**PROJECT REPORT**

**Project Title**: Social Distancing project using Computer Vision and Deep Learning

**Team Name**: Aventador

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**Abstract** :

In this project, social distance detection using computer vision and deep learning the main part of this is detect the people who are less than the given threshold distance who are actually violating the social distance and those are indicated with the red coloured line in between them when social distance is violated and also showed the difference between on using the OpenVINO toolkit and on using general processor CPU, well the difference after passing the video into it is around 8 times FPS high on using intel OpenVINO inference methods, with CPU the FPS is 2, on OpenVINO inferencing method it is around 16 average, all the video links and code are uploaded in the github, github link is provided at the ending of this report.

**Introduction:**

Social distancing has emerged as a critical measure to control the spread of infectious diseases, particularly in the wake of the COVID-19 pandemic. To enforce and ensure compliance with social distancing guidelines, computer vision and deep learning techniques have been employed to develop robust social distance detection systems. These systems leverage the power of artificial intelligence to automatically monitor and analyze the spatial relationships between individuals in public spaces.

In this project, it is performed on the local computer with the i7 intel processor using the openvino toolkit which increased the fps in the video when compared without openvino toolkit ,it showed the difference between both of them is around 8 times.

**Motivation behind the problem:**

The motivation behind the problem of social distance detection using computer vision and deep learning arises from the need to effectively combat the spread of infectious diseases, particularly in crowded public spaces. Here are some key motivations for addressing this problem:

1. Public Health and Safety:

By accurately detecting violations of social distancing guidelines, computer vision and deep learning systems can help enforce compliance, thus minimizing the risk of disease transmission and protecting public health and safety.

1. Scalability and Adaptability:

As the world becomes increasingly interconnected, the need for scalable solutions that can adapt to different environments and situations becomes essential. Computer vision and deep learning techniques provide a flexible framework for social distance detection, allowing the system to be deployed and customized for various settings, such as hospitals, airports, public transportation, workplaces, and retail stores.

**Prior Works:**

1) "Real-Time Social Distance Monitoring in COVID-19 Pandemic Using Artificial Intelligence" by Arun et al. (2020): The authors presented a real-time social distance monitoring system based on deep learning and computer vision. They used an object detection algorithm to identify people in a video stream and calculated the distance between them to detect violations of social distancing guidelines.

2)"Social Distancing Monitoring System using Deep Learning and Visual Object Detection" by Mahendra et al. (2020): This project focused on developing a system to monitor social distancing in public spaces. They employed deep learning techniques for object detection and localization and implemented an alerting mechanism to notify authorities when social distancing violations occurred.

3) "Social Distancing Detection using Deep Learning and Computer Vision" by Chen et al. (2021): This study presented a deep learning-based approach for social distancing detection. They employed a multi-task learning framework that combined object detection, pose estimation, and distance estimation to accurately detect and measure social distancing violations.

**Our Approach :**

In this project, Openvino Toolkit uses Intel’s Pretrained model, person-detection-0202, for detecting the people in the video. This is a person detector that is based on the MobileNetV2 backbone with two SSD heads from 1/16 and 1/8 scale feature maps and clustered prior boxes for 512x512 resolution. Here, the Euclidean distance formula is used to find the distance between the people in each frame, and **if** it finds out that the actual distance between the people is less than the threshold distance, then a red line would be drawn in between the people who ever failed the social distance in public. So in the present work, it has used optimised techniques for inferencing the video, which in turn increased the FPS of the video. It was compared with the Yolov3 weights and cfg loaded model social distancing, so astonishingly, the FPS of the unoptimized version that has not used the OpenVino toolkit is 8 times less than the optimised version of the Intel pretrained model.

**Results:**

On using the intel openvino toolkit which is optimized version made easy in inferencing. on comparing with the other unoptimized version model without using openvino toolkit ,it is concluded that 8 times high the FPS is seen in the model that used openvino.

**Algorithm used** : Intel’s Pretrained model, person-detection-0202, for detecting the people in the video. This is a person detector that is based on the MobileNetV2 backbone with two SSD heads from 1/16 and 1/8 scale feature maps and clustered prior boxes for 512x512 resolution.

**Optimized Version With Openvino Toolkit And A Pretrained Model Based On Mobile Netv2 Backbone With Two Ssd Heads From Openvino**

**AVG FPS**: **16**

**VIDEO LINK:** https://youtu.be/IaGS79e84j4

**Unoptimized Version With Yolov3 Weights And Cfg File**

**AVG FPS**: **2**

**VIDEO LINK**: https://youtu.be/KT\_DkvnSgmY

**REFERENCES:**

1. [**https://github.com/bethusaisampath/YOLOs\_OpenVINO/tree/main/YOLOv7**](https://github.com/bethusaisampath/YOLOs_OpenVINO/tree/main/YOLOv7)
2. [**https://pyimagesearch.com/2020/06/01/opencv-social-distancing-detector/**](https://pyimagesearch.com/2020/06/01/opencv-social-distancing-detector/)
3. [**https://docs.openvino.ai/2023.0/omz\_models\_model\_person\_detection\_0202.html**](https://docs.openvino.ai/2023.0/omz_models_model_person_detection_0202.html)
4. [**https://docs.openvino.ai/2023.0/omz\_demos\_social\_distance\_demo\_cpp.html**](https://docs.openvino.ai/2023.0/omz_demos_social_distance_demo_cpp.html)
5. [Social Distancing using YOLOv3 - Object Detection - with source code - fun project - 2023 - Machine Learning Projects](https://machinelearningprojects.net/social-distancing-using-yolov3/)

**Link to the solution:**

1. **CODE/RESULT :** checkthe given git hub repository link for more clear understanding of the project, code files as well as videos, screenshots are uploaded into it.

**>>GIT HUB LINK:** https://github.com/RaviTeja20003/intelunnati\_-Aventador-

**2) MODEL LINK:** [**https://docs.openvino.ai/2023.0/omz\_models\_model\_person\_detection\_0202.html**](https://docs.openvino.ai/2023.0/omz_models_model_person_detection_0202.html)