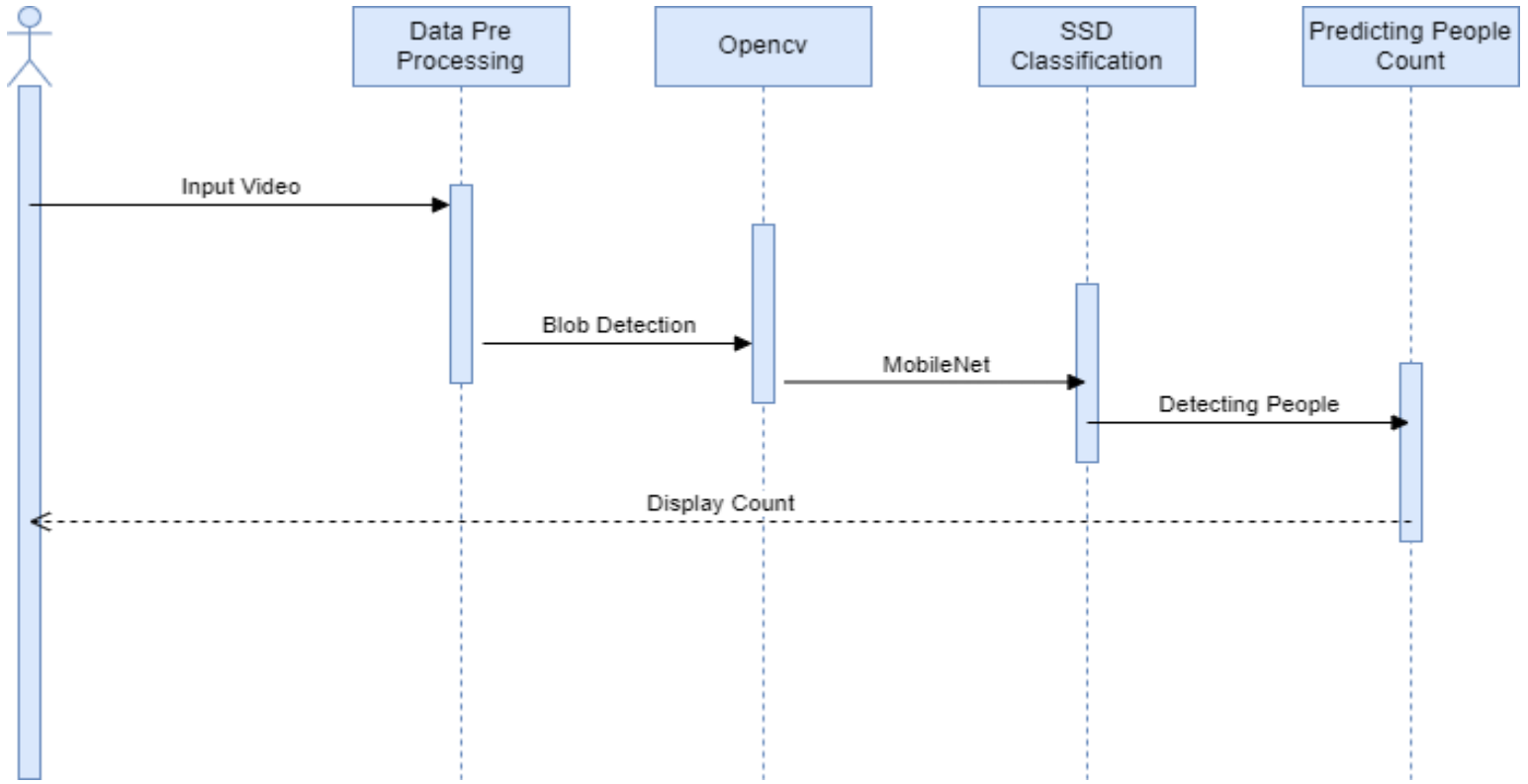
PROPOSED SYSTEM AND ITS OBJECTIVES

- The proposed system introduces an advanced, real-time **People Counting System** utilizing the **MobileNet-SSD deep learning algorithm** to overcome the limitations of traditional counting methods.
- By integrating a pre-trained MobileNet-SSD model, the system is capable of accurately detecting and counting people in live video streams or recorded footage.
- The system focuses specifically on identifying objects labeled as ‘person’ in each frame, drawing bounding boxes around detected individuals and maintaining a running count.
- It offers robustness against occlusions, varying lighting conditions, and different camera angles.

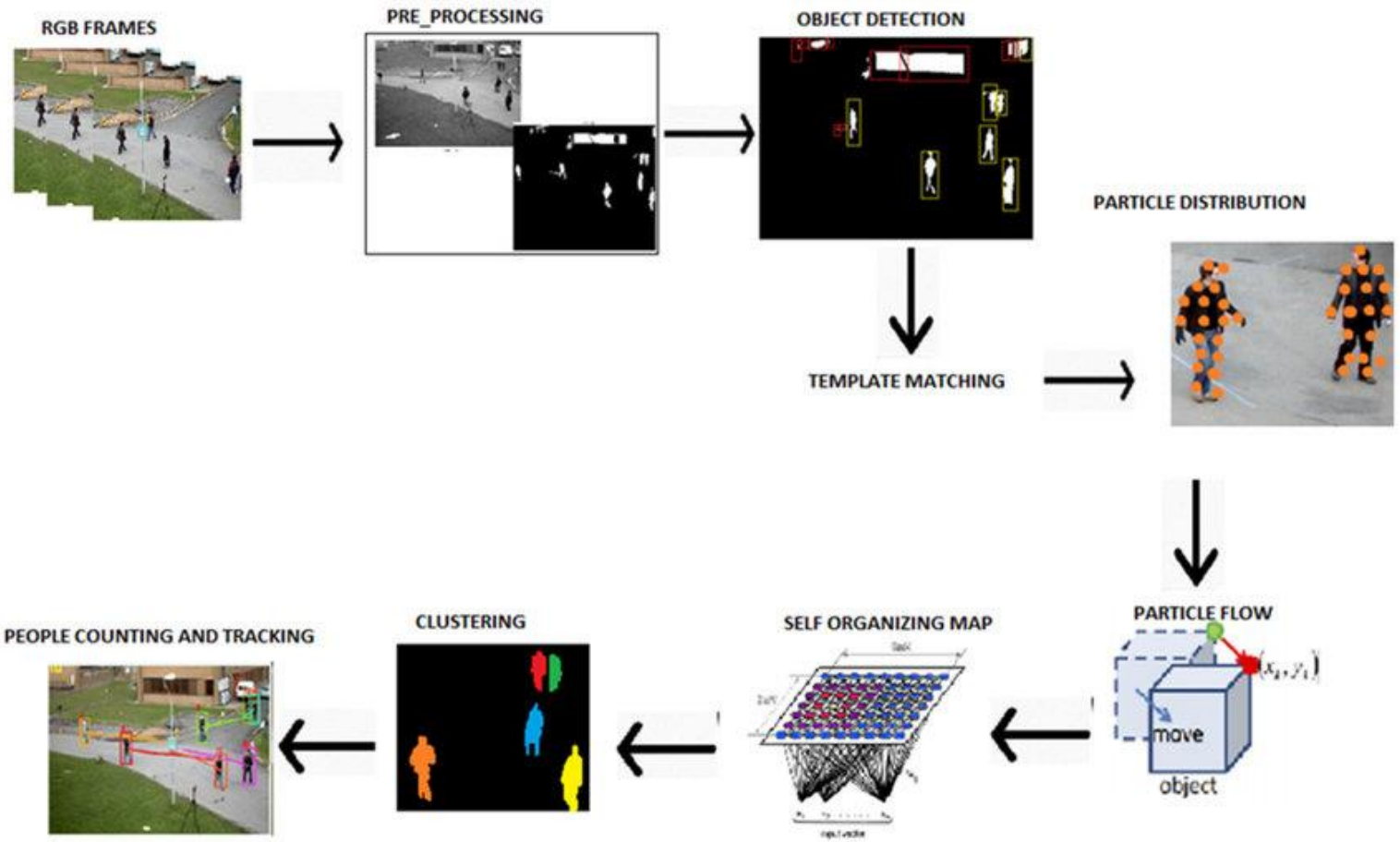
TECHNOLOGIES USED

- **Programming Language** – Python : The primary language for implementing the deep learning model and handling video processing due to its extensive libraries and ease of use.
- **Deep Learning Framework** – TensorFlow : Used to load and work with the pre-trained MobileNet-SSD model.
- **Model -** MobileNet-SSD (Single Shot MultiBox Detector)
- **Computer Vision Library** - OpenCV (Open Source Computer Vision Library)
- **Development Tools -** Visual Studio Code
- **Additional Libraries –** NumPy, Imutils, Matplotlib

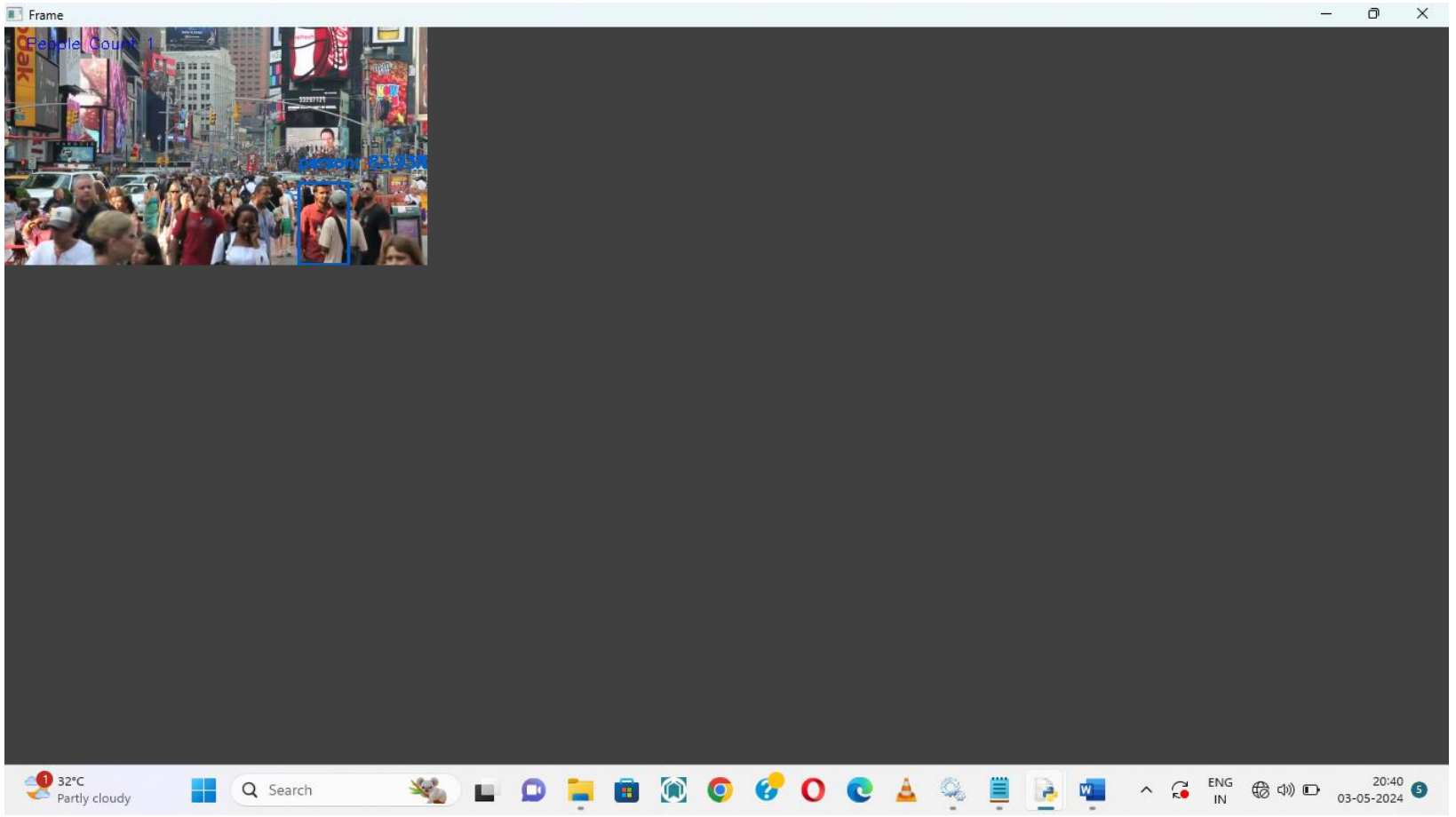
WORK FLOW


Data Pre Processing
Opencv
SSD Classification
Predicting People Count
Input Video
Blob Detection
MobileNet
Detecting People
Display Count

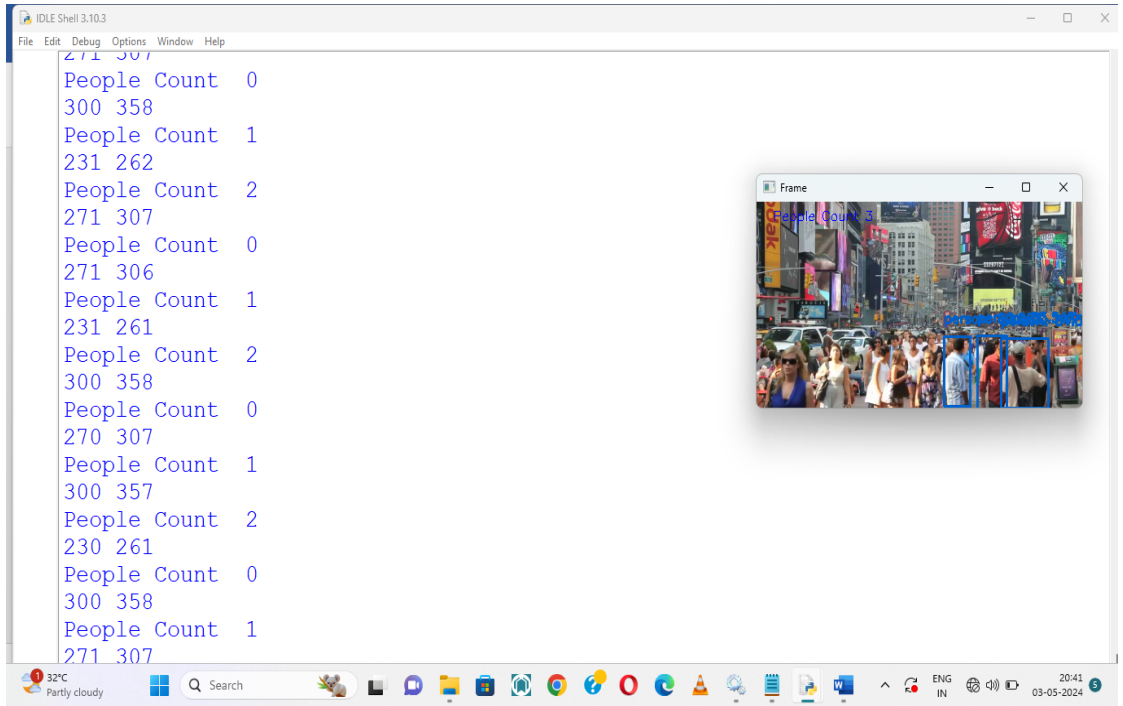
SYSTEM ARCHITECTURE DIAGRAM

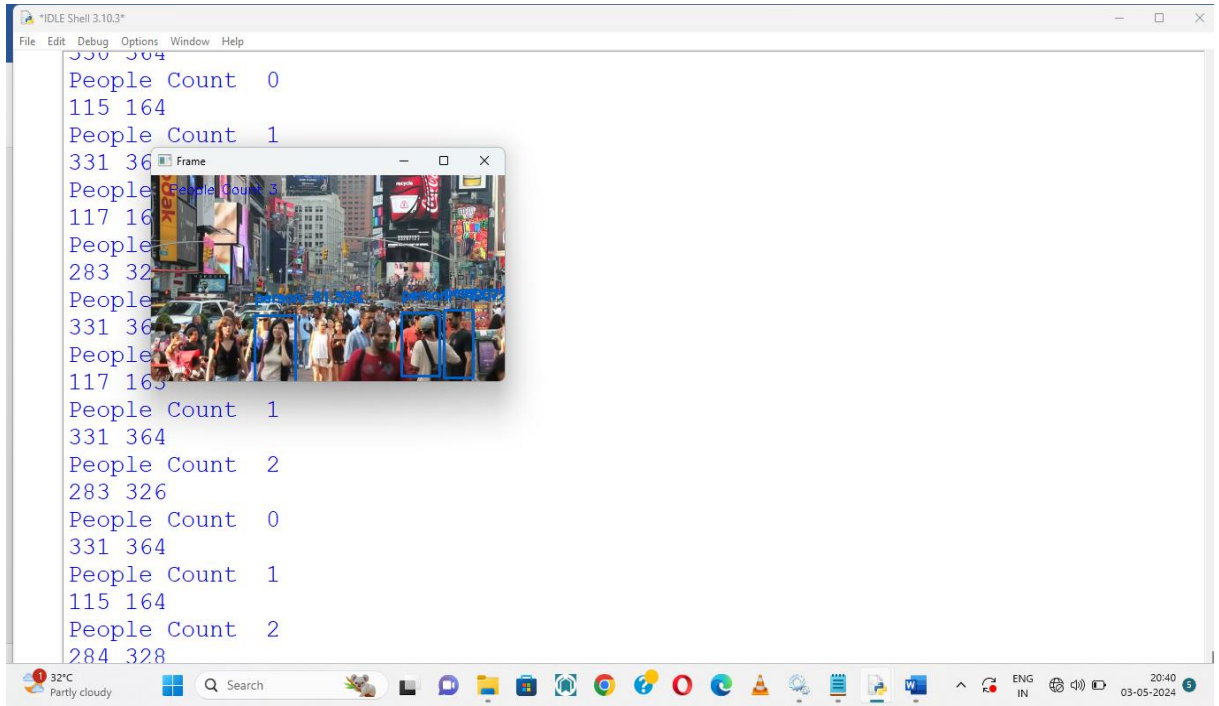


PROTOTYPE SCREEN



Video Frame Interface - The above picture shows that the bounding box is processing in the crowd place and then count the nimber of people in that video





People counting process by visual studio code

FUTURE ENHANCEMENTS

- **AI-based Object Detection**: Utilize deep learning techniques for object detection to accurately identify and count people even in crowded or complex environments.
- **Multi-Sensor Fusion:** Combine data from multiple sensors such as cameras, lidar, infrared sensors, and Wi-Fi tracking to improve accuracy and reliability.
- **Real-Time Analytics:** Implement real-time analytics to analyze crowd dynamics, such as crowd density, flow patterns, and dwell times.
- **Privacy-Preserving Techniques**: Develop privacy-preserving methods that anonymize data while still allowing accurate counting.
- **Adaptive Learning Algorithms:** Create algorithms that can adapt and learn from new data over time, improving accuracy and adaptability to changing environments or scenarios.

CONCLUSIONS

- In conclusion, the development and implementation of a people counting system represent a significant advancement in various domains, including retail, transportation, security, and urban planning. Through the integration of advanced technologies such as computer vision, machine learning, and IoT, these systems offer a range of benefits, including improved operational efficiency, enhanced customer experience, and better decision-making capabilities.
- Our exploration of people counting systems has revealed the diverse methodologies and approaches employed to tackle the challenges associated with accurately and efficiently counting individuals in dynamic environments. From traditional methods like infrared sensors and manual counting to modern solutions leveraging computer vision techniques and deep learning algorithms, there exists a spectrum of options for system designers and developers to choose from.

THANKYOU