

100K
Clips

50K
Rides

720p
Resolution

30 FPS
High frame-rate

GPU/IMU
Trajectories

Project: Image Tagging and Road Object Detection

Team 4: Arnold

Arpita Das

Pramod
Kadangotte

Mentor:

Sangeeth



A Diverse Driving Dataset for Heterogeneous Multitask Learning

Paper

Code

Doc

Data

Discuss

Models

EXPLORE

The Berkeley Deep Drive (BDD) dataset is one of the largest and most diverse video datasets for autonomous vehicles

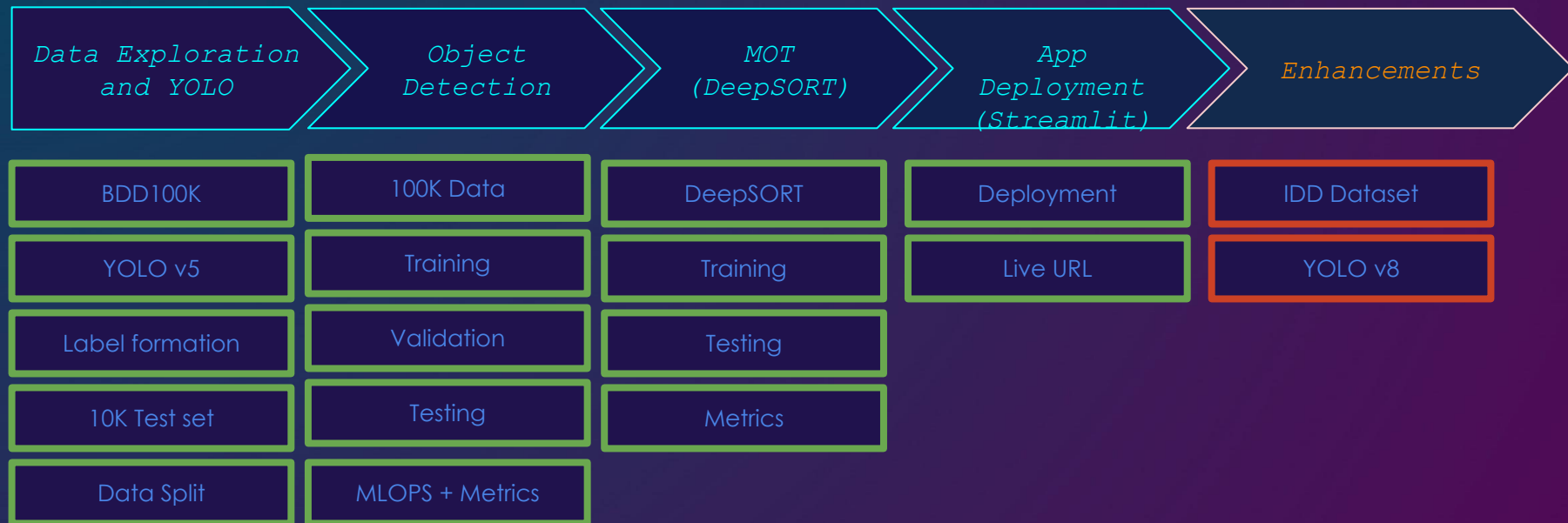
New York, San
Fran Bay Area,
etc.

City streets,
residential areas,
highways

Diverse weather
conditions

Different times of
the day

Project Workflow



Execution

- **YOLO Label format**

Custom code written in Python to convert labels to YOLO format.

Offline - Run in laptop to create Train, Val and Test directory with labels as per YOLO requirements and the directory uploaded in Google drive

- **YOLO v5 Training**

Google Colab Pro to train Yolo on 70K Training set, 10 K Val set and 20 K Test set

- 200 Epochs
- LR - 0.0001

Integrated to **ClearML** which stores relevant artifacts after training is complete and shows training status

Execution contd...

- **Deepsort integration with Yolo v5**

Code written in Python to integrate YOLO v5 to Deepsort

- **Github**

Added code to Github to facilitate Streamlit Cloud deployment

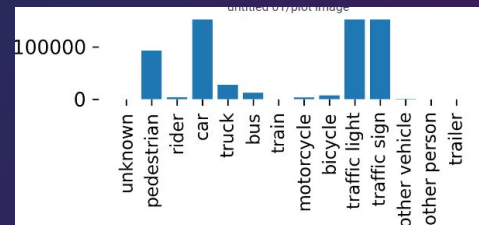
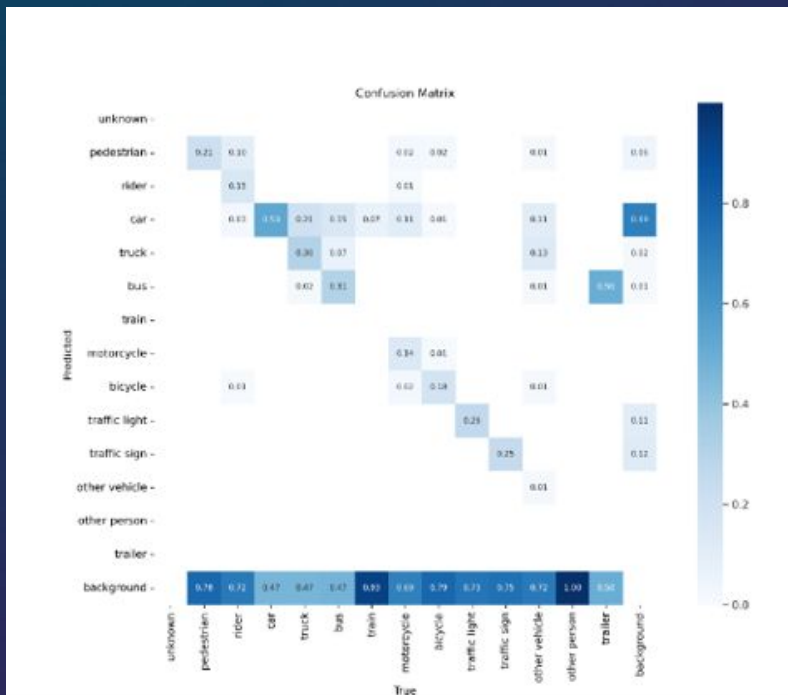
- **Streamlit Integration**

Run in localhost

Run in Streamlit Cloud

- **Project Report and Presentation**

Object Detection - Metrics



- Cars are predicted well but there are certain instances where other vehicles are predicted as cars
- Bus is predicted as bus.
- Motorcycles, traffic lights and signs are correctly predicted, when predicted

Object Detection - Metrics



- Precision is about 0.60
- Recall is about 0.20

Tracking Metrics

SORT

Notebook

Evaluating 1 tracker(s) on 1 sequence(s) for 8 class(es) on BDD100K dataset using the following parameters:

Evaluating qdtrack

1 eval_sequence(0000f77c-6257be58, qdtrack) 0.5079 sec

All sequences for qdtrack finished in 0.51 seconds

HOTA: qdtrack-cls_comb_cls_av	HOTA	DetA	AssA	DetRe	DetPr	AssRe
COMBINED	1.1888	1.0197	1.4673	1.2369	3.2848	4.1644
CLEAR: qdtrack-cls_comb_cls_av	MOTA	MOTP	MODA	CLR_Re	CLR_Pr	MTR
COMBINED	-65.209	8.4561	-65.187	1.0102	2.6828	0
Identity: qdtrack-cls_comb_cls_av	IDF1	IDR	IDP	IDTP	IDFN	IDFP
COMBINED	0.93548	0.64387	1.7099	58	1068	371
Count: qdtrack-cls_comb_cls_av	Dets	GT_Dets	IDs	GT_IDs		
COMBINED	429	1126	12	47		

- MOTP - 0(Good) - 1(Poor)
- MOTA - -inf(Poor) - 1(Good)

DEEPSORT

Notebook

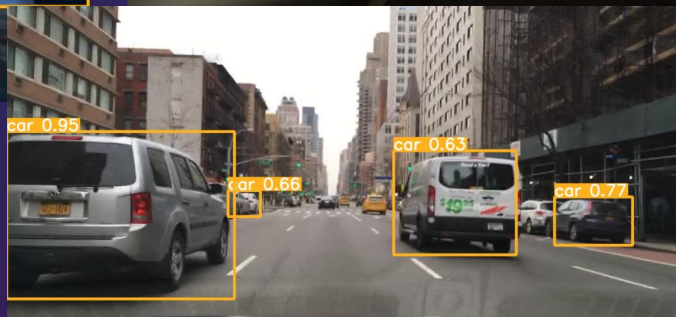
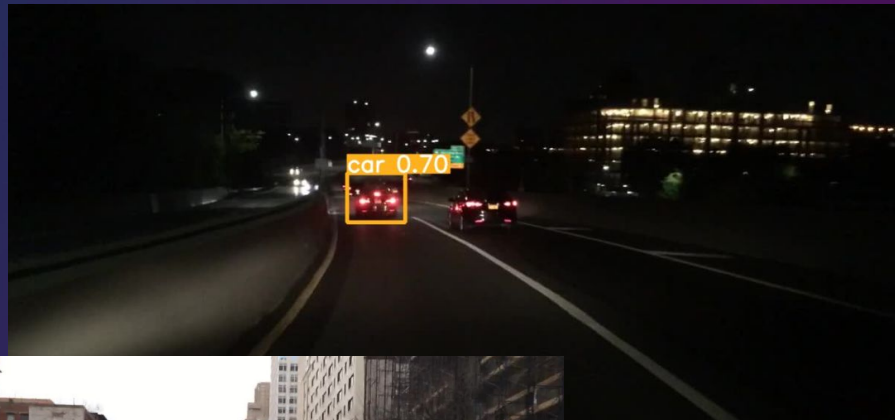
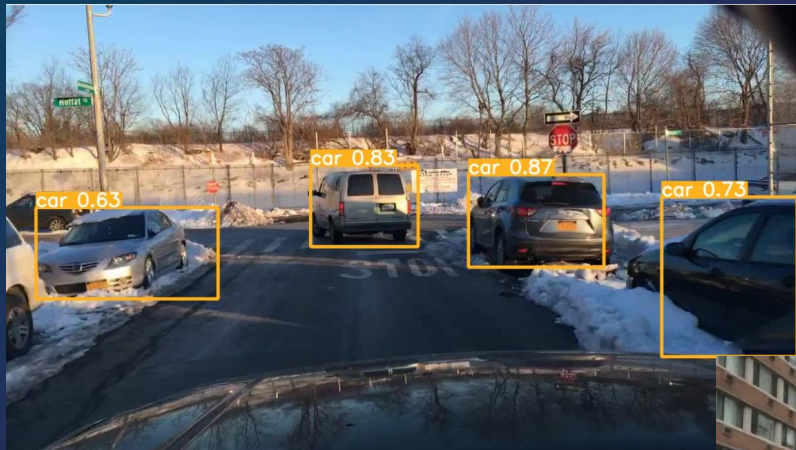
Evaluating qdtrack

1 eval_sequence(0000f77c-6257be58, qdtrack) 0.4664 sec

All sequences for qdtrack finished in 0.47 seconds

HOTA: qdtrack-cls_comb_cls_av	HOTA	DetA	AssA	DetRe	DetPr	AssRe
COMBINED	1.1288	0.97768	1.3959	1.1909	3.093	4.0158
CLEAR: qdtrack-cls_comb_cls_av	MOTA	MOTP	MODA	CLR_Re	CLR_Pr	MTR
COMBINED	-3.1417	8.3876	-3.1194	0.8467	2.1991	0
Identity: qdtrack-cls_comb_cls_av	IDF1	IDR	IDP	IDTP	IDFN	IDFP
COMBINED	0.74003	0.51248	1.331	46	1076	386
Count: qdtrack-cls_comb_cls_av	Dets	GT_Dets	IDs	GT_IDs		
COMBINED	432	1122	5	47		

Object Detection Samples



Object Tracking Samples

- For comparison

[Tracking on Coco Model](#)

[Tracking on our Yolov5 Model](#)

App Deployment

Insert Streamlit URL + Screen recording of complete app functionality

Expand, Choose File (of type image or video) and Upload

Choose a file

Drag and drop file here
Limit 200MB per file

Browse files

cad02f4a-dd2c4b41.jpg X
71.9KB

Select confidence threshold

0.25
0.00 1.00

Select IOU threshold


0.45
0.00 1.00

Task Selection

☒ Detect
☐ Track

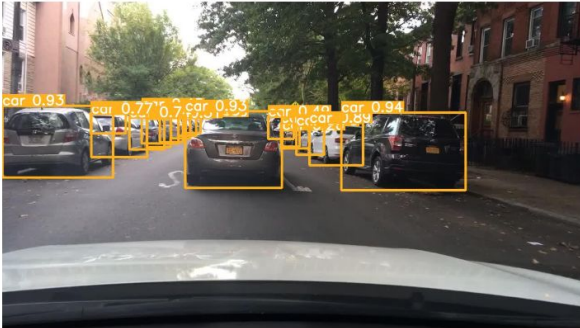
Detect

Uploaded Image



Object Detection and Tracking by IIITH *Group4 2023*

Processed Image



Made with Streamlit

Challenges

- Storing model file for download. Github LFS has limitation in free tier. Used OneDrive Personal with downloadable link
- Codec issue while running app in Streamlit. Used ffmpeg to convert video from avi to mp4 so that streamlit HTML5 player can play the video. 'avi' video is created from frames as the codec is pre installed in Streamlit Cloud.
- Training of Yolo v5 model was slow. 50 Iterations in about 9 hours. The problem is still not solved
-
- Creating video detections in Streamlit Cloud is slower than some teams. The problem is still not solved.

Work Ahead

- Train the model another 100 Epochs with a slower learning rate and test. Better model metrics
- IDD
- Yolo v8
- Deploy in Azure Cloud or AWS

Applications

Part of FSD (Full Self-Driving), Tesla, Google Waymo - Toyota, Lexus, Chrysler

Traffic flow analysis

Surveillance and Security

Infrastructure maintenance

City planning