Helwan University

كلية الحاسبات والذكاء الإصطناعي
Faculty of Computers & Artificial Intelligence

Faculty of Computers and Artificial Intelligence

Computer Science Department

2022/2023

CS Selected Topics in CS-4

Research Project

Team Number: 1

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Delivered to:

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Eng. Omar Tarek

PAPER DETAILS

a. Paper's citation

Authors name: Mingxing Tan, Ruoming Pang, Quoc V. Le
Paper name: EffcientDet: Scalable and Efficient Object Detection
Publisher name: IEEE
Year of Publication: 2020

b.

Dataset used: coco 2017
Implemented algorithm: EffcientNet
Results: mAP: 52.6, AP50: 71.6, AP75: 56.9.

Project Description

a. General Information on the selected dataset:

Dataset Name

Name: *COVID-19 PPE Dataset for Object Detection*

Link: *https://www.kaggle.com/datasets/ialimustufa/object-detection-for-ppe-covid19-dataset*

Number of classes and their labels

Number of classes: 5

(Mask, Face Sheild, Full Cover, Gloves, Goggles)

Dataset Samples Numbers

Train Images: 366

Test Images: 50

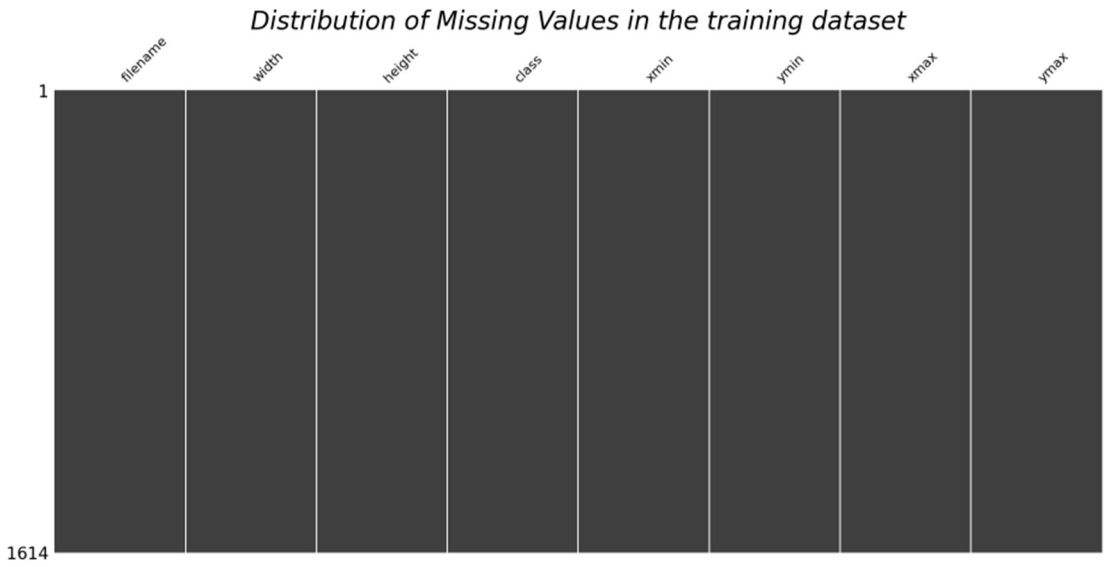
The dimension of images:

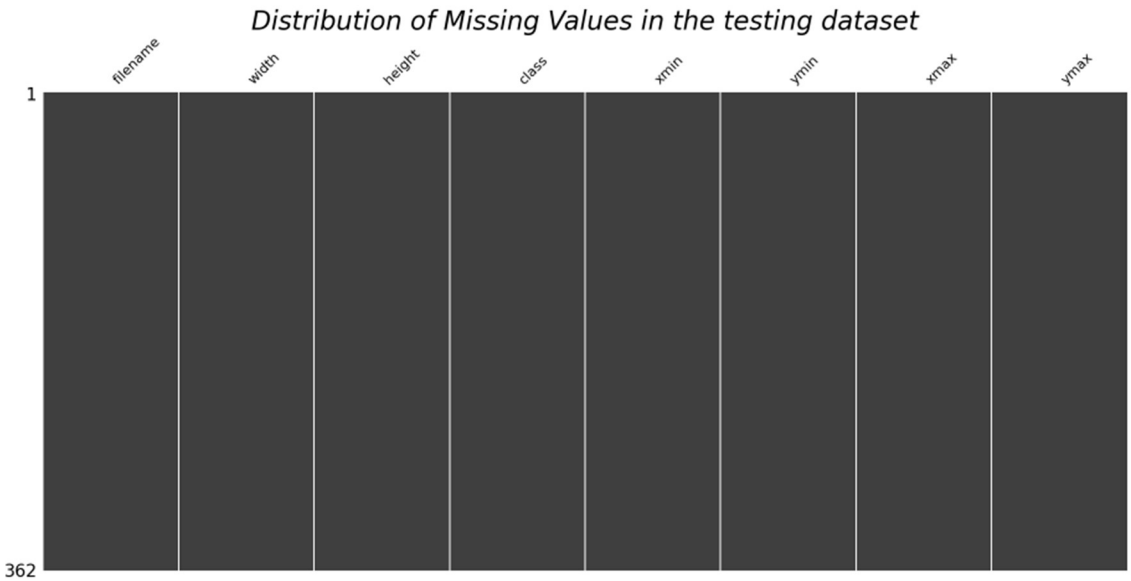
Height: 640

Width: 640

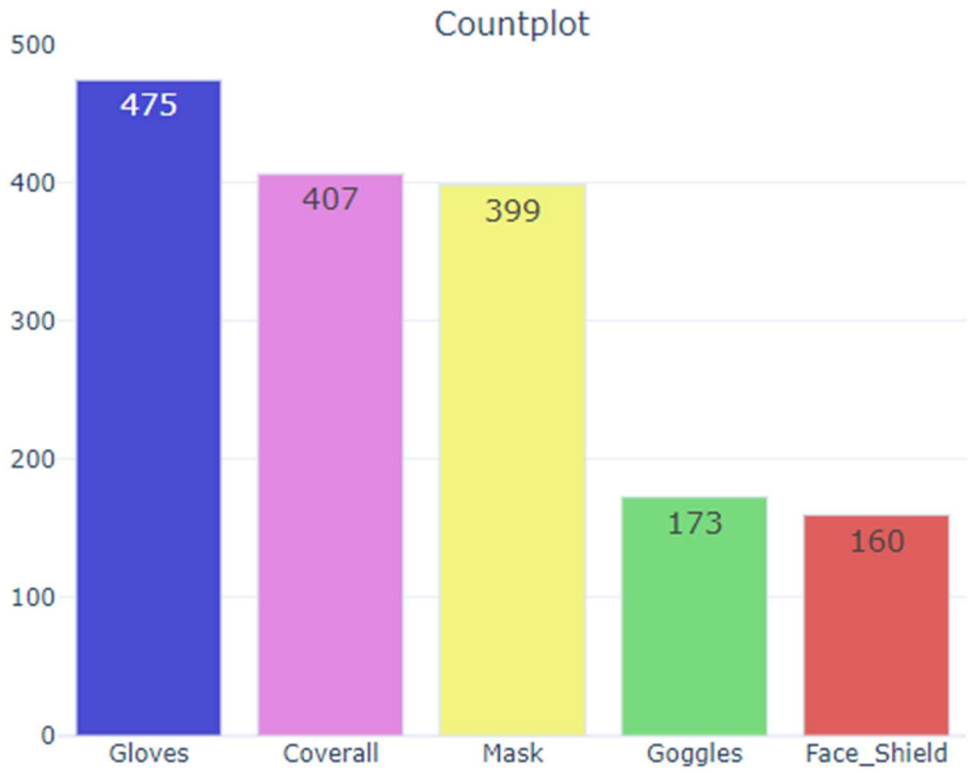
b. EDA about the selected dataset:

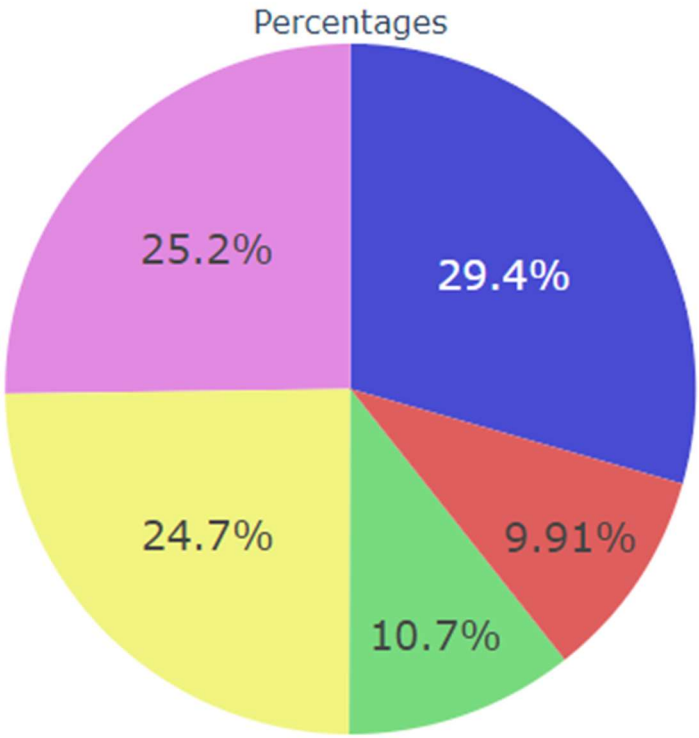
Distribution of null values



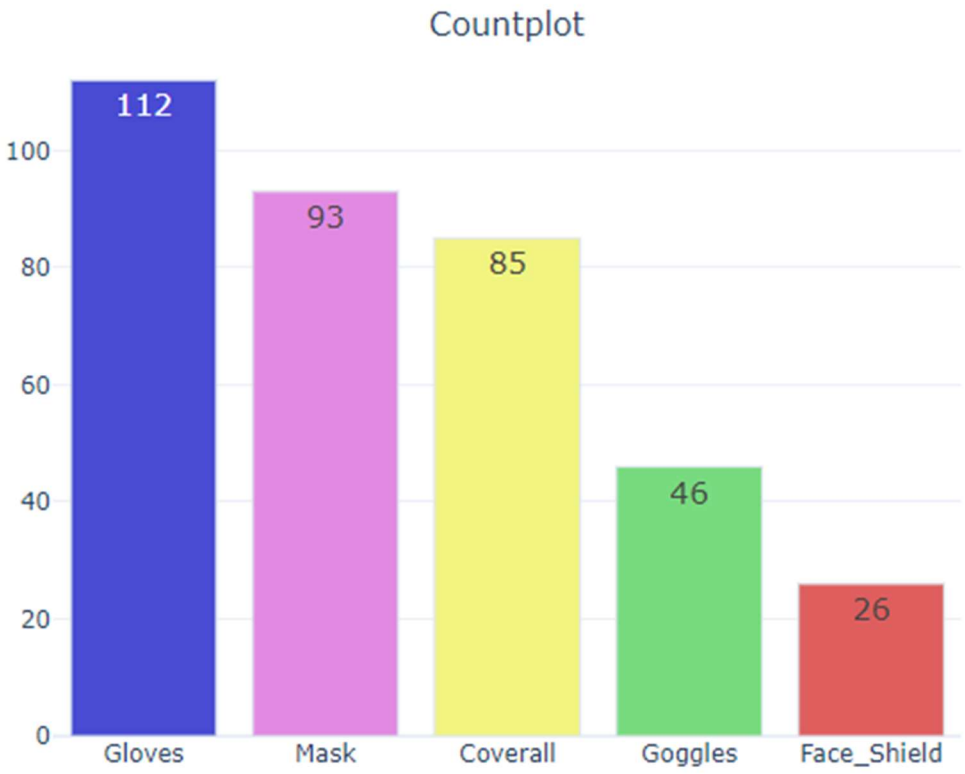


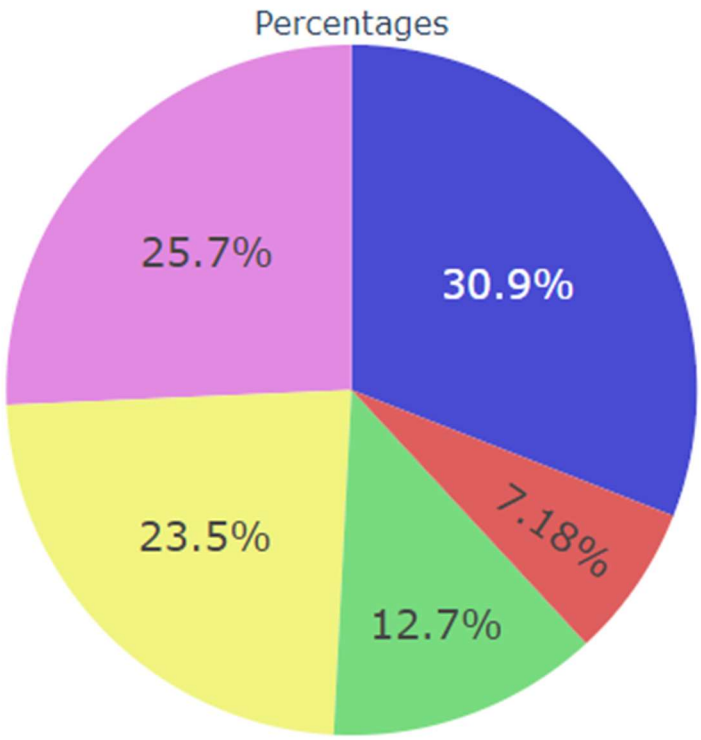
Distribution of the labels in the training dataset





Distribution of the labels in the testing dataset


Countplot
112
93
85
46
26
100
80
60
40
20
0
Gloves
Mask
Coverall
Goggles
Face_Shield

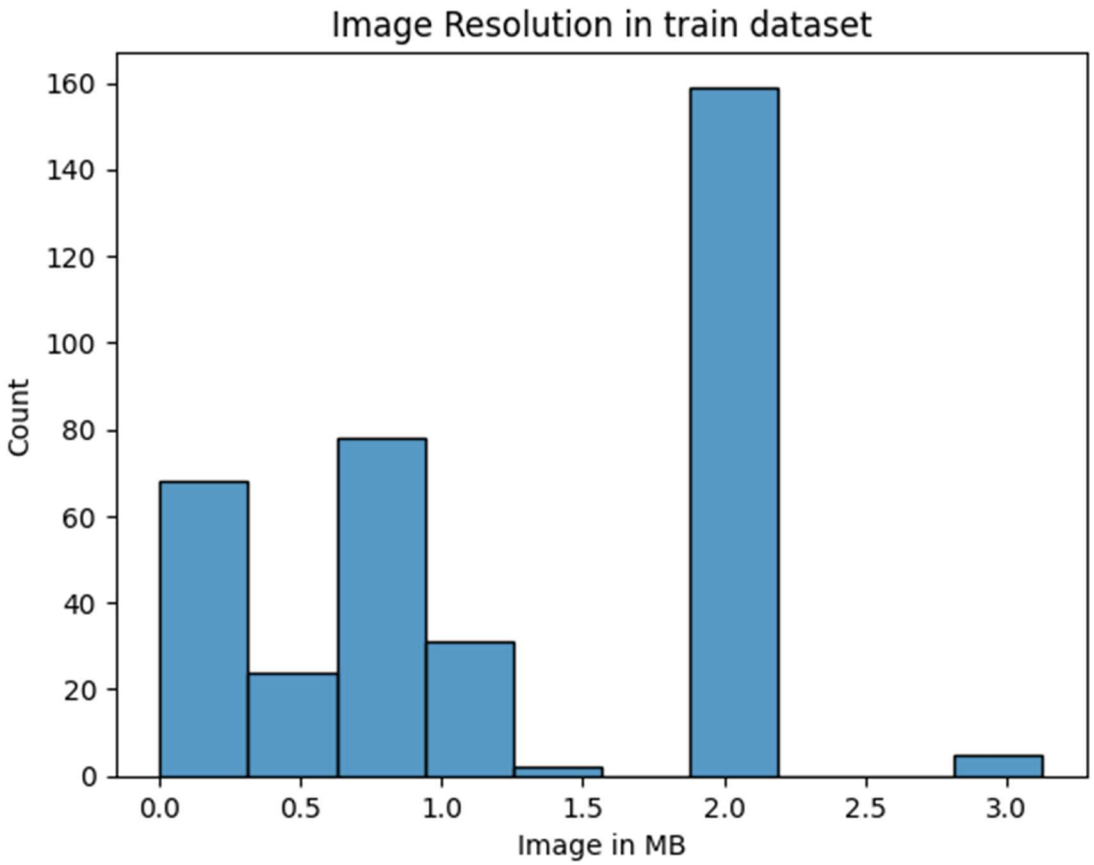

Percentages
25.7%
30.9%
23.5%
7.18%
12.7%

Descriptive Statistics

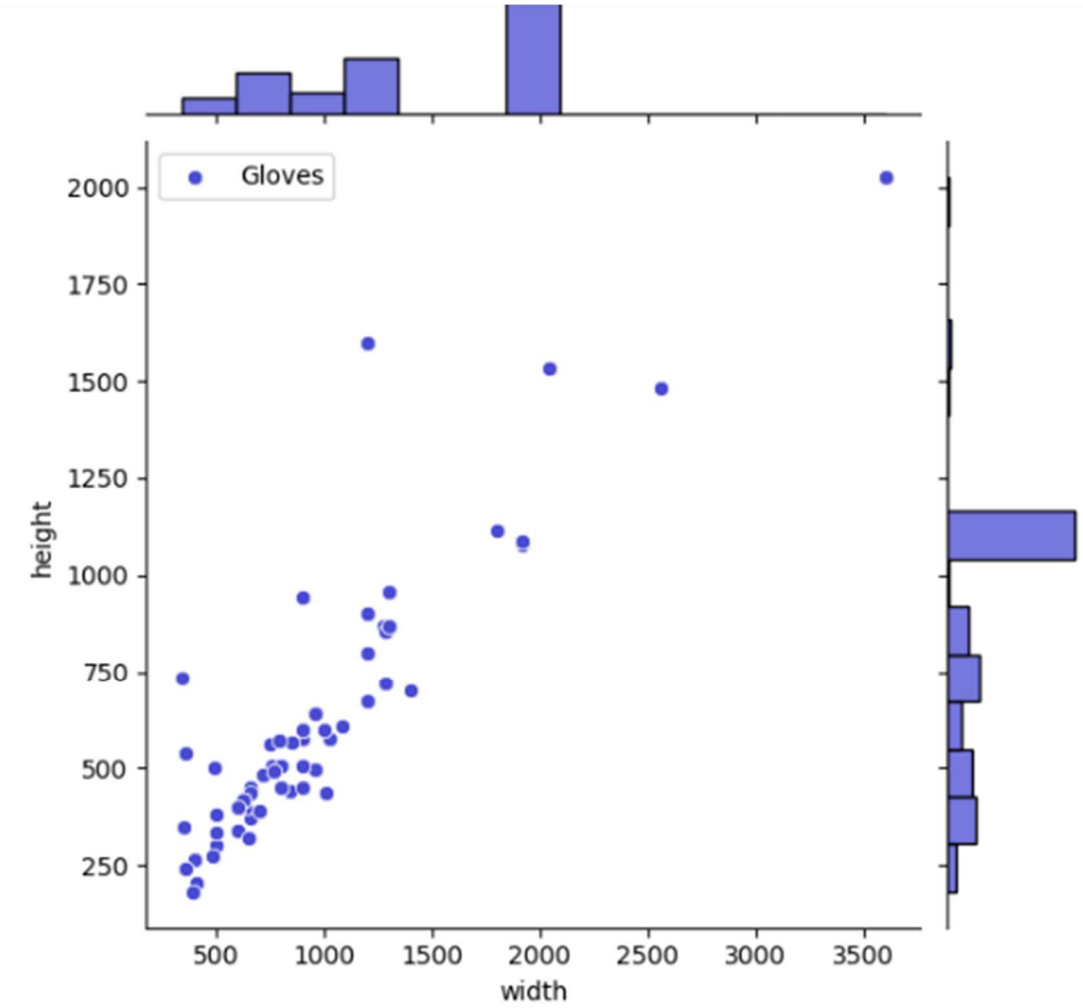
	count	mean	std	min	25%	50%	75%	max
width	1614.000000	1343.381041	533.844304	0.000000	900.000000	1280.000000	1920.000000	3600.000000
height	1614.000000	803.259603	308.043024	0.000000	576.000000	720.000000	1088.000000	2340.000000
xmin	1614.000000	562.322181	318.520416	1.000000	304.250000	559.000000	805.000000	2241.000000
ymin	1614.000000	258.218092	193.540260	1.000000	111.000000	217.500000	362.750000	1268.000000
xmax	1614.000000	805.774473	398.254985	53.000000	482.500000	805.500000	1101.000000	3594.000000
ymax	1614.000000	506.516109	291.849800	48.000000	275.000000	455.000000	694.000000	2070.000000

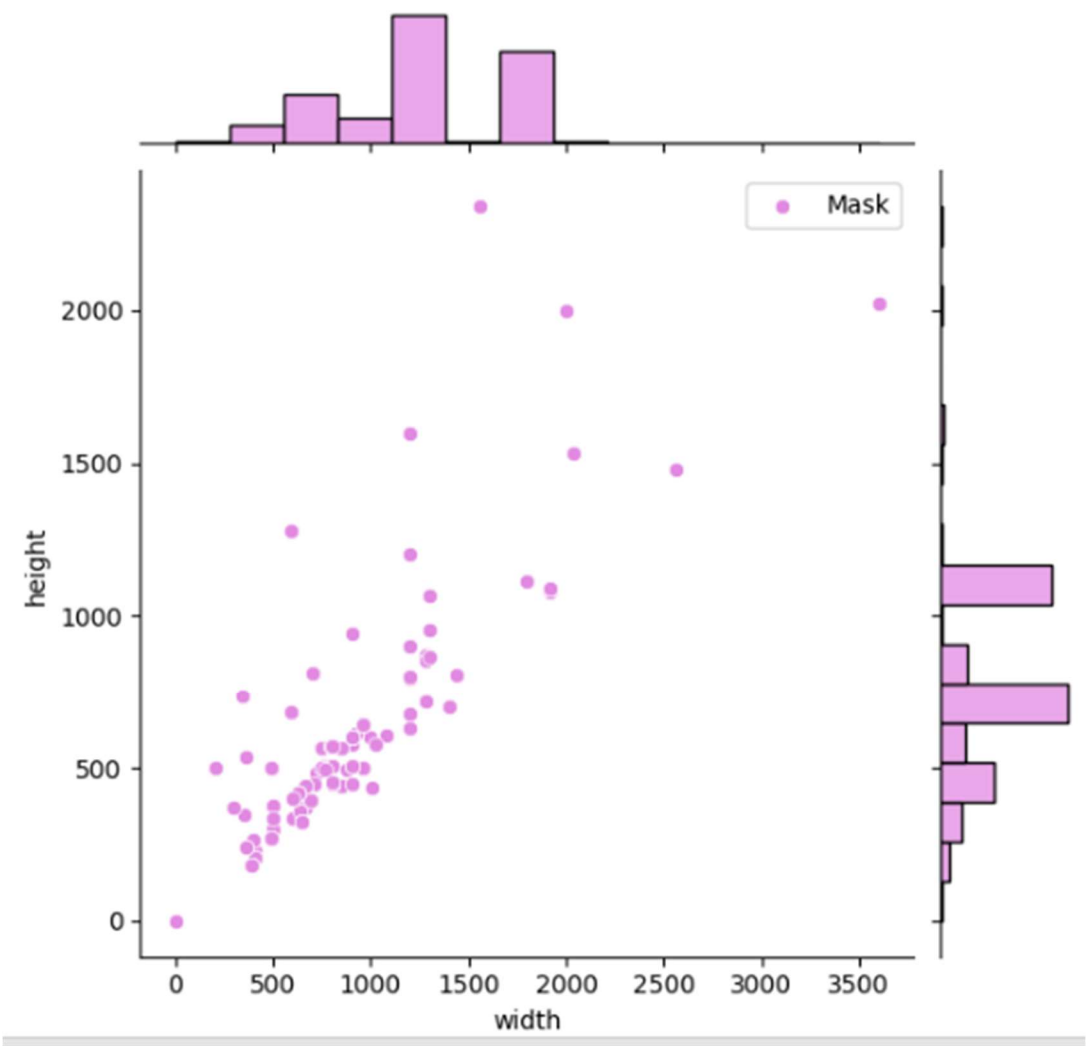
	count	mean	std	min	25%	50%	75%	max
width	362.000000	1188.408840	837.634292	296.000000	716.000000	900.000000	1200.000000	4552.000000
height	362.000000	799.359116	575.924148	247.000000	450.000000	563.500000	834.000000	2832.000000
xmin	362.000000	498.646409	521.578551	1.000000	212.000000	369.500000	612.250000	3601.000000
ymin	362.000000	233.803867	218.217477	1.000000	82.250000	162.000000	333.000000	1404.000000
xmax	362.000000	718.613260	658.532802	10.000000	345.250000	535.000000	797.500000	4538.000000
ymax	362.000000	491.696133	432.481965	54.000000	216.000000	397.500000	593.500000	2827.000000

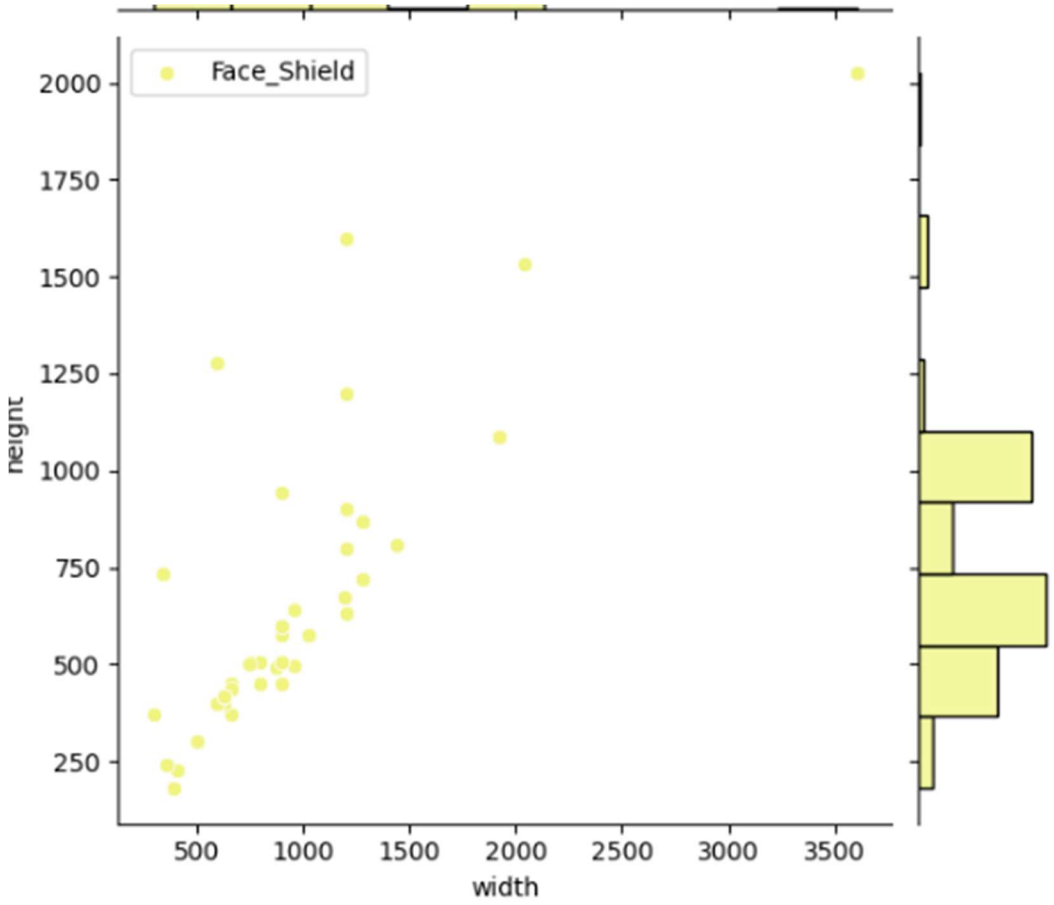
Image Resolution

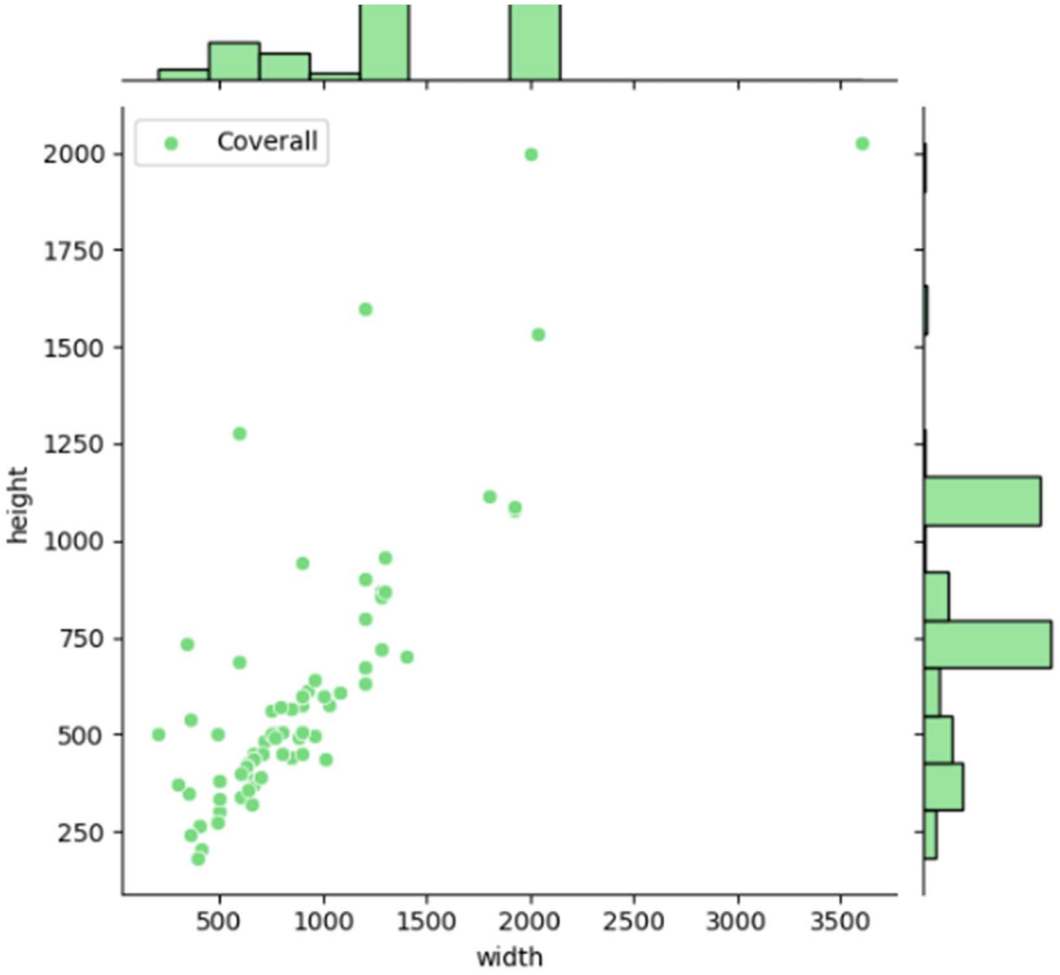


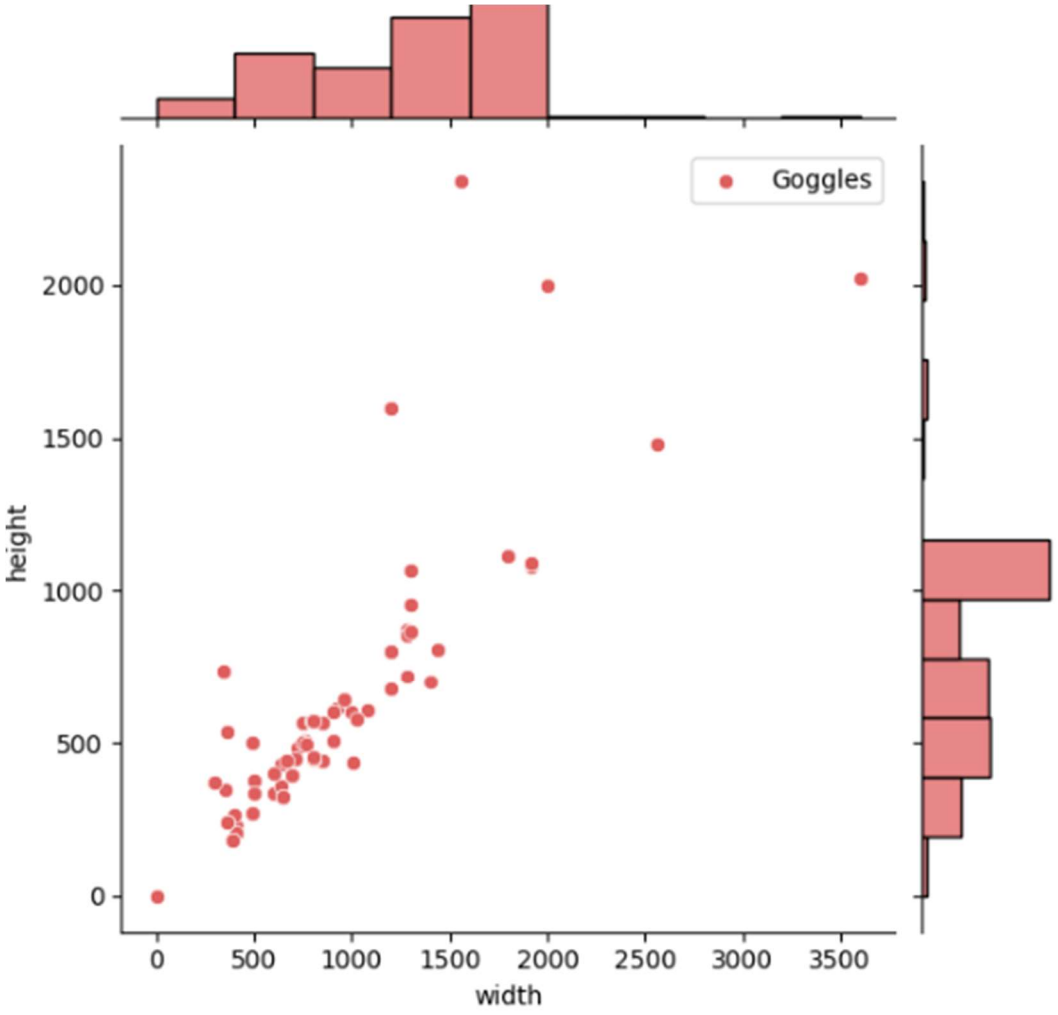
Distribution of width and height of the images


Gloves
height
width
2000
1750
1500
1250
1000
750
500
250
500
1000
1500
2000
2500
3000
3500

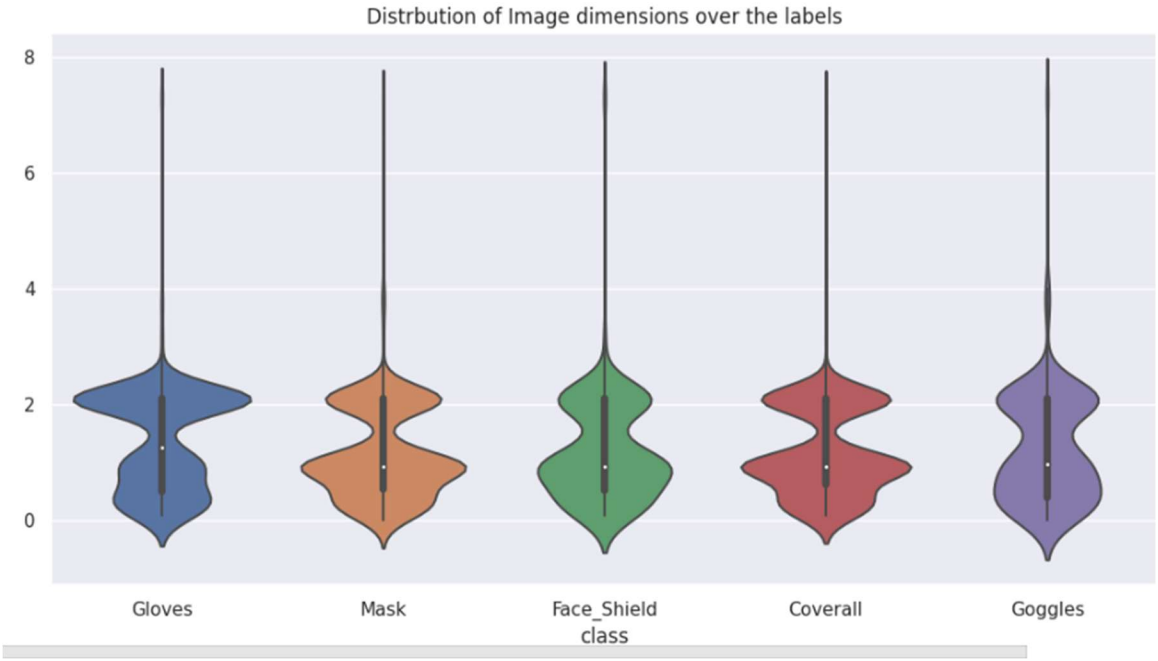

Mask
height
width
0
500
1000
1500
2000
2500
3000
3500


Face_Shield
2000
1750
1500
1250
1000
750
500
250
500
1000
1500
2000
2500
3000
3500
width

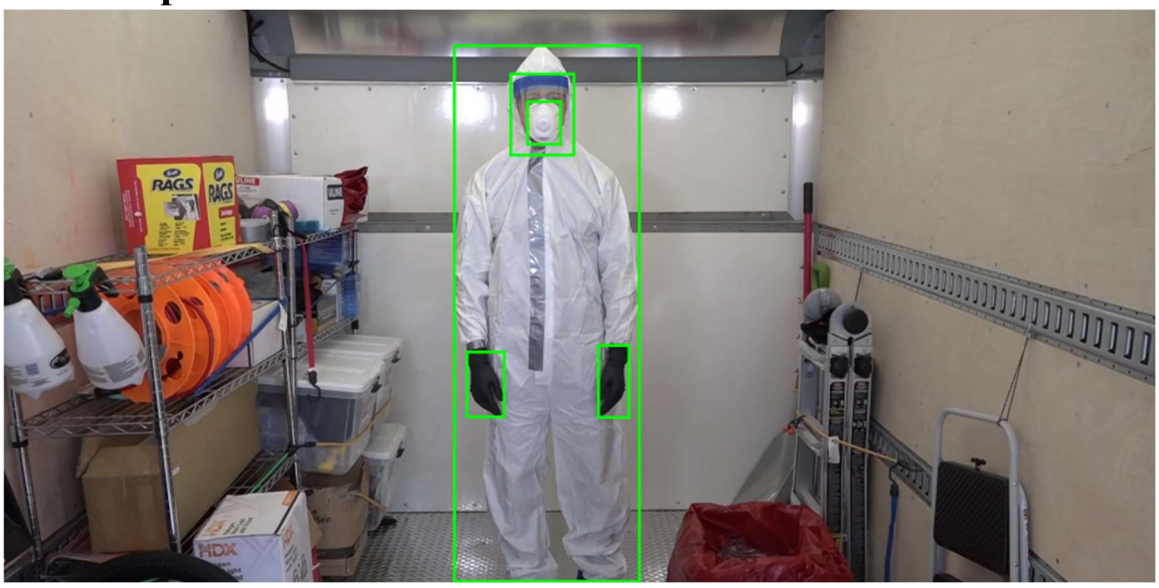

Coverall
2000
1750
1500
1250
1000
750
500
250
height
500
1000
1500
2000
2500
3000
3500
width

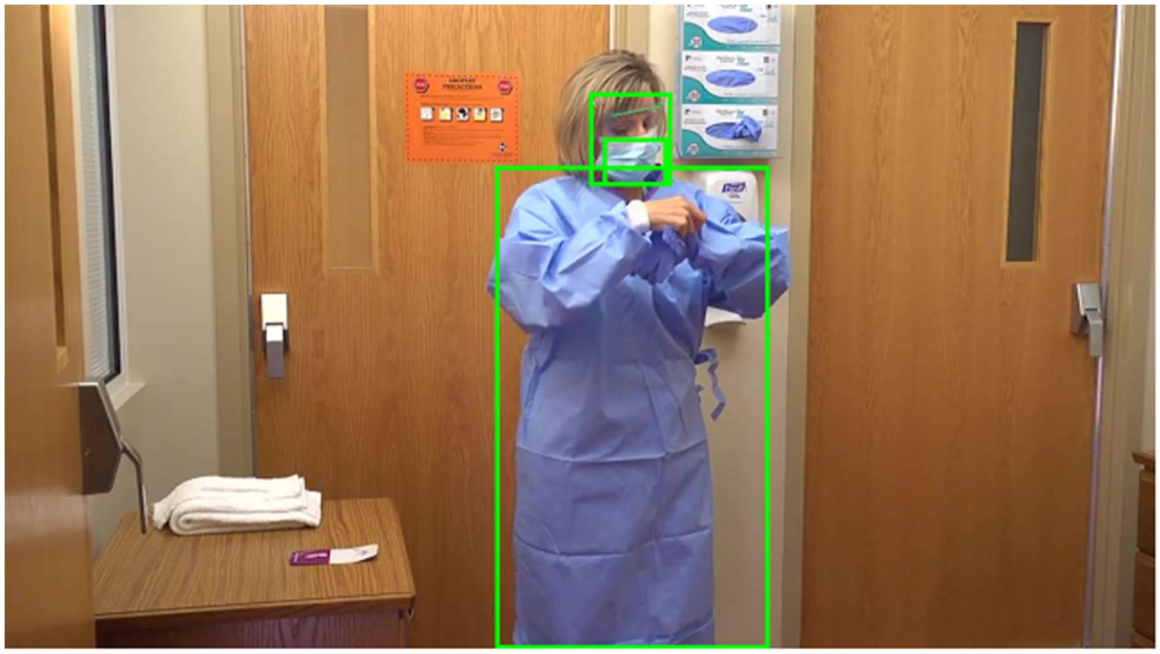


Distribution of the images with violin plot



Plot samples of the data

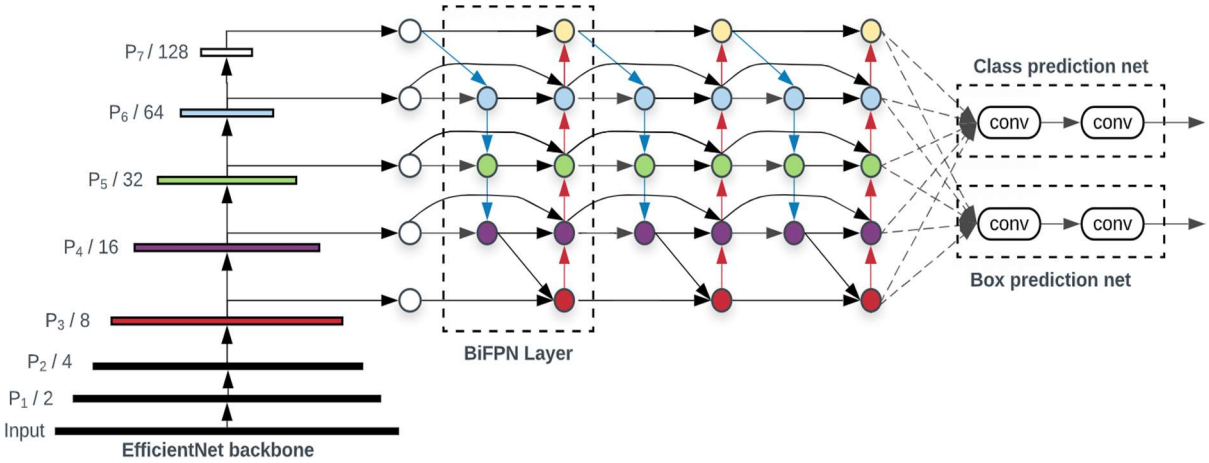




2. Implementation Details

a. The block diagram of the implemented model:

EfficientNet architecture:



It employs *EfficientNet* as the backbone network, *BiFPN* as the feature network, and shared *class/box prediction network*. Both *BiFPN* layers and *class/box* net layers are repeated multiple times based on different resource constraints.

b. Hyperparameters used in your model:

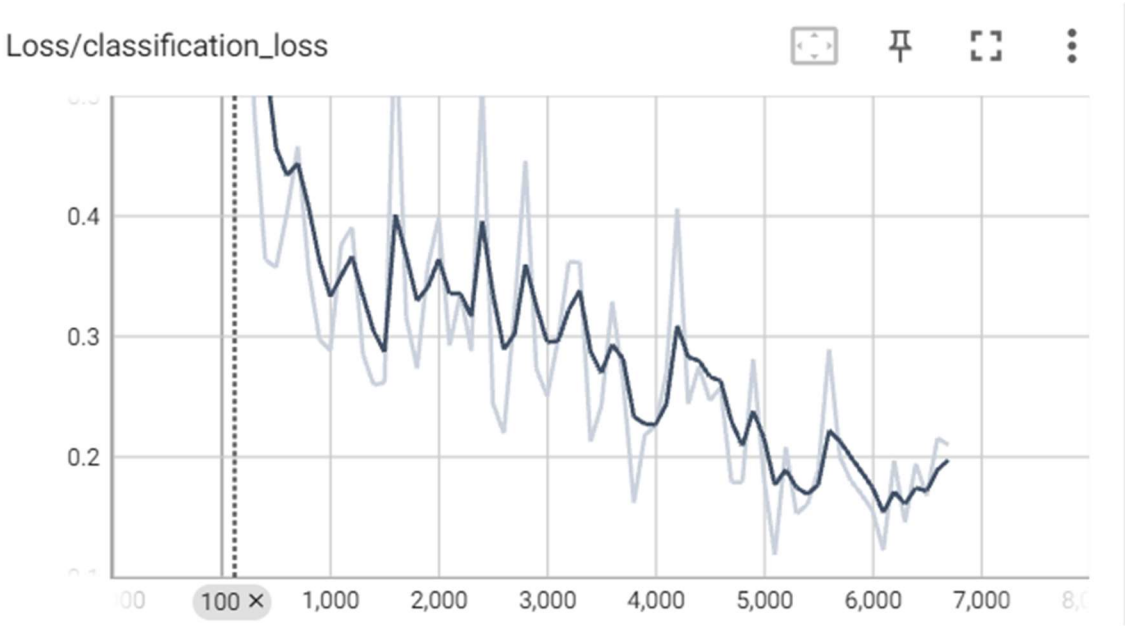
Number of epochs: 300
Batch size: 4

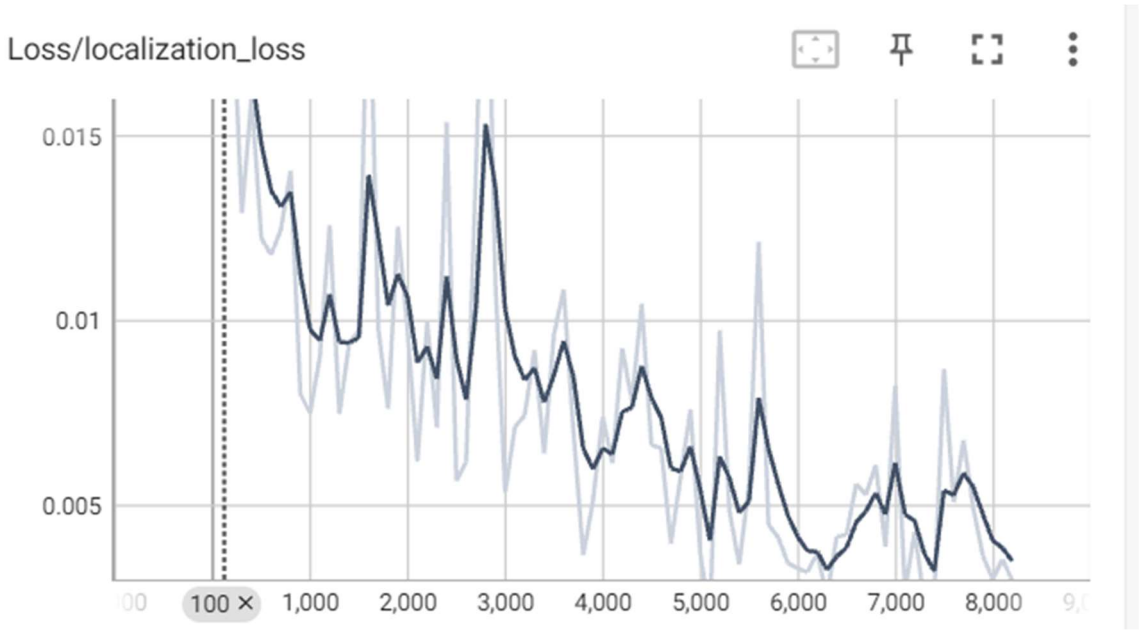
3. Models Results on testing data

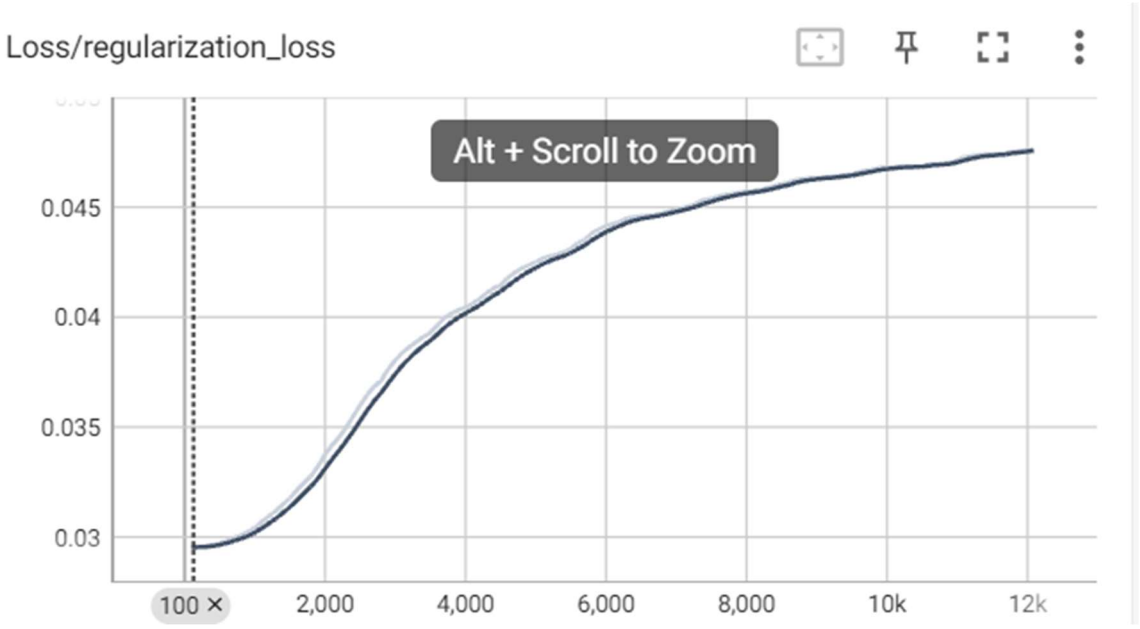
classification loss: 0.09
localization loss: 0.0010
Regularization loss: 0.05
Total loss: 0.14
learning rate: 0.078

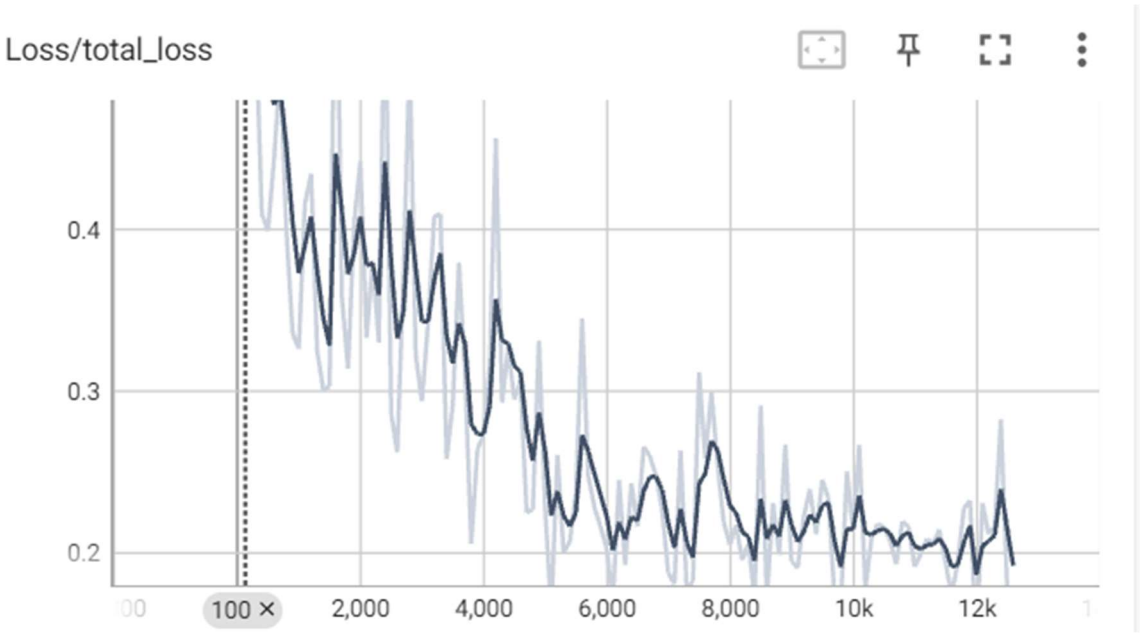
Mean Average Precision (MAP): 72.61
Average Recall (AR): 60.6

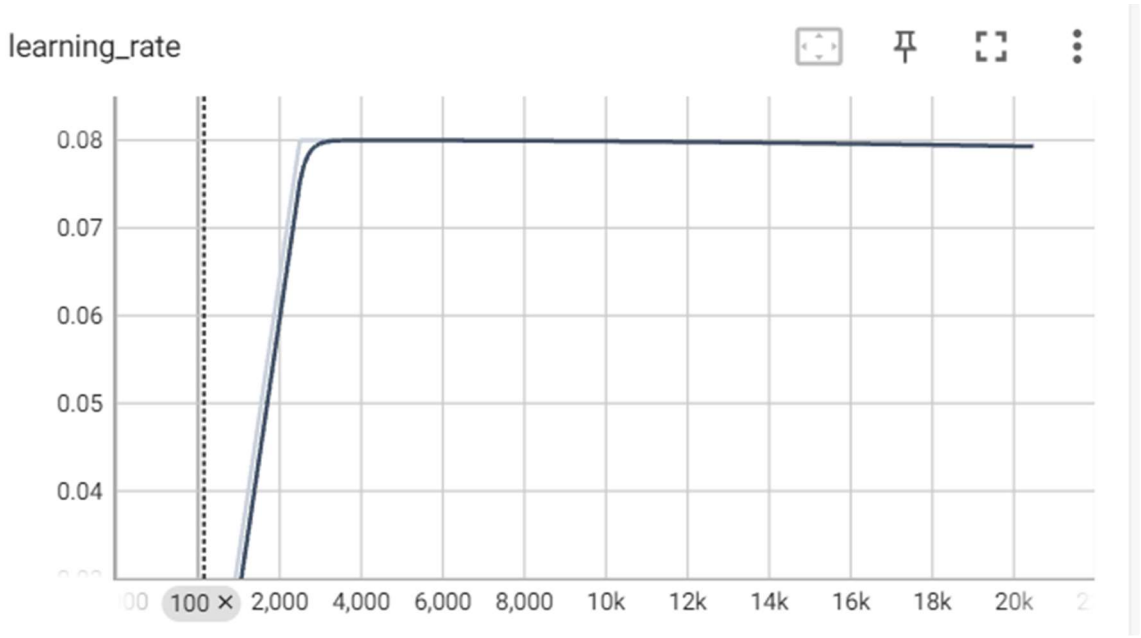
More details about the training results:



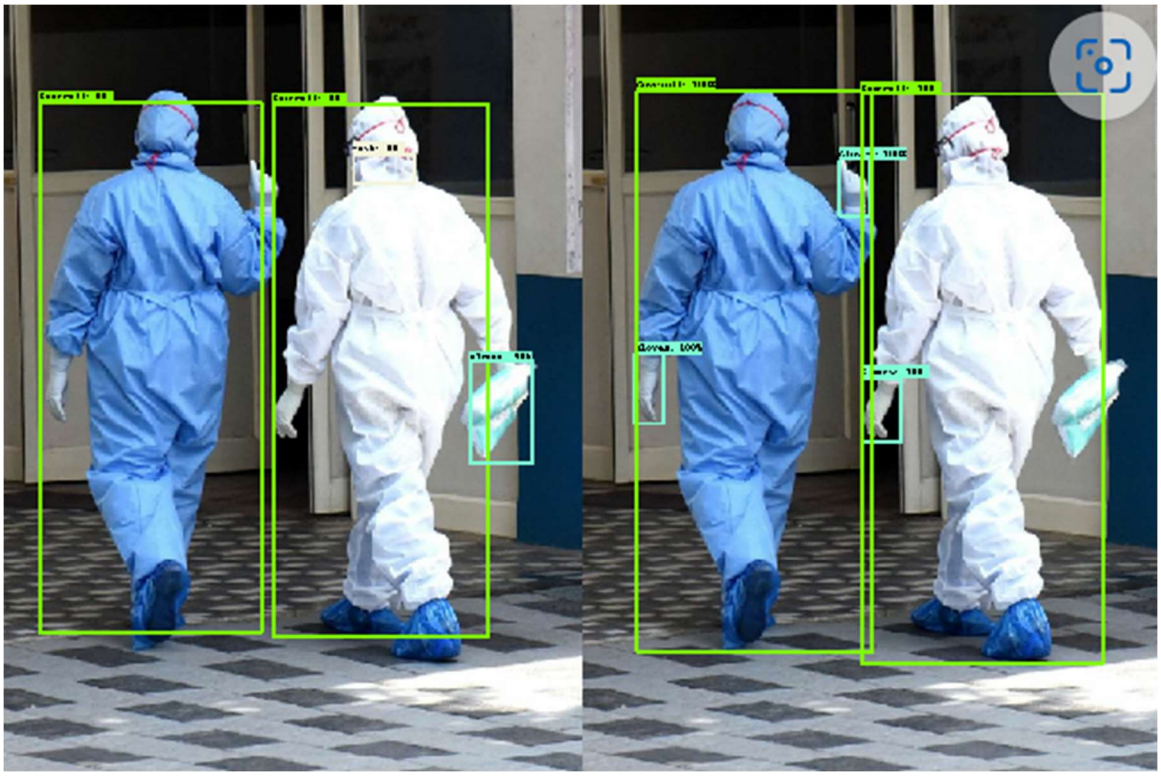

Loss/localization_loss
0.015
0.01
0.005
100 ×
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000


Loss/regularization_loss
Alt + Scroll to Zoom
0.045
0.04
0.035
0.03
100 ×
2,000
4,000
6,000
8,000
10k
12k


Loss/total_loss
0.4
0.3
0.2
100 ×
2,000
4,000
6,000
8,000
10k
12k


learning_rate
0.08
0.07
0.06
0.05
0.04
100 ×
2,000
4,000
6,000
8,000
10k
12k
14k
16k
18k
20k

Some results:



S


Coverall: 99%
Mask: 99%
Gloves: 62%
Gloves: 91%


Mask: 100%