Weekly Progress Report

Oct 4 - 8th, 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:**
  - Checking for once eval_metric
  - Writing script for evaluation: `evel_log_extraction.py (to be pushed)`
    - Picking the best checkpoint in terms of
      - Average mAP for BEV of the 4 classes {car, truck, pedestrian, cyclist)
      - Threshold = 0.3, 0.5, 0.7 ?
  - Plot best checkpoint for each evaluation (oracle)
    - Oracle:
      - p40 → p40
      - ONCE→ ONCE
      - M2 → M2
  - Plot best checkpoint in oracle for each naive evaluation
    - Naive:
      - ONCE → M2
      - p40 → M2
- **In Progress:**
  - Retrain m2_oracle with full dataset (previously 5k)
  - Plot mAP for all checkpoint for each class
- **Recent Goals:**
  - Visualize frames having good and bad performances
  - Understanding: once_metric vs kitti metric

Work Logs

- Oct 4 (Monday)
  - Re-evaluate once dataset (was not evaluated using kitti metrics)
    - Has “eval_metric: kitti” but not outputting the kitti output
      - Result: we cannot use KITTI metric for ONCE due to its lack of information
  - Writing script for evaluation
    - Picking the best checkpoint in terms of
      - Average mAP for BEV of the 4 classes {car, truck, pedestrian, cyclist)
      - Threshold = 0.3, 0.5, 0.7

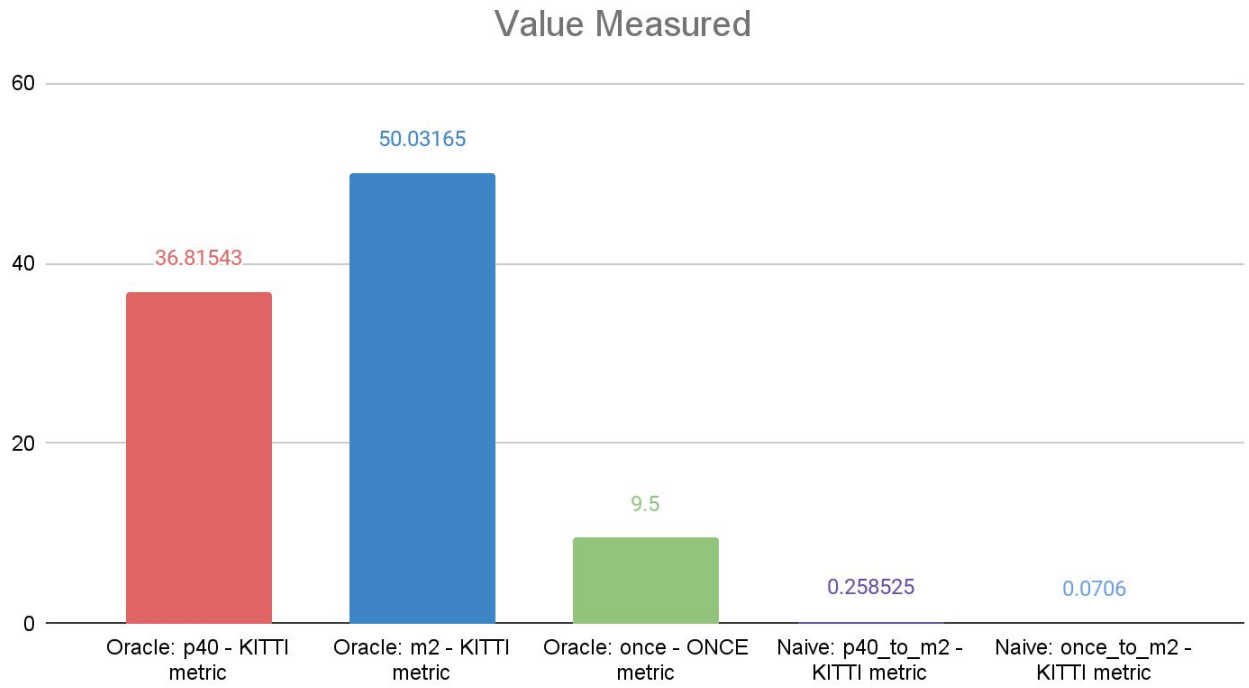
Work Logs

- Oct 5 (Tuesday)
  - Developed “`evel_log_extraction.py`”
    - p40: oracle

	Metric	Measured value	ckp#
Oracle: p40_avg_mAP	kitti	36.81543	74
Oracle: m2_avg_mAP	kitti	50.03165	58
Oracle: once_avg_0-30m	once	9.5	74

Work Logs

- Oct 5 (Tuesday) (cont')



Work Logs

- Oct 6 (Wednesday)
  - Plot best checkpoint in oracle for each naive evaluation
    - Naive:
      - ONCE → M2
      - p40 → M2
  - Compare m2 oracle result with Xingxin, found that we used 5k split (to be retrained with full dataset)
  - Plot mAP for all checkpoint for each class

	Metric	Measured value	Ckp #
Naive : p40→m2_avg_mAP	kitti		74
Naive : once→m2_avg_mAP	kitti		58

Work Logs

- Oct 7 (Thursday)
  - Plot mAP for all checkpoint for each class
  - Re-configure m2 oracle training with full dataset split
  - Push `evel_log_extraction.py` to gitlab
- Oct 8 (Friday)
  - Train m2 oracle full data split
  - Write visualization script to see oracle's & naive's performances
  -

End of October 8th, Weekly Report

Presented by Yannis (Yiming) He 84189287

Weekly Progress Report

Oct 11 - 15th, 2021

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Noah's Ark | Autonomous Driving Lab
LiDAR Domain Adaptation

Manager: Bingbing Liu 00435285
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HUAWEI

Weekly Summary

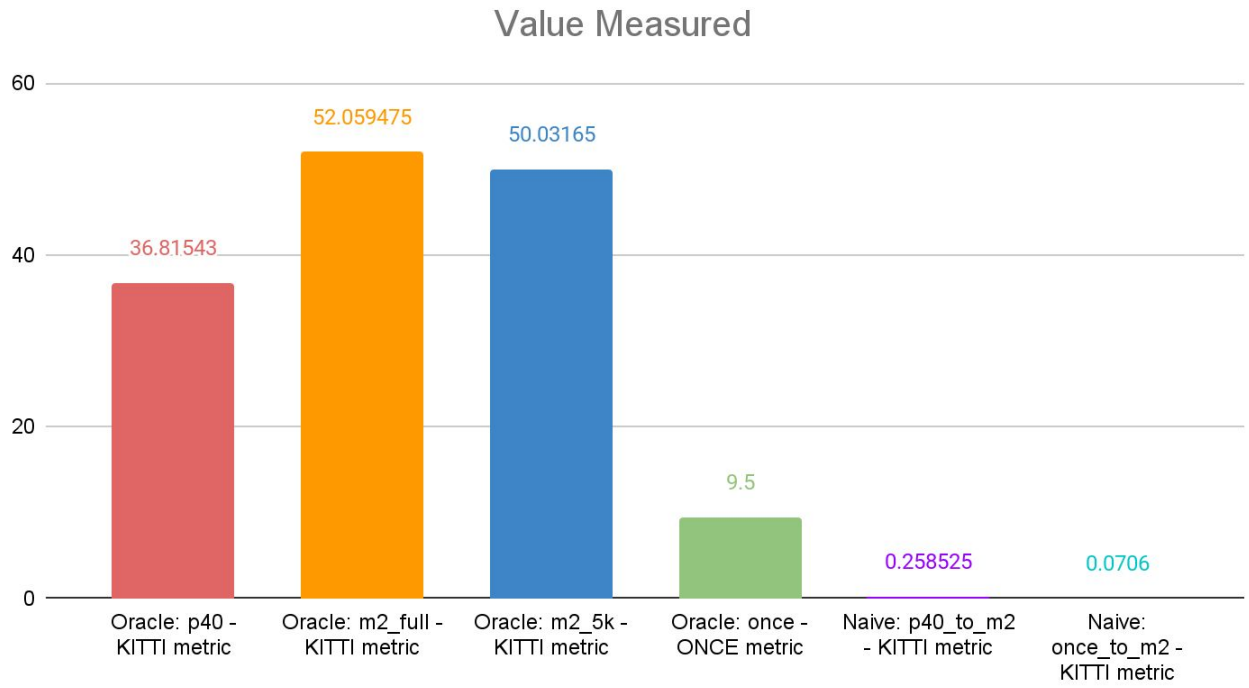
- **Done:**
  - Configured and retrained m2_oracle with full dataset split (previously 5k)
  - Validated m2_full_oracle and picked the best checkpoint
  - Discuss with Xingxin and compare m2_full_oracle results
- **In Progress:**
  - Visualize frames having good and bad performances (see Work Logs on next page for more details)
    - Understand the testing pipeline (done)
    - Shorten dataset for rapid testing (done)
    - Locate evaluation for individual frame (in progress)
    - Rank frames by AP (TODO)
    - Visualize frame with high & low AP (TODO)
- **Recent Goals:**
  - Create video for p40, m2, once pointcloud
    - 4 point views
  - Plot mAP for all checkpoint for each class
  - Understanding: once_metric vs kitti metric

Work Logs

- Oct 11 (Monday)
  - Thanksgiving (holiday)
- Oct 12 (Tuesday)
  - Finished Train m2 oracle full data split (m2_full_oracle)
  - TODO: Validate m2_full_oracle and plot against other configuration
  - Write visualization script to see oracle's & naive's performances
    - For each best oracle and naive checkpoint:
      - Run through each frame and sort frames by mAP
      - Sample frames from two extrema to visualize
      - output the "path, classes, #instance, and mAP for each frame"
      - Plot against ground truth (gt) for: x, y, z (of centroid), h, w, l, theta
        - Show delta of each parameters
- Oct 13 (Wednesday)
  - Validated m2_full_oracle and plot against other configuration (see next page)
  - Discussion with Xingxin to compare m2_full_oracle results
  - Write visualization script to see oracle's & naive's performances

Work Logs

- Oct 13 (Wednesday) (cont')



Work Logs

- Oct 14 (Thursday)
  - Attend Waterloo workshop
  - Worked on frame visualization
    - Step 1: Identify evaluation pipeline:
      - Test_naive_visualization.py: eval_one_epoch()
      - > eval_utils.py: dataset.evaluation()
      - > m2_dataset.py: kitti_eval.get_official_eval_result()
      - > pcdet/dataset/kitti/kitti_object_eval_python/eval.py
        - get_official_eval_result()
        - do_eval()
        - eval_class()
- Oct 15 (Friday)
  - Worked on frame visualization
    - Step 2: shorten frame size for rapid testing:
      - pcdet/dataset/__init__.py
        - Set short_dataset by torch.utils.data.random_split(dataset) >> creating a subset
        - Copy all attributes of the dataset to the subset

End of October 15th, Weekly Report

Presented by Yannis (Yiming) He 84189287

Weekly Progress Report

Oct 18 - 22th, 2021

Presented by Yannis (Yiming) He 84189287

Noah's Ark | Autonomous Driving Lab
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Supervisor: Eduardo Corral Soto 00407762

HUAWEI

Weekly Summary

- **Done:**
  - Create video for p40, m2, once pointcloud
    - 4 point views
  - Visualize frames having good and bad performances
    - Understand the testing pipeline (done)
    - Shorten dataset for rapid testing (done)
    - Locate evaluation for individual frame (done)
    - Test validity of single frame by using ground Truth as input (done) → error found in pipeline
  - Train m2 oracle without data augmentation
- **In Progress:**
  - Train p40 without data augmentation (running on gpu 0-3)
  - Evaluate & Plot m2 oracle without data augmentation
  - Visualize frames having good and bad performances
    - Investigate correlation between performance & bbox (in progress)
    - Run entire pipeline with each frame individually (TODO)
    - Rank frames by AP (TODO)
    - Visualize frame with high & low AP (TODO)
- **Recent Goals:**
  - Evaluate p40 without data augmentation → m2 naive
  - Detailed diagram for evaluation pipeline
  - Implement ROI
  - Plot mAP for all checkpoint for each class
  - Understanding: once_metric vs kitti metric
    - Prepare a decision diagram & flowchart for testing pipeline

Work Logs

- Oct 18 (Monday)
  - Create video for p40, m2, once pointcloud (4 point views)
    - Output 5 videos
      - P40 & m2 has “with augmentation” & “no augmentation”
      - Video saved in “/data/perception/datasets/pointcloud_visualization”
  - Visualize frames having good and bad performances
    - Locate evaluation for individual frame (done)
      - Eval.py: eval_class()
        - Maps gt_annos & det_annos into a dict, where dict[‘precision’] is a numpy with shape=(4,3,2,41)
          - This numpy can be mapped into mAP for different classes
      - Eval.py: get_trhesholds()
        - This function maps the numpy array into a smaller size
    - Test validity of single frame by using ground Truth as input

Work Logs

- Oct 19 (Tuesday)
  - Visualize frames having good and bad performances
    - Test validity of single frame by using ground Truth as input
      - Found error in testing pipeline:
        - After making *Prediction* = *Ground Truth*, *3D* & *bev* metric does not return 100%
          - Has error or both “single frame” & “full dataset”
        - However *bbox* & *aos* metric does return 100% for full dataset
          - Verified the correlation of bbox: higher is better
            - Can be potentially used as the metric to sort performance for each frame
    - Next step:
      - Validate that bbox shows 100% for single frame when making *Prediction* = *Ground Truth*
  - Training model with no data augmentation
    - M2 oracle without augmentation (in progress, gpu 0-3)
    - P40 without augmentation (TODO)

Work Logs

- Oct 20 (Wednesday)
  - Visualize frames having good and bad performances
    - Next step:
      - Validate that bbox shows 100% for single frame when making *Prediction = Ground Truth*
  - Training model with no data augmentation
    - M2 oracle without augmentation (done)
    - P40 without augmentation (in progress)
- Oct 21 (Thursday)
  - Visualize frames having good and bad performances
    - Next step:
      - Modify N_SAMPLE_PTS = 41 → N_SAMPLE_PTS = 1 in eval_class()
        - See if 3d output will be 100% under *Prediction = GroundTruth*
  - Evaluate model with no data augmentation
    - M2 oracle without augmentation (TODO)
    - P40 without augmentation (Waiting training to finish)

Work Logs

- Oct 22 (Friday)
  - Visualize frames having good and bad performances
    - Next step when GPUs are free:
      - Modify N_SAMPLE_PTS = 41 → N_SAMPLE_PTS = 1 in eval_class()
        - See if 3d output will be 100% under *Prediction* = *GroundTruth*
  - Evaluate model with no data augmentation
    - M2 oracle without augmentation (Running)
    - P40 without augmentation (Waiting training to finish)
  - Draw a evaluation diagram

End of October 22th, Weekly Report

Presented by Yannis (Yiming) He 84189287

Weekly Progress Report

Oct 25 - 29th, 2021

Presented by Yannis (Yiming) He 84189287

Noah's Ark | Autonomous Driving Lab
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Manager: Bingbing Liu 00435285
Supervisor: Eduardo Corral Soto 00407762

HUAWEI

Weekly Summary

- **Done:**
  - Trained, evaluated, and plotted m2 oracle without data augmentation
  - Trained p40 without data augmentation & evaluate oracle → picking best performance checkpoint
  - Evaluated P40_no_augmentation → m2 naive: better performance without augmentation for both naive & oracle
  - Trained & evaluated m2_5k without data augmentation
  - Clone Xingxin's latest code with ONCE fixed & modified according to gx9 setting
  - Trained & Evaluated ONCE oracle using the new pipeline (in progress on GPU 456): only saved 51-80 epochs
- **In Progress:**
  - A quick train to ensure having a working pipeline (in progress on GPU: 0123)
  - Analysis ONCE evaluation, find best checkpoint and do naive DA on M2
  - Train P40 with ROI_x_flip_prob = 0.5 (bug found: To be fixed and run on GPU 456)
- **Recent Goals:**
  - Evaluate P40 with ROI_x_flip_prob = 0.5 on M2 dataset
  - Visualization every frame BEV, create a video
- **TODO**:
  - Understanding: once_metric vs kitti metric
    - Prepare a decision diagram & flowchart for testing pipeline
  - Implement ROI
  - Plot mAP for all checkpoint for each class
  - Visualize frames having good and bad performances
    - Investigate correlation between performance & bbox (in progress)
    - Run entire pipeline with each frame individually (TODO)
    - Rank frames by AP (TODO)
    - Visualize frame with high & low AP (TODO)

Work Logs

- Oct 25 (Monday)
  - Evaluated m2_full_oracle_without_augmentation
    - Discovery:
      - ~10% performance drop comparing with “with augmentation”
      - Lower performance than m2_5k_oracle WITH augmentation
        - To train m2_5k_oracle WITHOUT augmentation
      - Best performance with checkpoint 38 (instead of 60 for full dataset WITH augmentation)
        - Expected, overfit easier without augmentation
    - Plotted result (next page)
  - Evaluating p40_without_augmentation → m2
    - Finding best checkpoint by evaluate p40 → p40 (in progress)
    - Use the best checkpoint to do naive DA on m2 (TODO)
  - Investigate testing pipeline:
    - Current issue: 3d not showing 100% when setting Detection = ground truth
  - Get Xingxin’s latest code
    - Rerun everything related to ONCE
      - Oracle, naive

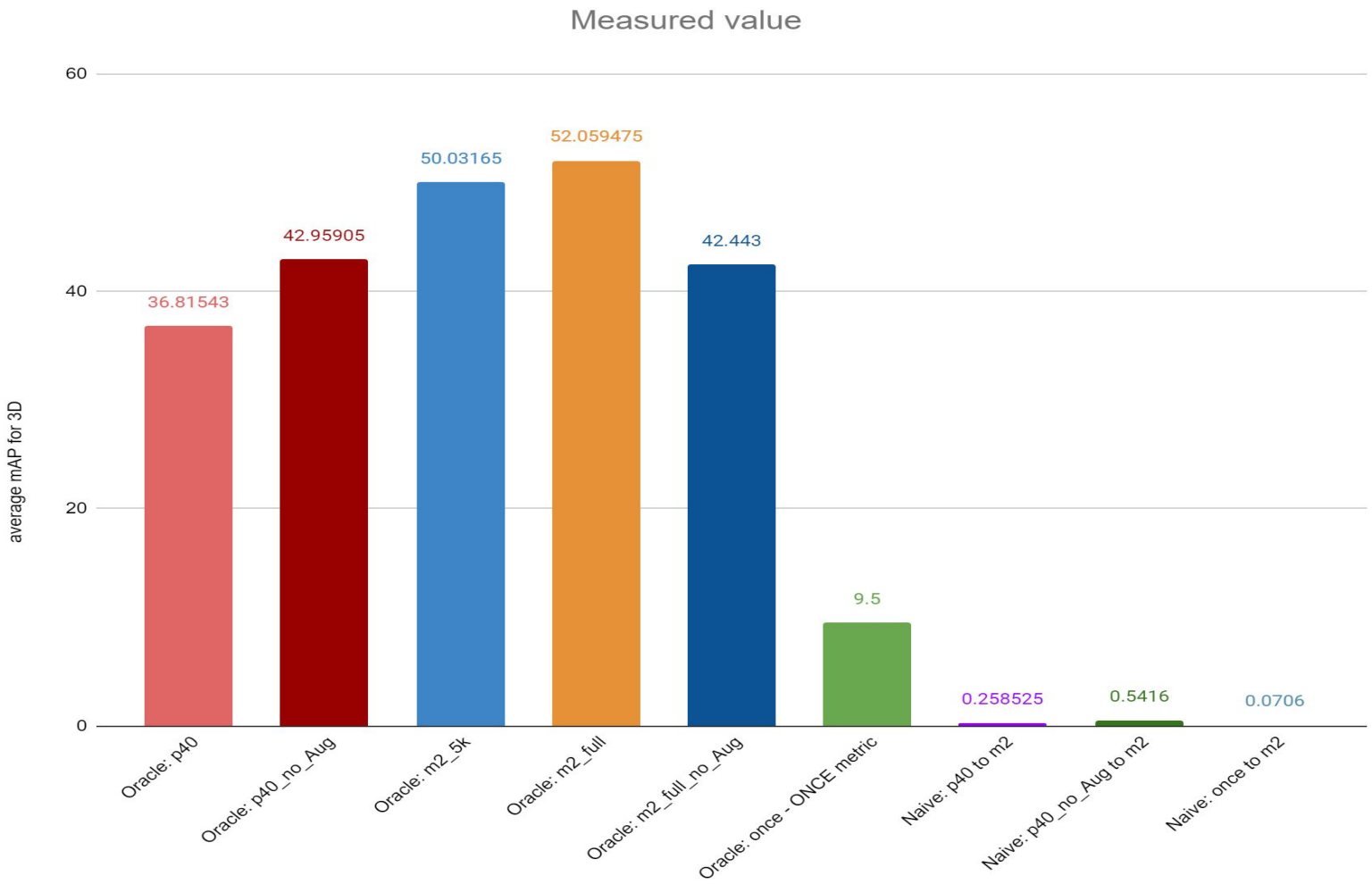
Work Logs

- Oct 26 (Tuesday)
  - Modified Xingxin's newest pipeline to match gx9 setting
  - Evaluated P40_without_augmentation
    - Best checkpoint: 56 with mAP = 42.96,
      - better than with Augmentation, mAP = 36.82
    - Evaluated on m2 (naive) with mAP = 0.5416
      - Better than naive with augmentation, mAP = 0.26
  - Train p40_without_augmentation on new pipeline to ensure pipeline is working (in progress)
  - Trained m2_5k_without_augmentation (completed)
  - Evaluate m2_5k_without_augmentation (in progress)
  - Train once on new pipeline (in progress)
  - Evaluate once performance (oracle) and find best checkpoint to test on m2 (TODO)

Work Logs

- Oct 27 (Wednesday)
  - Modify Xingxin's newest pipeline to match gx9 setting
  - Train p40_without_augmentation on new pipeline to ensure pipeline is working (in progress)
  - Evaluate m2_5k_without_augmentation (completed)
  - Train once on new pipeline (in progress on GPU 456)
  - Evaluate once performance (oracle) and find best checkpoint to test on m2 (TODO)

Work Logs


Measured value
average mAP for 3D
60
40
20
0
36.81543
42.95905
50.03165
52.059475
42.443
9.5
0.258525
0.5416
0.0706
Oracle: p40
Oracle: p40_no_Aug
Oracle: m2_5k
Oracle: m2_full
Oracle: m2_full_no_Aug
Oracle: once - ONCE metric
Naive: p40 to m2
Naive: p40_no_Aug to m2
Naive: once to m2

End of October 29th, Weekly Report

Presented by Yannis (Yiming) He 84189287