Object Detection using YOLOv8 Algorithm

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ABSTRACT

Object detection is a critical task in computer vision with applications ranging from surveillance to autonomous vehicles ,to maintain reduced risk in Hospitals,banks even in houses,monitoring crop health in agriculture .YOLO (You Only Look Once) is an Object detection algorithm used for image and video processing which have gained significant attention due to their real-time processing capabilities. Exploring the implementation and performance evaluation of the YOLOv8 algorithm for object detection.We then delve into the training process, dataset selection, and data augmentation techniques employed to enhance model generalization.In order to implement this YOLOv8 ,we used ROBOFLOW, a tool to create a dataset.We proposed potential solutions to improve the algorithm's robustness and adaptability.

KEYWORDS: Ultralytics, YOLOv8, Object Detection, Roboflow, Machine Learning, Computer vision.

INTRODUCTION

Object Detection is a technique used to detect objects in a given picture or visual media.It is a important methodology used in computer vision that analyzes the input and predicts the objects accurately.The purpose of object detection is that it only locates the objects in the predefined dataset and ignores the surroundings .It has real world applications that includes detecting tumors cells in health care , keeps track of crop health in agriculture, face detection for authorized entry in security cameras , helps to detect vehicle parked in no parking areas.In day to day life Object detection plays an important role in navigating the visually impaired and also in exploring practical applications of YOLOv8 in scenarios such as pedestrian detection, vehicle detection, and object tracking

LITERATURE SURVEY

S. No	Title	Author	Contribution	Limitation	Year Published
1.	Detection and identification of plant leaf diseases using YOLOv4	E. A. Aldakheel, M. Zakariah, and A. H. Alabdalall	This paper tells about the model that can predict and identify the plant disease.Where the leaf or any part provided using webcam.	this paper uses YOLO4 algorithm that only detects the object and cannot identify it.	Apr. 2024
2.	Automatic object detection for behavioral research using YOLOv8	F. Hermens	This proposal talks about how the yolov8 algorithm is used in predicting human behaviours and changes	this algorithm detects the invidual but cannot identify the particular person.	May 2024

LITERATURE SURVEY

S.No	Title	Author	Contribution	Limitation	Year Published
3.	Object Detection Based on YOLO Network	Chengji Liu, Yufan Tao, Jiawei Liang, Kai Li, Yihang Chen	This paper uses the base algorithm for the simple object detection using the YOLOv2 module, the first YOLO algorihtm	this proposed project uses YOLO2 algorithm it is the way more older and it doesn't have the advancement	2018
4.	Enhanced Lightweight YOLOX for Small Object Wildfire Detection in UAV Imagery,	T. Luan, S. Zhou, G. Zhang, Z. Song, J. Wu, and W. Pan	This paper talks about the Enhancement of YOLO algorithm to YOLOX in the detection of wildfire	this proposed project detects the wildfire from the image not from the scratch.It doesn't uses webcam technologies	Apr. 2024

LITERATURE SURVEY

S.No	Title	Author	Contribution	Limitatioins	Year Published
5.	An object detection system based on YOLO in traffic scene	Jing Tao, HongboWang,XinyuZhang, Xiaoyu Li, Huawei Yang-	This propsal say how the algorithm is used to detect the cities traffic and vehicles involved in crime spots.	this paper uses older version like YOLO6-2v the accuracy of this algorithm is less effiecient	2017
6.	Understanding of Object Detection Based on CNN Family and YOLO	Juan Du	This research paper speaks about how the CNN algorithm is iimplemented in YOLO algorithm .	this paper only provides the basic knowledge about the YOLO	2022

RESEARCH GAP

Customization for Specific Environments:

- Many existing object detection systems are not tailored to specific environments, leading to suboptimal performance in unique settings.

Real-Time Processing on Resource-Constrained Devices:

- Implementing real-time object detection on edge devices with limited computational resources remains a challenge, affecting latency and responsiveness.

Balancing Accuracy and False Alarm Rates:

- Achieving a balance between high detection accuracy and low false positive/negative rates is difficult, especially in dynamic and crowded environments.

Continuous Learning and Adaptability

- Many current systems lack mechanisms for continuous learning and adaptation to evolving security threats and environmental changes.

PROPOSED METHODLOGY

Dataset preparation

-Collected images for the training,testing and validation of model

-Uploaded raw input images to Roboflow

Model Development

-Splitting of dataset

-Ultralytics, a library provides tools for computer vision

Real - time processing

-Splitted dataset is exported so that unique access ID

-Processed dataset is imported,within the classified dataset the trained one is made to detect the objects in order to evaluate the performance.

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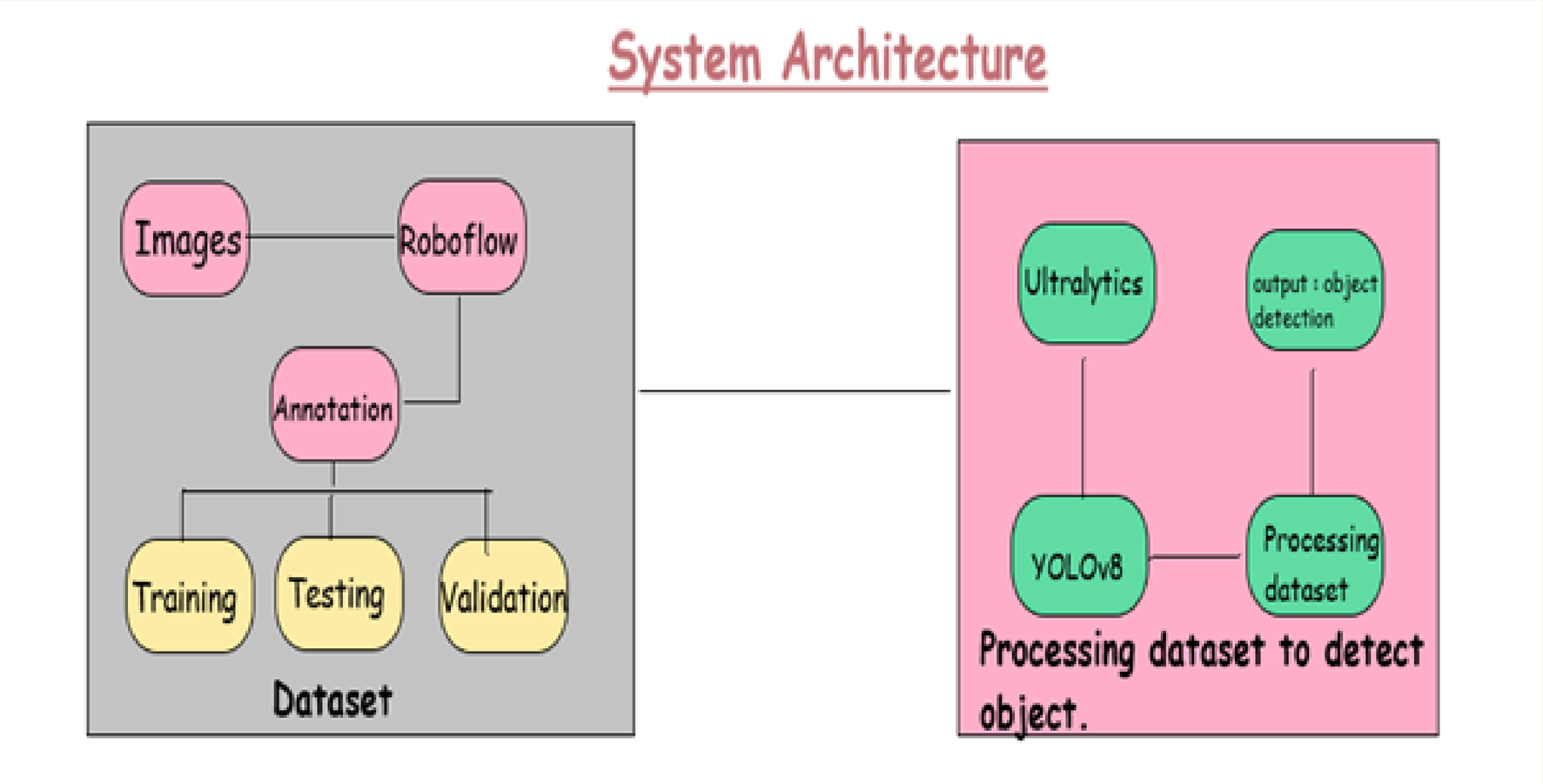
PROPOSED METHODLOGY



RESULT AND DISCUSSION

YOLOv8ML.ipynb

File Edit View Insert Runtime Tools Help All changes saved

Comment Share

Files

drive

sample_data

Disk 51.12 GB available

+ Code + Text

```
tensor([0.], device='cuda:0')
```

+ Code + Text

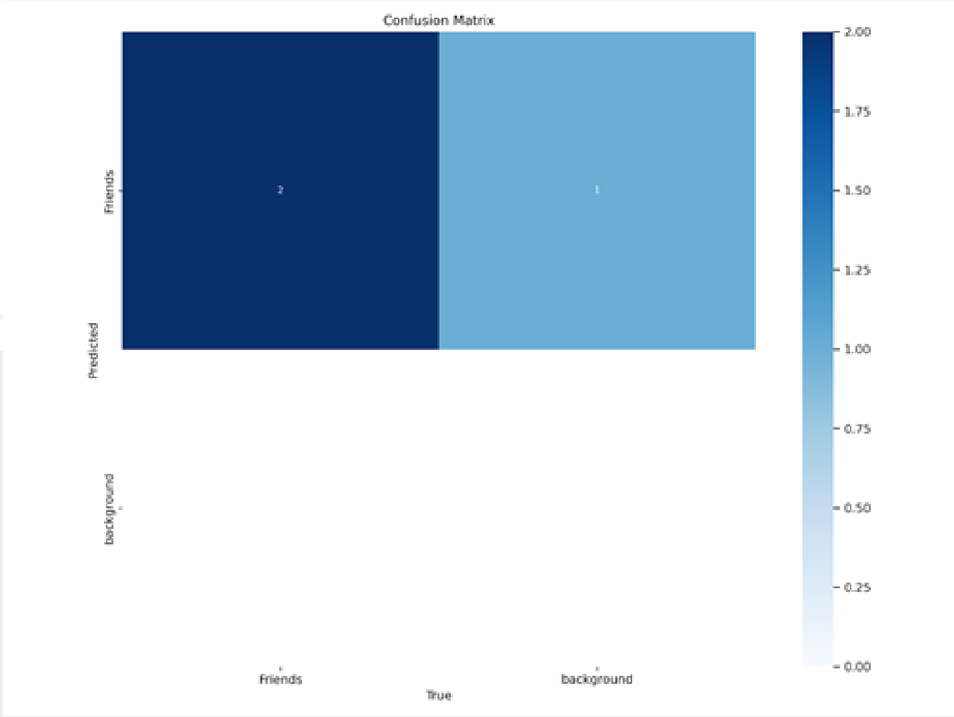
```
!mkdir {HOME}/datasets
%cd {HOME}/datasets

!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="irVe9re73ZKfi5AKd8Ft")
project = rf.workspace("vilashini").project("detecting-image-using-yolo")
version = project.version(1)
dataset = version.download("yolov8")
```

```
/content/datasets
Collecting roboflow
  Downloading roboflow-1.1.28-py3-none-any.whl (74 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 74.6/74.6 kB 2.9 MB/s eta 0:00:00
Collecting certifi==2023.7.22 (from roboflow)
  Downloading certifi-2023.7.22-py3-none-any.whl (158 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 158.3/158.3 kB 13.0 MB/s eta 0:00:00
Collecting chardet==4.0.0 (from roboflow)
  Downloading chardet-4.0.0-py2.py3-none-any.whl (178 kB)
```

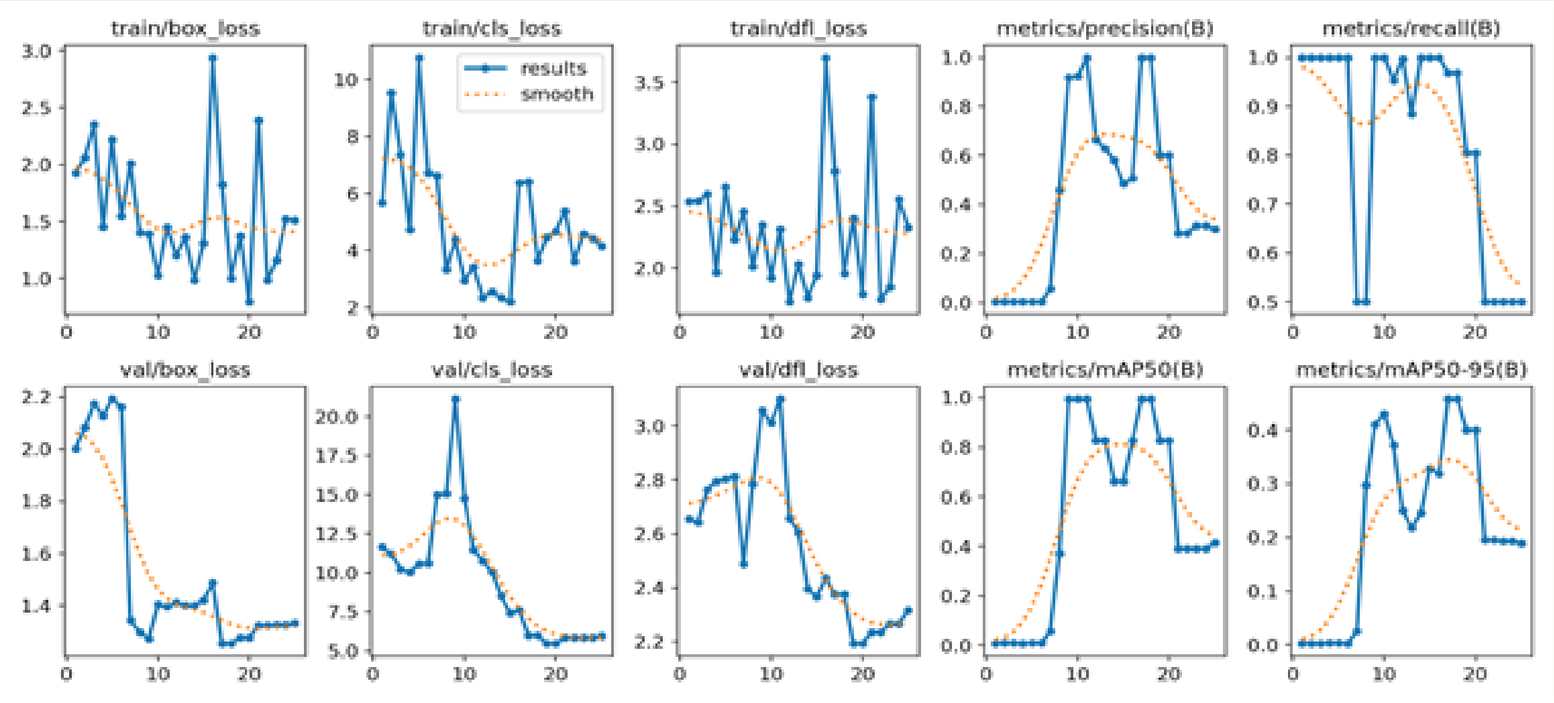
Connected to Python 3 Google Compute Engine backend (GPU)

CODE SNIPPET OF THE MODEL

CONFUSION MATRIX

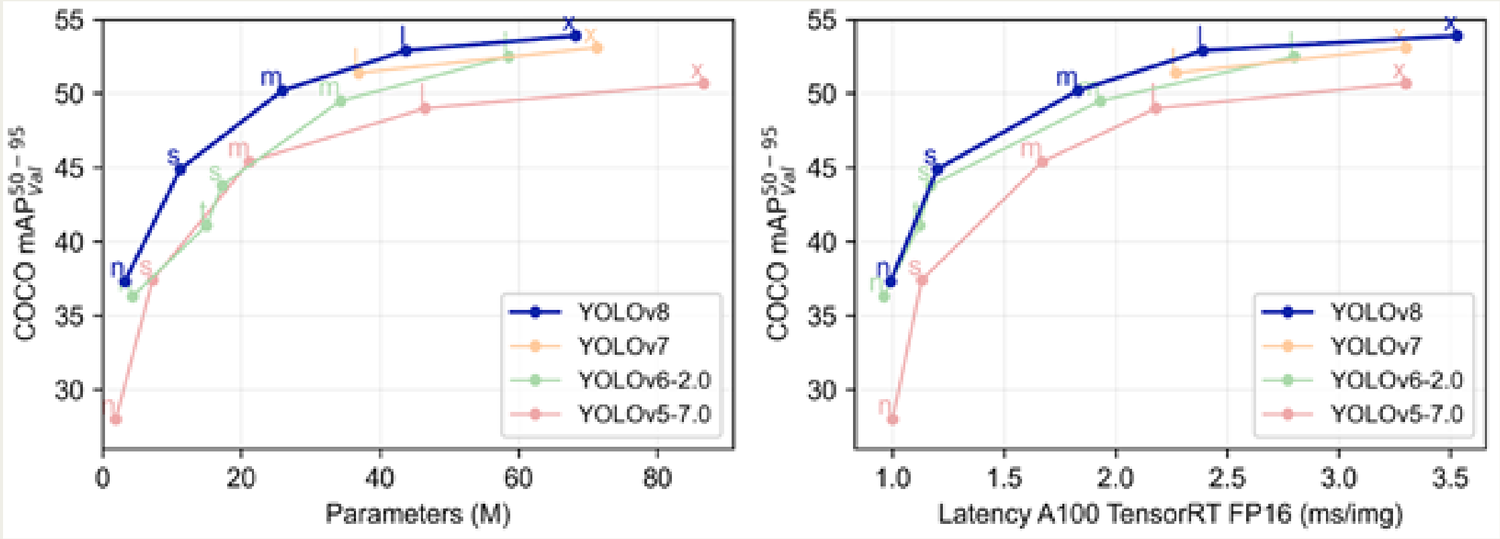


RESULT AND DISCUSSION



GRAPHICAL RESULT OF THE MODEL

COMPARATIVE ANALYSIS



COMPARISON WITH OTHER YOLO VERSIONS

You Only Look Once is a framework that can support previous versions of YOLO and can toggle between previous versions, so it is easy to it with compare the performance of previous versions.

CONCLUSION AND FUTURE ENHANCEMENT

CONCLUSION:

In conclusion, our model ascertains the particular objects in the given input(image) with the reference of fed data.our model used YOLOv8 and roboflow tools to detect the object and ascertained the details of the particular object with maximum accuracy.To access the website a QR code is provided ,by scanning it we can navigate to the website where we can capture the image and the model will analyze and classify the objects in the image and also provide the accuracy rate. To access this model with PC we have two options.Either we can drag and drop the image from the files in the device or else we can also on the webcam and take the picture and submit it.

CONCLUSION AND FUTURE ENHANCEMENT

FUTURE ENHANCEMENT:

- Our model can be further developed to detect multiple specific objects, that is the model will be trained with more than one class.
- The accuracy and performance of the predicting model can be improved.
- Enhanced features of the YOLO algorithm can be used to compare the output between this model and the enhanced model.
- The dataset can be maximized in order to maximize the accuracy , performance and prediction clarity.

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Thank you!