

# Weekly Progress Report

Nov 01 - 05th, 2021


Presented by Yannis (Yiming) He 84189287

Noah's Ark | Autonomous Driving Lab  
LiDAR Domain Adaptation

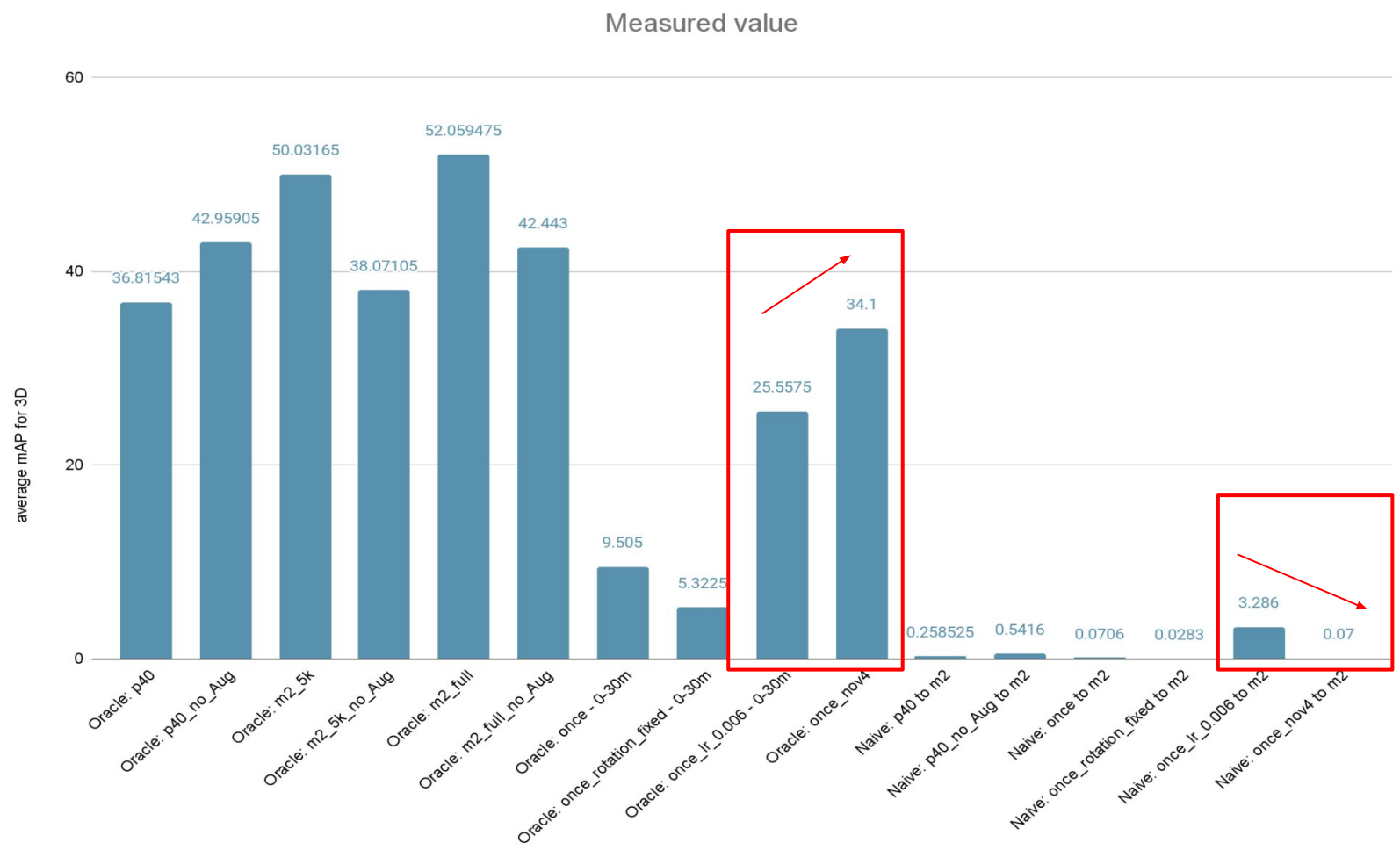
Manager: Bingbing Liu 00435285  
Supervisor: Eduardo Corral Soto 00407762



## Weekly Summary

- **Done:**
  - Experiment on effect after ONCE\_rotation\_fixed (Oracle & naive DA on m2)
    - Drop in performance.
    - Investigation on configuration: learning rate is making a great difference
    - With lr: 0.072  $\rightarrow$  0.006
      - Oracle improved  $\sim 5$  times (5.32  $\rightarrow$  25.6)
      - Naive DA on m2 improved (0.03  $\rightarrow$  3.3)
  - Experiment on Xingxin's code base (Oracle & naive DA on m2)
    - Current best performance on ONCE oracle, BUT got  $\sim 0$  for naive DA to m2
    - Investigation on configuration: learning rate is making a great difference
      - Oracle: 25.6  $\rightarrow$  34.1
      - Naive DA on m2: 3.3  $\rightarrow$  0.07
- **In Progress:**
  -  - Investigate why the inverse performance (oracle vs naive) occurred
    - Code, configuration, etc.
  - Region of Interest (ROI):
    - Evaluate P40 with ROI\_x\_flip\_prob = 0.5 on M2 dataset
  - Visualization every frame BEV
    - to understand the false positive/negative
- **Recent Goals:**
  - Development: Plot mAP for all checkpoint for each class
- **TODO:**
  - Understanding: once\_metric vs kitti metric
    - Prepare a decision diagram & flowchart for testing pipeline
  - 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



## Work Logs

- Nov 01 (Monday)
  - Investigation on training:
    - P40 new vs old code base:
      - Unstable training
      - Bug:
        - “Cannot perform reduction function max on tensor with no elements because the operation does not have an identity at ...”
      - Worse performance
    - ONCE before vs after rotation fixed:
      - Worse performance, not on the same scale with what Xingxin got
    - ROI:
      - dimension unmatched
  - Development: Plot mAP for all checkpoint for each class

## Work Logs

- Nov 02 (Tuesday)
  - Investigation on training:
    - P40 new vs old code base:
      - Unstable training
      - Bug:
        - “Cannot perform reduction function max on tensor with no elements because the operation does not have an identity at ...”
      - Worse performance
  - Experiment on effect after ONCE\_rotation\_fixed (Oracle & naive DA on m2)
    - Got worse performance.
    - Investigation on configuration: learning rate is making a great difference
    - With lr: 0.072  $\rightarrow$  0.006
      - Oracle improved  $\sim 5$  times (5.32  $\rightarrow$  25.6)
      - Naive DA on m2 improved (0.03  $\rightarrow$  3.3)
    - ROI:
      - dimension unmatched
  - Development: Plot mAP for all checkpoint for each class

## Work Logs

- Nov 03 (Wednesday)
  - Investigation on training:
    - P40 new vs old code base:
      - Unstable training
      - Bug:
        - “Cannot perform reduction function max on tensor with no elements because the operation does not have an identity at ...”
      - Worse performance
  - Experiment on effect after ONCE\_rotation\_fixed (Oracle & naive DA on m2)
    - Got worse performance.
    - Investigation on configuration: learning rate is making a great difference
    - With lr: 0.072  $\rightarrow$  0.006
      - Oracle improved  $\sim 5$  times (5.32  $\rightarrow$  25.6)
      - Naive DA on m2 improved (0.03  $\rightarrow$  3.3)
    - ROI:
      - dimension unmatched
  - Development: Plot mAP for all checkpoint for each class

## Work Logs

- Nov 04 (Thursday)
  - Investigate the ROI
  - Modify the experimental set up to work with reverted rotation angle
  - Debug P40 for cuda error
- Nov 05 (Friday)
  - Create docker for ROI project and Xingxin's codebase
  - Run sample experiment on new docker to confirm consistent performances similar to previous environment

# End of November 05th, Weekly Report



# Weekly Progress Report

Nov 08 - 12th, 2021

Presented by Yannis (Yiming) He 84189287

Noah's Ark | Autonomous Driving Lab  
LiDAR Domain Adaptation

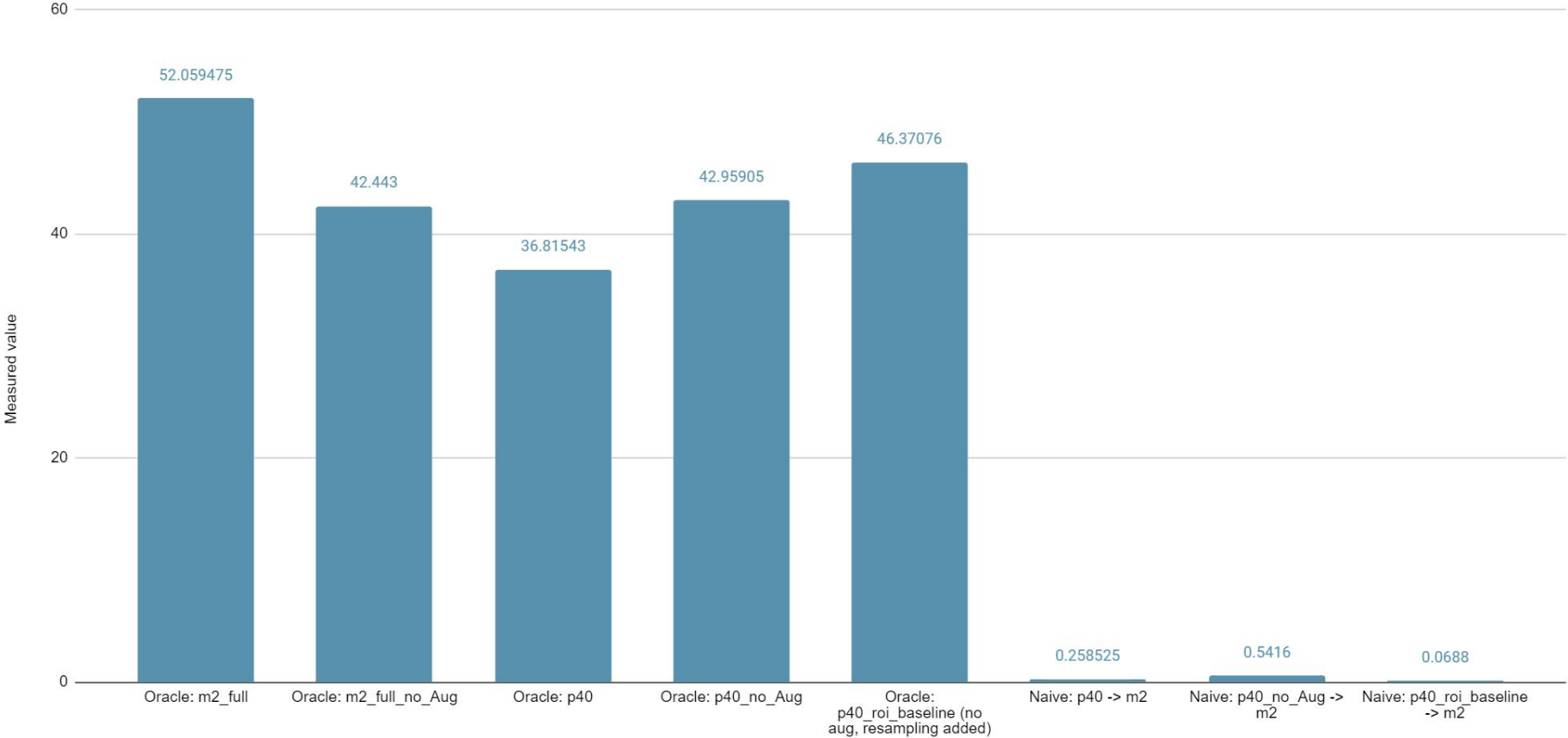
Manager: Bingbing Liu 00435285  
Supervisor: Eduardo Corral Soto 00407762



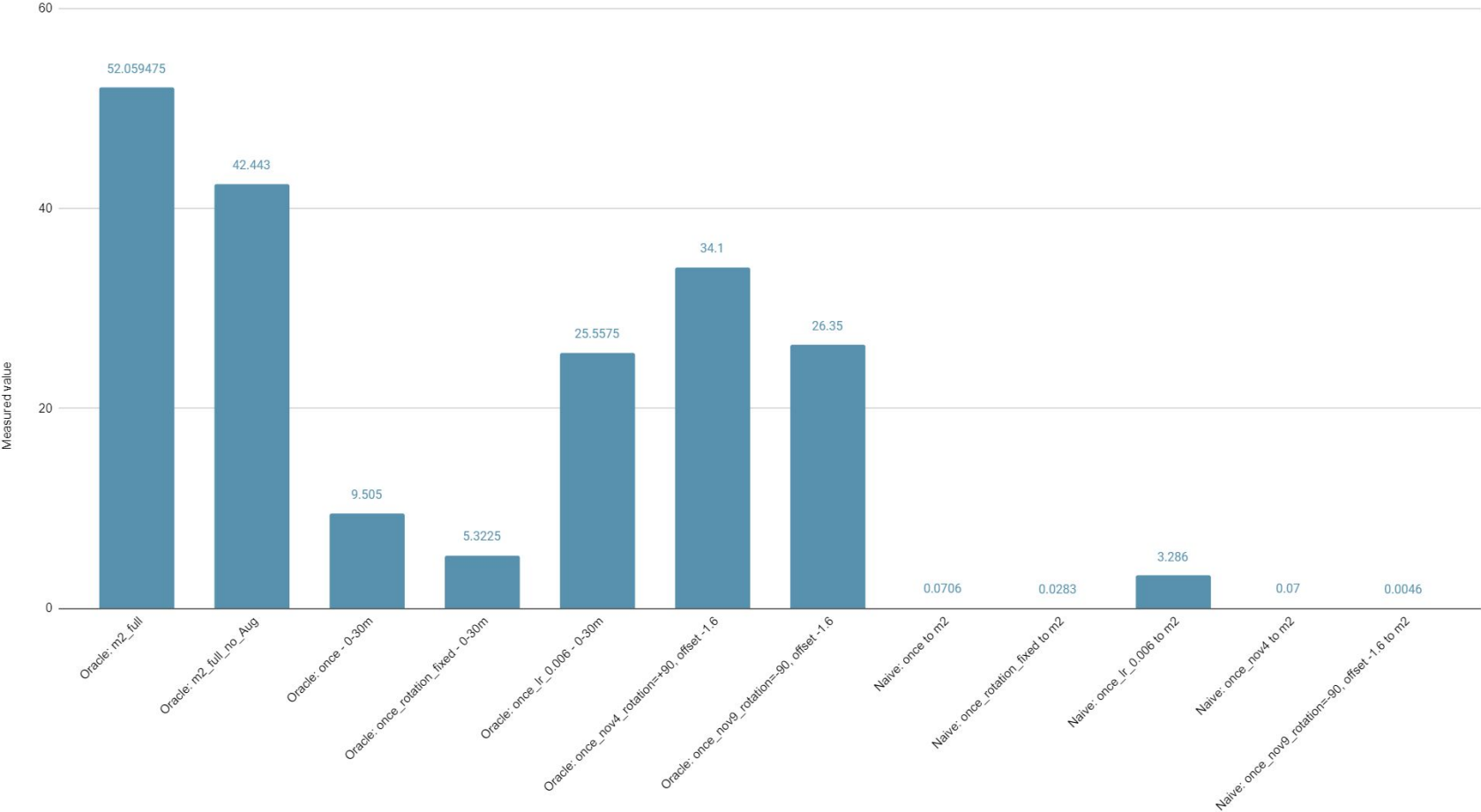
## Weekly Summary

- **Done:**
  - Investigate why the inverse performance (oracle vs naive) occurred
    - Xingxin's codebase hasn't invert the rotation angle from 90 to -90 degree
  - Synced Xingxin's changes for p40
  - Investigated the inverse behavior for rotation → +90 degree is the correct one
  - Experiment: ONCE with ~~corrected~~ rotation angle (-90) and perform oracle and naive DA on m2
  - Experiment: ONCE with corrected rotation angle (+90) and offset = 0
  - Experiment: P40, original ROI + resampling for missing gt\_box
- **In Progress:**
  - Region of Interest (ROI):
    - ➡ - Debug ROI, studying the code (half way through)
      - Evaluate P40 with ROI\_x\_flip\_prob = 0.5 on M2 dataset
  - Visualization every frame BEV
    - to understand the false positive/negative
- **Recent Goals:**
  - Development: Plot mAP for all checkpoint for each class
- **TODO:**
  - Understanding: once\_metric vs kitti metric
    - Prepare a decision diagram & flowchart for testing pipeline
  - 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)

P40 Measured value



ONCE dataset



## Work Logs

- Nov 08 (Monday)
  - Investigate why the inverse performance (oracle vs naive) occurred: code, configuration, etc.
    - Trained function (no difference)
    - Configuration
      - Data processor
        - Xingxin:
          - Offset: [0, 0, -1.6]
          - Rotation: 1.5708
        - Yannis:
          - Offset: [0, 0, 0]
          - Rotation: -1.5708
- Nov 09 (Tuesday)
  - Trained once with “Offset: [0, 0, -1.6] & Rotation: -1.5708” (GPU 4,5,6)
    - Result: worse performance in oracle when having -90 degree
      - Discussing with group, +90 should be the correct one
  - Experiment on the effect of offset
  - Run p40 with resampling embedded

## Work Logs

- Nov 10 (Wednesday)
  - Get project comparison software
  - Experiment: ONCE with ~~corrected~~ rotation angle (-90) and perform oracle and naive DA on m2
  - Experiment: P40, original ROI + resampling for missing gt\_box
- Nov 11 (Thursday)
  - Investigate the effect of offset:
    - Experiment with offset = 0 vs -1.6 for each rotation setting (+- 90)
  - Experiment ROI baseline
    - Oracle & naive on m2
- ➡ Nov 12 (Friday)
  - Debugged ROI POINT\_CLOUD\_RANGE from crashing caused by dimension unmatched
    - Experiment on modifying POINT\_CLOUD\_RANGE and learn the pattern
    - Go through code base and check computation
    - Research on original repo
  - Paper selection for Next Friday's paper reading session

# End of November 12th, Weekly Report

# Weekly Progress Report

Nov 15 - 19th, 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

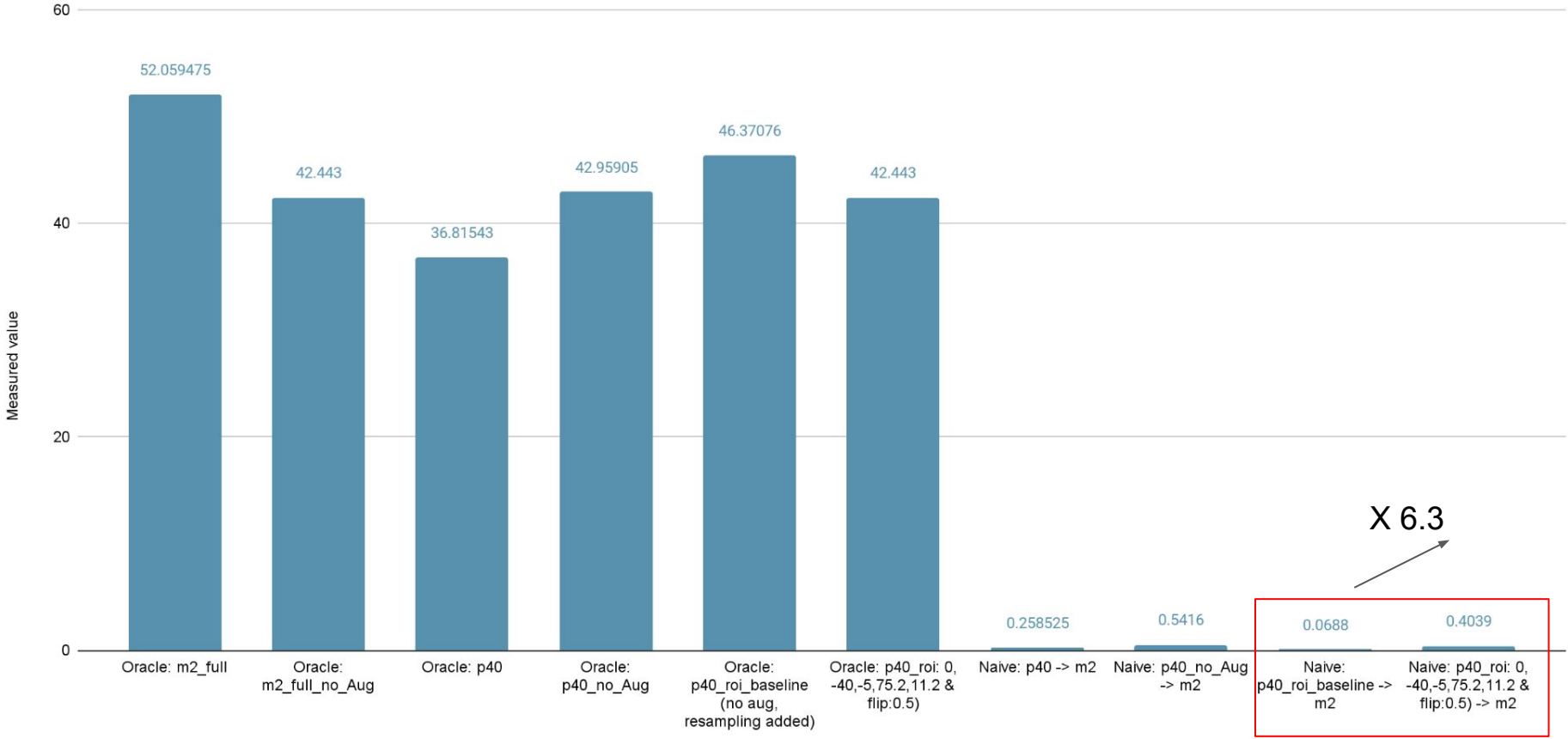




## Weekly Summary

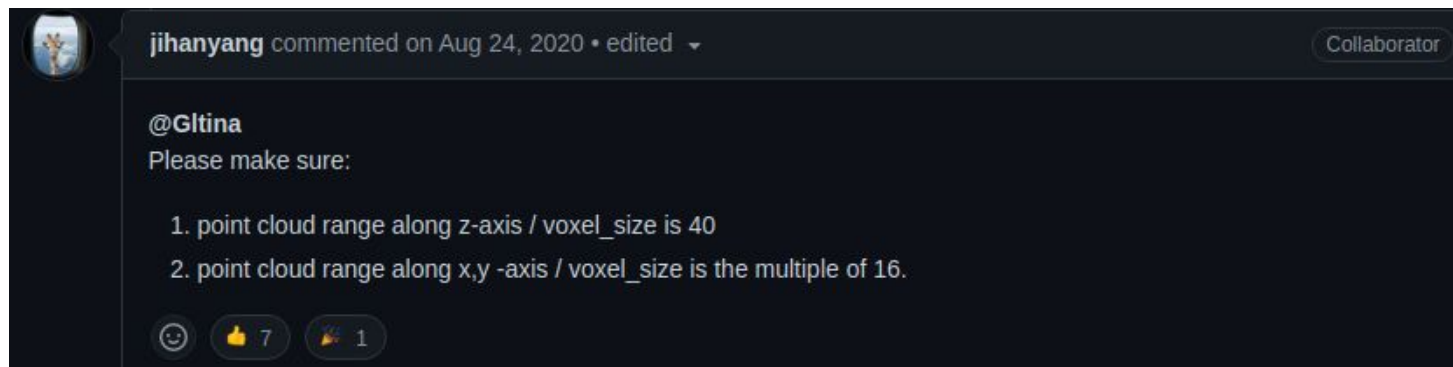
- **Done:**
  - Investigate why the inverse performance (oracle vs naive) occurred
    - Code, configuration, etc.
  - Debugged ROI POINT\_CLOUD\_RANGE from crashing caused by dimension unmatched
  - Selected 2-3 papers for paper reading session on Nov 19
  - Oracle & Naive experiment for P40 with ROI\_x\_flip\_prob = 0.5 on M2 dataset (gpu 0,1,2,3)
  - Analyze papers and Create slides for paper reading session
- **In Progress:**
  -  - Region of Interest (ROI):
    - Train P40 with densified point clouds with new ROI with/without augmentation
- **Recent Goals:**
  - Visualization every frame BEV
    - to understand the false positive/negative
- **TODO:**
  - Understanding: once\_metric vs kitti metric
    - Prepare a decision diagram & flowchart for testing pipeline
  - Development: 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)

P40 Measured value



## Work Logs

- Nov 15 (Monday)
  - Debugged ROI POINT\_CLOUD\_RANGE from crashing caused by dimension unmatched
    - POINT\_CLOUD\_RANGE: [0, -40, -5, 75, 10, 7]  
>>
    - POINT\_CLOUD\_RANGE: [0, -40, -5, 75.2, 11.2, 7]



- Selected 2-3 papers for paper reading session on Friday
- Met Eduardo after meeting for next step discussion

## Work Logs

- Nov 16 (Tuesday)
  - Papers selection, with official code:
    - Self-Supervised Pillar Motion Learning for Autonomous Driving
    - Visualizing Adapted Knowledge in Domain Transfer
    - Regressive Domain Adaptation for Unsupervised Keypoint Detection
    - Towards Semantic Segmentation of Urban-Scale 3D Point Clouds: A Dataset, Benchmarks and Challenges

## Work Logs

- Nov 17 (Wednesday) (cont')
  - Papers selection, No official code:
    - DRANet: Disentangling Representation and Adaptation Networks for Unsupervised Cross-Domain Adaptation
    - Continual Adaptation of Visual Representations via Domain Randomization and Meta-learning
    - Source-Free Domain Adaptation for Semantic Segmentation
    - GeoSim: Realistic Video Simulation via Geometry-Aware Composition for Self-Driving
    - Informative and Consistent Correspondence Mining for Cross-Domain Weakly Supervised Object Detection
    - Generalized Domain Adaptation
    - Self-adaptive Re-weighted Adversarial Domain Adaptation
    - DA-DETR: Domain Adaptive Detection Transformer by Hybrid Attention
  - Next step:
    - Eduardo will use his model-free python code to densify p40 point cloud (To be received)
    - Train p40 on the densified point cloud without augmentation (except for vertical flipping)
    - Train p40 with augmentation (only insertion of GT object)
      - Need to run python script to generate object database

## Work Logs

➡ Nov 18 (Thursday)

- Experiment: Naive DA: p40 (roi: 0,-40,-5,75.2,11.2 & flip:0.5)
  - Improvement:
    - Baseline mAP: 0.0688
- Current mAP: 0.4039 (626%)
- Papers selection:
  - ✓ - Unsupervised Domain Adaptation in Semantic Segmentation via Orthogonal and Clustered Embeddings
  - Self-Adversarial Disentangling for Specific Domain Adaptation
  - Semi-supervised Domain Adaptation based on Dual-level Domain Mixing for Semantic Segmentation
  - ✓ - Target-targeted Domain Adaptation for Unsupervised Semantic Segmentation
- Analyze papers and Create slides for paper reading session
- Met with Yang to discuss Carla's vs P40&ONCE's performance for M2 Naive DA

## Work Logs



Nov 19 (Friday)

- Slides & Paper sharing presentation
- Region of Interest (ROI):
  - Train P40 with densified point clouds with new ROI with/without augmentation

# End of November 19th, Weekly Report



# Weekly Progress Report

Nov 22 - 26th, 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



## Weekly Summary

- **Done:**
  - Region of Interest (ROI):
    - Trained P40 with densified point clouds with new ROI without augmentation
  - Investigated m2 evaluation performance difference with different configuration (Yang's configuration vs mine)
  - Region of Interest (ROI):
    - Evaluate P40 with densified point clouds with new ROI without augmentation
    - Train P40 with pointcloud  $z\_offset = -0.6$
- **In Progress:**
  - Region of Interest (ROI):
    - Comparing performance with Aich's code base
    - Generate info files for non-augmentation training
  - Research state-of-the-art domain adaptation technique for potential individual research direction
- **Recent Goals:**
  - Train p40 with augmentation (only insertion of GT object)
  - Visualization every frame BEV
    - to understand the false positive/negative
- **TODO:**
  - Understanding: once \_metric vs kitti metric
    - Prepare a decision diagram & flowchart for testing pipeline
  - Development: 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

- Nov 22 (Monday)
  - Region of Interest (ROI):
    - Train P40 with densified point clouds with new ROI without augmentation (gpu: 0-3)
    - Generate info files for augmentation training
      - Need to run python script to generate object database
  - Research state-of-the-art domain adaptation technique for potential individual research direction
  - Meeting Yang
- Nov 23 (Tuesday)
  - Meeting with Yang to discuss difference in m2 evaluation
  - Meeting with Thomas:
    - Rank board model
      - Runtime (10Hz)
      - Performance
    - Find a topic
    - Innovation:
      - Training technique, data augmentation, loss function, module, etc
    - Find a baseline
      - Code

## Work Logs

- Nov 24 (Wednesday)
  - Region of Interest (ROI):
    - Train P40 with densified point clouds with new ROI without augmentation (gpu: 0-3)
    - Train P40 with pointcloud `z_offset = -0.6`
    - Generate info files for augmentation training
    - Compare Aich's configuration
    - Study code for info file generation
  - Research paper reading
- Nov 25 (Thursday)
  - Region of Interest (ROI):
    - Test previous p40 model on `roi_dense` codebase
  - Download Aich's codebase
  - Evaluate P40 with `z_offset = -0.6`
  - Debug `nms_min_radius` → the hyper-parameter itself doesn't get called. However, changing the value causes parameter loading error
- Nov 26 (Friday)
  - Meeting with Aich, Eduardo, Xingxin, Yang for reproducing Aich's result
  - Train ONCE Oracle
  - Generate info files for dense p40 dataset (Thanks Xingxin for helping)

# End of November 26th, Weekly Report

# Weekly Progress Report

Nov 29 - Dec 3rd, 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



## Weekly Summary

### - Done:

- Generated info files for dense p40
- Get Aich's codebase to produce ONCE → M2 result
  - Compared Oracle performance with Aich's code base
  - Test naive performance
    - 80th epoch generated by trained
    - vs 80th epoch trained by Aich
    - vs 80th epoch RE-trained by Aich
    - vs 80th epoch RE-trained by Yannis
- Backed up ONCE & M2 dataset on gx9
- Run script to generate the infor files for ONCE and make sure the new info file can produce the same results
  - Evaluate 80th epoch & plot the bar chart
- Wiki for the *info generation branch* & *ONCE\_Benchmark branch*

### - In Progress:



- Modify the code to try  $z\_offset = 1.25$
- Generate ONCE info files for **densified** pointcloud (pointcloud to be given by Eduardo)
- Get the newest merged codebase from Xingxin and configure towards gx9

### - Recent Goals:

- Train densified ONCE on Xingxin's new codebase

### - TODO:

- 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)

## Work Logs

➡ Nov 29 (Monday)

- Use ONCE checkpoint epoch 80th given by Yang (trained by Aich) to evaluate on ONCE using ONCE metric
  - Compare results: Yang's vs Mine
    - Oracle:
      - Cannot perform since no one else has done oracle testing
    - Naive:
      -
  - Evaluate ONCE checkpoint s on m2 for naive DA for both checkpoint
  -



# End of December 3rd, Weekly Report