Crowd Detection

Deep Learning Project

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I. Introduction

People gather in many places, including conferences, fairs, festivals, shopping districts, events, etc. When people gather in groups, it immediately increases the risk of injuries, crime, antisocial behavior, terrorism occurs, and other incidents that can through panic, distress, or anxiety. There are several diverse and complex incidents when crowds panic, such as crushing, stamping, etc. Knowing how to recognize, handle and manage these incidents is of paramount importance when implementing crowd safety strategies. With Covid-19, crowd management has become very important to reduce the spread of epidemics, and the application of social distancing has become a necessity in all places.

II. Problem Statement

When we faced crowd gathering problems, we must perfectly manage them, and through the application of deep learning in this field, we will take real-time pictures of the places capable of unorganized gathering and monitor them, and through the application of deep learning, the model will give an alert when a limit is reached To manage crowds and give crowd alerts, so they will be organized using our model.

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III. Data Description

The train data was collecting from Kaggle.

- The mall dataset was collected from a publicly accessible webcam for crowd counting and profiling research.
- It contains 2000 of images, as JPG, Video length: 2000 frames
  Frame size: 640x480

Several data have been collected, including the Holy Mosque of Mecca and some areas of the Riyadh season, like winter wonderland, Assalam park. The model has been applied to it.

IV. Tools and Libraries:

- Numpy.
- Jupyter Notebook.
- Matplot.
- PIL
- Scipy.
- Pandas.
- Tensorflow
- Keras
- Sklearn

V. Models

Transfer learning with ResNetV50. learning rate starts with 0.0010 and end with 1.3730e

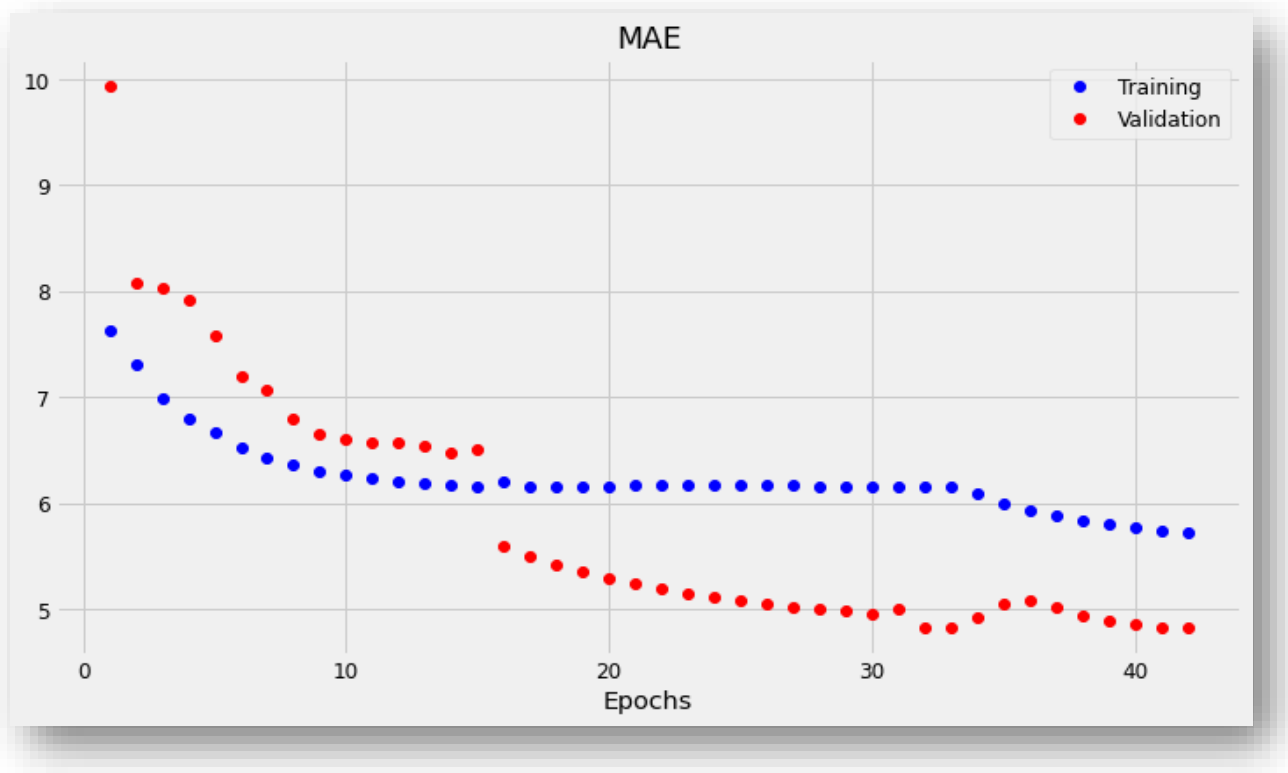
Batch size 64, Epoch = 20, optimizer Adam.

ResNet50	Loss	MAE	Loss Val	MAE Val
Epoch 1	83.3968	7.1712	9504984.0	3083.0103
Epoch 10	62.4793	6.1051	34.3206	4.9406
Epoch 20	48.7628	5.3244	28.6115	3.9866

Transfer learning with **InceptionResNetV2**. learning rate starts with 0.0010 and end with 7.5000e-04, Batch size 16, pooling ‘avg’, Epoch = 20 optimizer Adam.

InceptionResNetV2	Loss	MAE	Loss Val	MAE Val
Epoch 1	88.5487	7.4489	103.1567	8.7971
Epoch 10	60.9571	6.1481	47.2172	5.7910
Epoch 20	59.2559	6.1188	42.4718	5.4793

This graph represent Mean Absolute error for validation and training with InceptionResNetV2



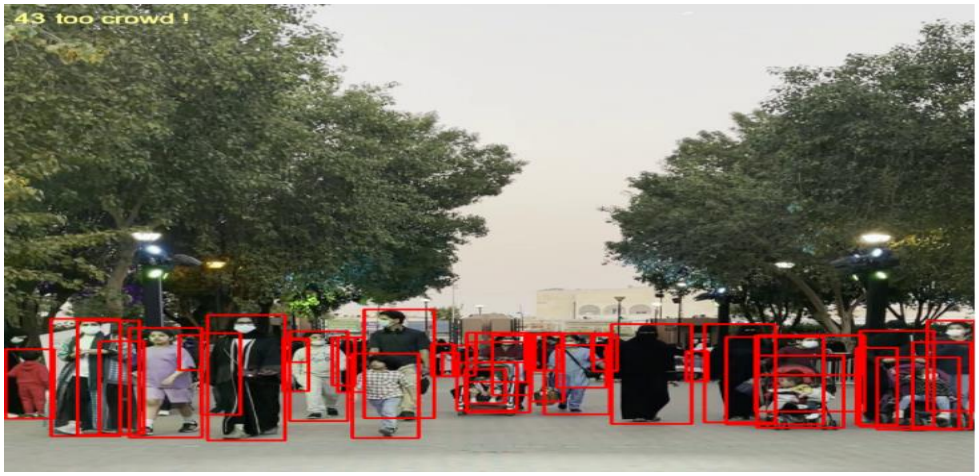
VI. Test Case

Case 1 In this case we take the image from Riyadh season Winter Wonderland

We apply **EfficientDet** model with **Threshold** = 10. The **limit** of alert = 30

Case 2 In this case we take the image from Riyadh season Assalam Park

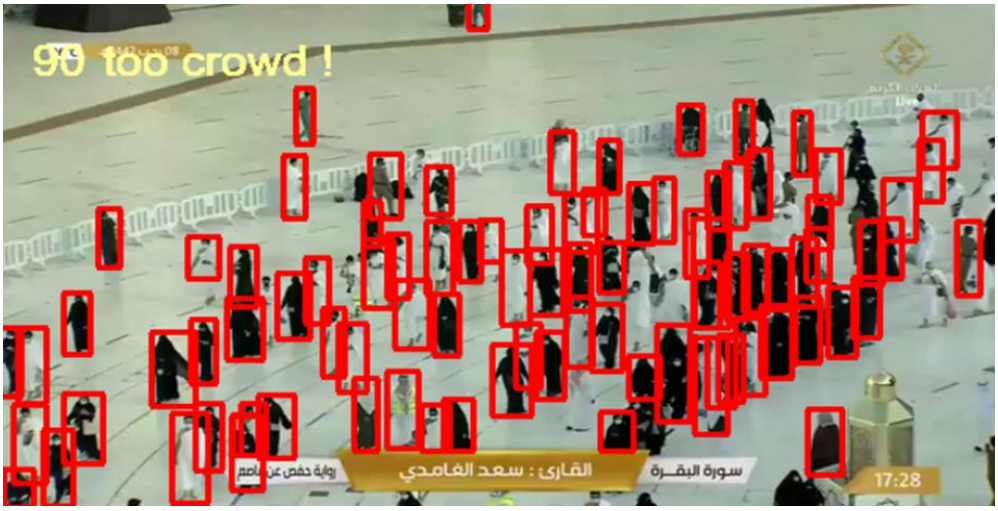
We apply EfficientDet model with Threshold = 10. The limit of alert = 40



Case 3 In this case we take the image from live video about Holy mosque in YouTube

We apply EfficientDet model with Threshold = 15.

The limit of alert = 80



VII. Future Work

- We will connect our model with a complete automated live system that alerts security personnel or organizers to close the gates and organize crowds.
- We will transfer it qualitatively to the idea to make it customized for cars to regulate traffic, for example at traffic lights and highways.
- We will create another system dedicated to calculating the number of people who entered the event, for example, and making statistics at peak times, etc.

VIII. Summary

- We noticed that when we increase the epochs the model will be better
- We found inceptionResNetV2 very useful with our model, and with adding layer it will be better.
- This model can used in any uses for object detection, and crowd management