Weekly Progress Report

Dec 6th - Dec 10th, 2021

Presented by Yannis (Yiming) He 84189287

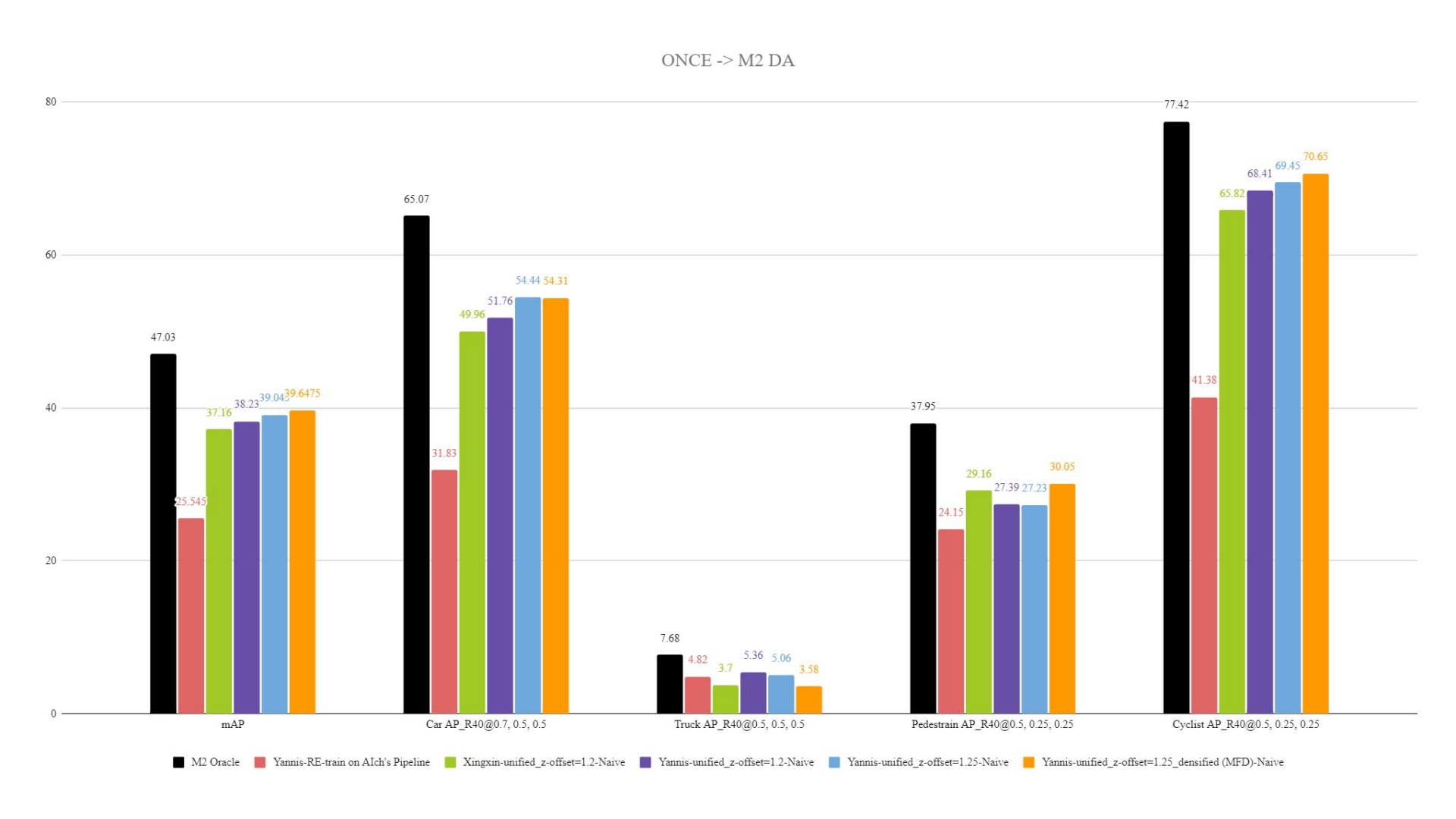
Noah's Ark | Autonomous Driving Lab
LiDAR Domain Adaptation

Manager: Bingbing Liu 00435285
Supervisor: Eduardo Corral Soto 00407762

HUAWEI

Weekly Summary

- **Done:**
  - Reproduced the results from Xingxin's once_kitti-format_z_offset=1.2
  - Compare performance for once-z_offset=1.2 vs 1.25 → 1.25 is better
  - Verifying the effectiveness of densified pointcloud on ONCE
    - Generate ONCE info files for **densified** pointcloud with z_offset=1.25
    - Experiment on kitti-style-densified(MFD)-z_offset1.25-Naive DA
    - Densified M2 validation set and repeat the Naive DA on M2_MFD
- **In Progress:**
  - Fine-tuning (train on ONCE_MDF → test on M2)
  - MFD parameter experiment (optimize the hyper-parameters)
- **Recent Goals:**
  - Incorporate Mrigank's DSBN
  - MFD range experiment
    - No need to densified nearby object. Only densify far-away objects
- **TODO**:
  - Implement densification on P40 (if densification is working)
  - P40 oracle training on undensified data (to make sure it's working)
  - Train p40 with augmentation (only insertion of GT object)
    - to understand the false positive/negative
  - Experiment on p40 densified pointcloud (baseline, ROI, z_offset, etc)

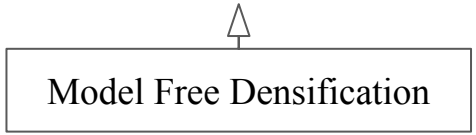

ONCE -> M2 DA
80
60
40
20
0
47.03
25.545
37.16
38.23
39.045
39.6475
65.07
31.83
49.96
51.76
54.44
54.31
7.68
4.82
3.7
5.36
5.06
3.58
37.95
24.15
29.16
27.39
27.23
30.05
77.42
41.38
65.82
68.41
69.45
70.65
mAP
Car AP_R40@0.7, 0.5, 0.5
Truck AP_R40@0.5, 0.5, 0.5
Pedestrain AP_R40@0.5, 0.25, 0.25
Cyclist AP_R40@0.5, 0.25, 0.25
M2 Oracle
Yannis-RE-train on AIch's Pipeline
Xingxin-unified_z-offset=1.2-Naive
Yannis-unified_z-offset=1.2-Naive
Yannis-unified_z-offset=1.25-Naive
Yannis-unified_z-offset=1.25_densified (MFD)-Naive

Work Logs

- Dec 6 (Monday)
  - Reproduced Xingxin's result on "once_kitti-format_offset1.2"
  - TODO:
    - Generate info files for "once_not-densified_kitti-format_offset1.25"
    - Train on "once_not-densified_kitti-format_offset1.25" and compare performance with offset 1.2
      - Test on m2 to compare
    - X = max (performance of offset=1.2, performance of offset=1.25)
    - Prepare dataset from
      - "once_densified_once-fotmat_offset0_wo_info" → "once_densifed_**kitti**-format_offset**X**_**w**_info"
    - Train on the "once_densifed_**kitti**-format_offset**X**"
      - Test on m2

Work Logs

- Dec 7 (Tuesday)
  - Generated info files for “once_not-densified_kitti-format_offset1.25”
  - Experiment: “once_not-densified_kitti-format_offset1.25”
    - compared performance with offset 1.2 → **z_offset 1.25 is better**
  - 1.25 = max (performance of offset=1.2, performance of offset=1.25)
  - Prepared dataset (Thanks to Xingxin’s help):
    - From: “once_densified_once-fotmat_offset0_wo_info”
    - generated: “once_densifed_**kitti**-format_offset**1.25**_**w**_info”
  - Experiment: “once_densifed(MFD)_**kitti**-format_offset1.25” → **current best** Naive DA



Work Logs

- Dec 8 (Wednesday)
  - Add bar for once without rotation (from Aich's slides)
  - Densified M2 validation set and repeat the Naive DA on M2_MFD
  - MFD range experiment
    - No need to densified nearby object. Only densify far-away objects
  - MFD parameter experiment (optimize the hyper-parameters)
  - Fine-tuning (train on ONCE_MDF → test on M2)
  - Incorporate Mrigank's DSBN

Work Logs

- Dec 9-10 (Thursday & Friday)
  - To compare with results from Mrigank, we repeat Experiments using Best Checkpoint:
    1. Train on ONCE_MFD | evaluate on M2
    2. Train on ONCE_MFD , finetune on M2 | evaluate on M2
    3. Train on ONCE_MFD , finetune on M2_MFD | evaluate on M2_MFD
    4. Train on ONCE_MFD , finetune on M2_MFD | evaluate on M2_MFD

End of December 6th, Weekly Report

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Weekly Progress Report

Dec 13th - Dec 17th, 2021

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Weekly Summary

- **Done:**
  - Experiment on ONCE_offset & Naive DA on M2
  - Fine-tuning (train on ONCE_MDF → test on M2)
  - MFD parameter experiment (optimize the hyper-parameters)
    - Max_Point_Per_Voxel (MPPV) = 5, 10,15
  - Upper Bound Experiment:
    - Want to see if the model can replicate the performance on the sparse data with the dense data
- **In Progress:**
  - MFD parameter experiment (optimize the hyper-parameters)
    - Finetunne_Learning Rate (FTLR)= 3e-5, 3e-4, 3e-3
  - Experiments on new ONCE-dataset (currently generating by Eduardo, to be copied to gx9)
- **Recent Goals:**
  - Incorporate Mrigank's DSBN
  - MFD range experiment
    - No need to densified nearby object. Only densify far-away objects
- **TODO**:
  - Implement densification on P40 (if densification is working)
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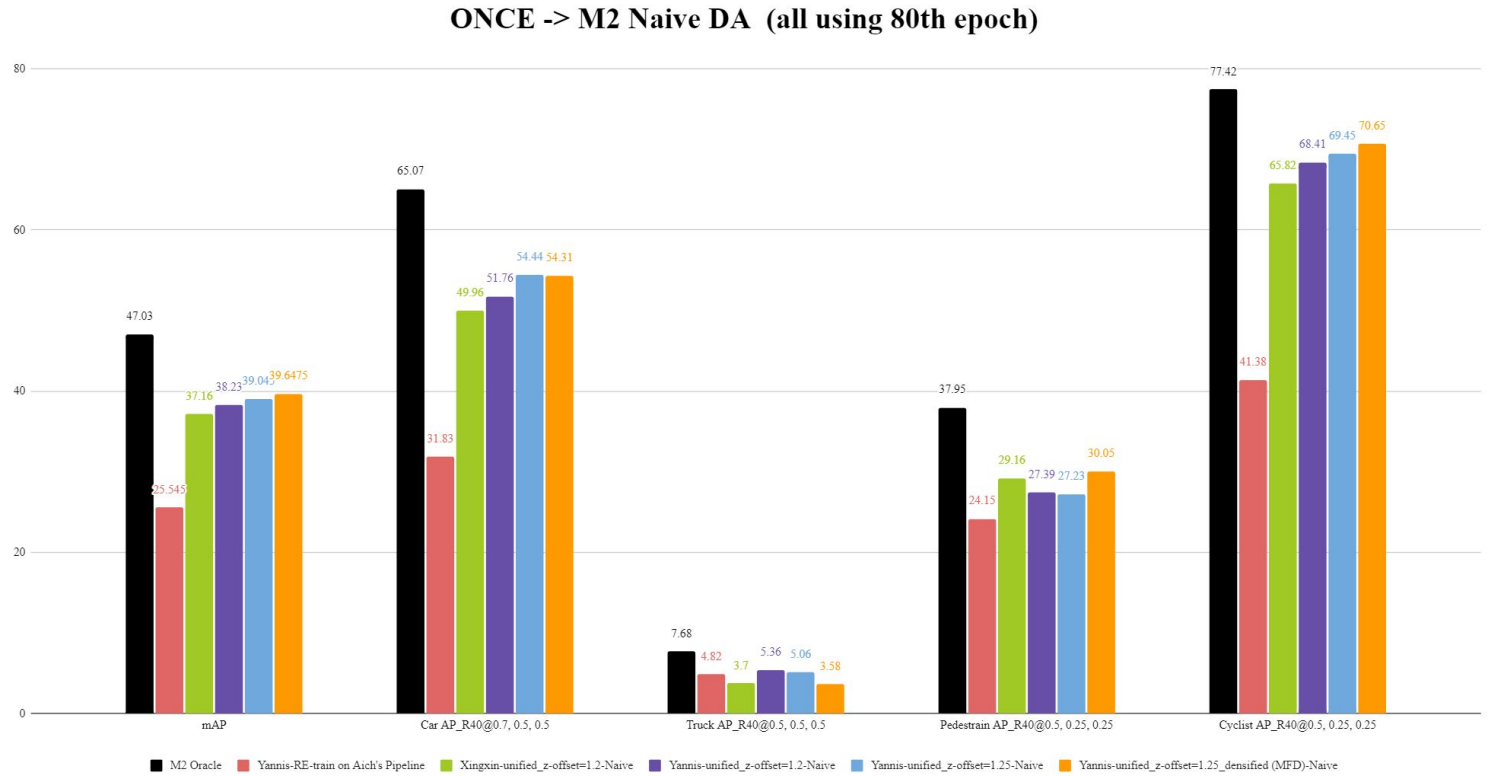
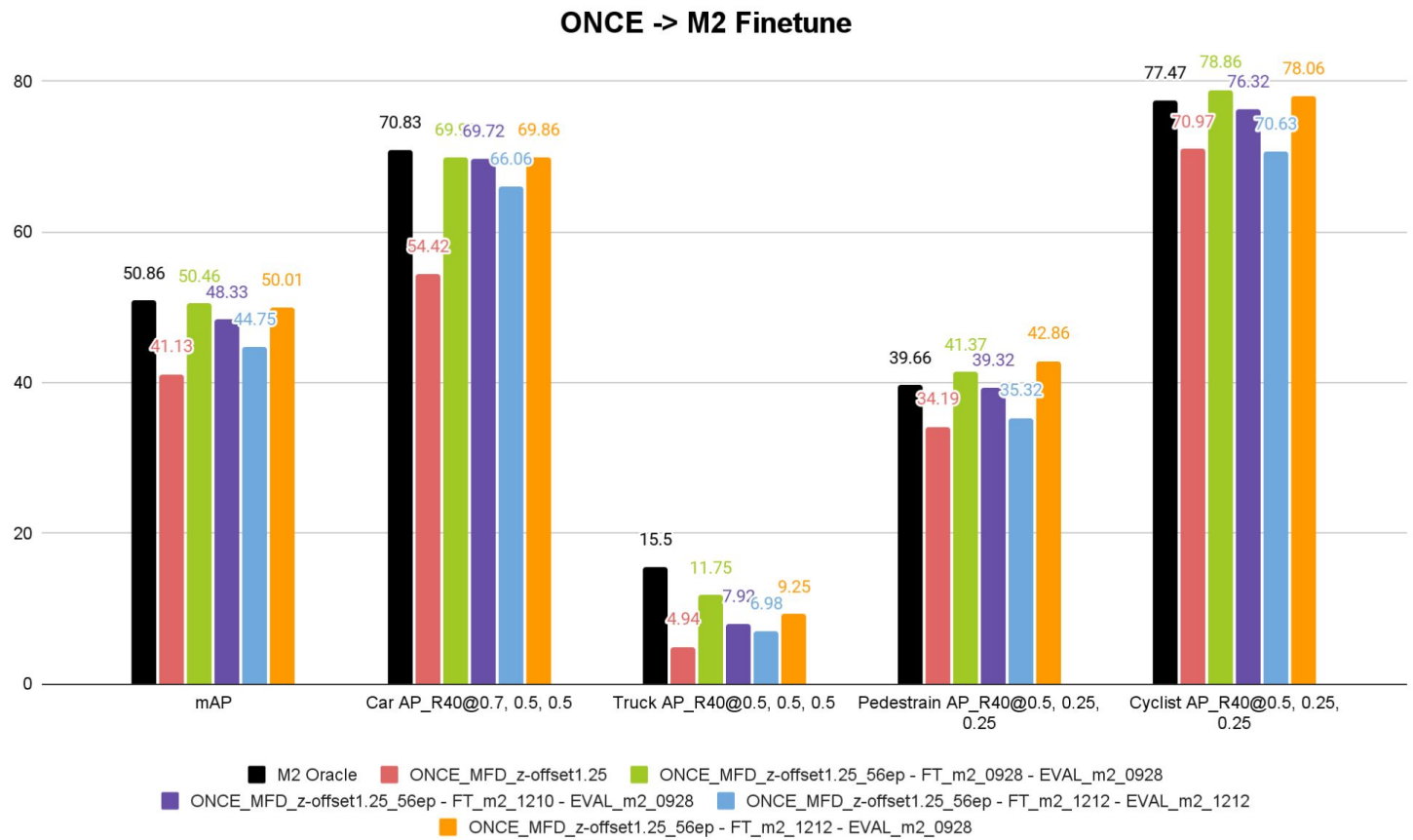


Conclusion:

1. For ONCE → M2: add z_offset=1.25 is the best
2. Densification on source dataset increase performance (specially for small objects, i.e. pedestrian & cyclist)



Note: M2_0928: sparse m2_1212: dense

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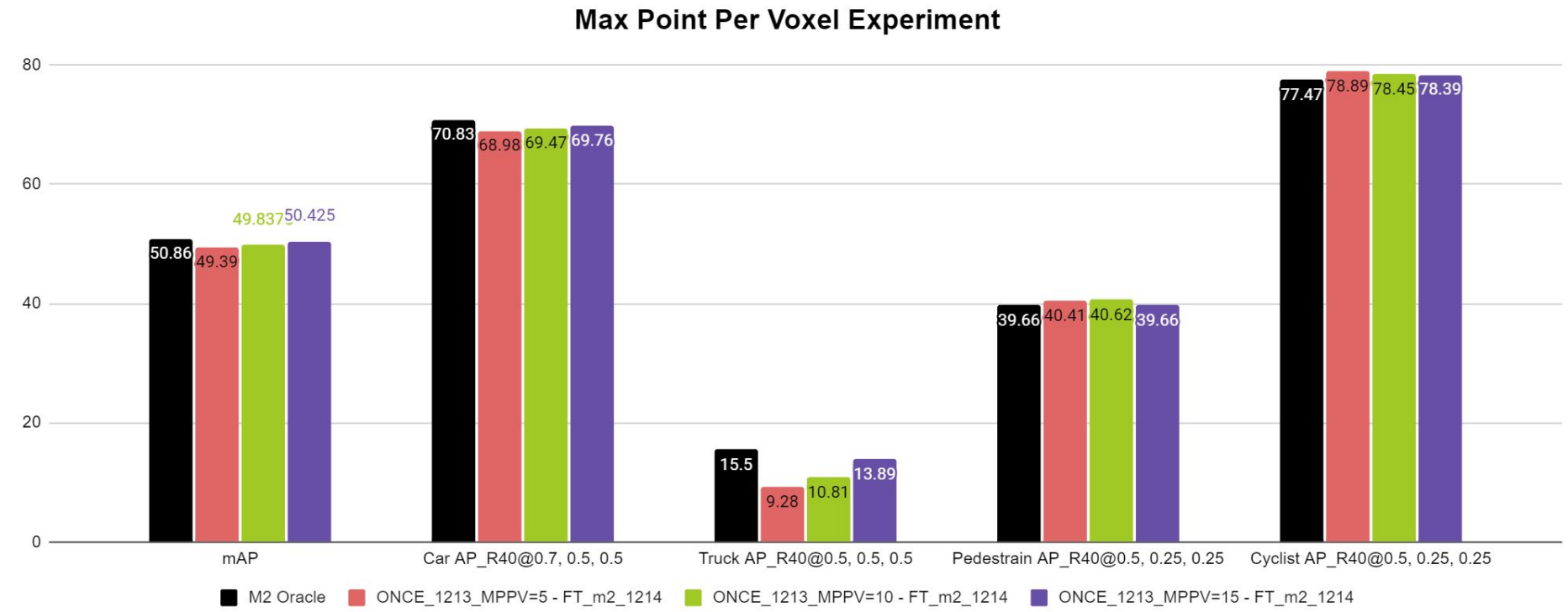
Work Logs



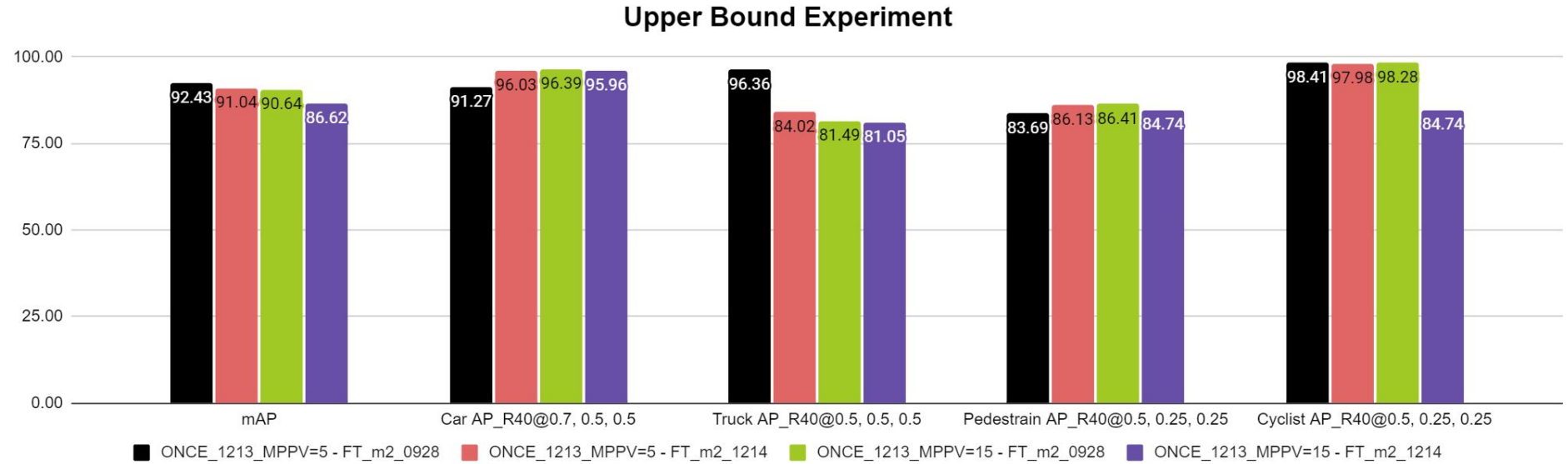
Note:

- Default value: 5
- Average densification: approx. 3 times more points

Conclusion:

1. For ONCE → M2: for densified dataset: MPPV=15 has best performance
2. 5 → 15 ⇒ matching the 3 times densification

Work Logs



Note:

- Train & evaluate on the Validation set
- Purpose: Want to see if the model can replicate the performance on the sparse data with the dense data
- M2_0928: sparse | M2_1214: dense
- ONCE_1213: dense

Conclusion:

- In general: Train on dense ONCE, then finetune on M2 sparse has a higher performance (Black vs Pink, green vs purple)
- Reasoning: M2 was originally dense. By densifying ONCE, we are being the source domain closer to target domain (m2_sparse)

Work Logs

LR	mAP	Car	Truck	Pedestrian	Cyclist
Oracle	50.86	70.83	15.5	39.66	77.47
3e-3	50.42	69.76	13.89	39.66	78.39
3e-4	TODO	TODO	TODO	TODO	TODO
3e-5	TODO	TODO	TODO	TODO	TODO

Experimented Setting :

- Variable:
  - learning rate (LR)
- Fixed:
  - Train: ONCE_dense (offset = 1.25)
  - Finetune: M2 dense
  - MPPV = 15

Conclusion:

- TODO

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Weekly Summary

- **Done:**
  - Data processing:
    - Clean data
    - Convert to unified format
    - Generate info files
  - Documentation: README.md
- **In Progress:**
  - Experiments on clean once,m2 datasets with different subsampling
  - MFD parameter experiment (optimize the hyper-parameters)
    - Finetunne_Learning Rate (FTLR)= 3e-5, 3e-4, 3e-3
- **Recent Goals:**
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Work Logs

- Dec 20 (Monday)
  - Data processing:
    - Clean data frames that has unreasonable dimensions
    - Add offset & rotation
    - Generate info files
  - New data:

Name	once:m2 mean#points ratio	Note
m2_0928_clean	1	Baseline: cleaned undensified m2 dataset
once-offset-1.25-clean	1.25	Baseline: cleaned undensified once dataset in kitti format
once_1220_sub2	0.72	Model-free-densification subsampling #2 with clean frames
once_1220_sub3	0.83	Model-free-densification subsampling #3 with clean frames
once_1220_sub4	0.91	Model-free-densification subsampling #4 with clean frames

Work Logs

- Dec 20 (Monday) (cont')
  - Experiment TODO:
    - **Baseline:**
      - Trained on cleaned once →

#	**Train**	**Finetune**	**Eval**
Baseline			
1,2,3	Cleaned once_1220_sub 2,3,4 with MPPV = 8	Cleaned m2_0928	Cleaned m2_0928
Parameter Tuning: LR			
4,5,6	Cleaned once_1220_sub_best with MPPV = 8	Cleaned m2_0928, lr = 3e-3,4,5	Cleaned m2_0928
Parameter Tuning: …			

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