Master-Praktikum - Learning for self-driving cars and intelligent systems - Winter 2019/20
Weekly Report: Sensor Modality Fusion

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Accomplished tasks:

- Started working on a Mixture of Experts methodology.
    - Looked deeper into the outputs of the network
    - Changed the MoE model to have three conv layers followed by two fully-connected layers. (Removed max pooling) :

```
self.img_conv1 = slim.conv2d(self.img_feature_maps, 16,
[3,3],scope='img_conv1')

self.bev_conv1 = slim.conv2d(self.bev_feature_maps, 16,
[3,3],scope='bev_conv1')

self.img_conv2 = slim.conv2d(self.img_conv1, 8, [3,3], scope='img_conv2')

self.bev_conv2 = slim.conv2d(self.bev_conv1, 8, [3,3], scope='bev_conv2')

self.img_conv3 = slim.conv2d(self.img_conv2, 1, [3,3], scope='img_conv3')

self.bev_conv3 = slim.conv2d(self.bev_conv2, 1, [3,3], scope='bev_conv3')

self.gating_net_input = tf.concat([slim.flatten(self.img_conv3),

                          slim.flatten(self.bev_conv3)], axis=1)

self.fc1 = slim.fully_connected(self.gating_net_input, 50, scope='fc1')

self.fc2 = slim.fully_connected(self.fc1, 2,
```

```
                    activation_fn=None,scope='fc2')#,activation_fn=None

self.out = slim.softmax(self.fc2)
```

- Found out that there are dropouts whose values are calculated based on a probability. Two such dropout weights : img_dropout and bev_dropout. They can be either 1 or 0. They are multiplied with the respective feature maps.
- Found out that the scales of the two feature maps were different. So rescaled one of them by finding out the max between the two maps.
- Trials:
    - Training of avod model by **removing the dropouts**: Removed the dropouts and froze the weights to 0.5 for both img and bev and after evaluation it was found that they performed **worse than the original avod model**.
    - Trained only the MoE model with the checkpoint from the above avod model. It was found that the performance didn't improve with MoE.
    - Training of avod model **with dropouts**: First trained the avod model by setting the weights for bev and img to 0.5 and 0.5 respectively. In evaluation, the result is **similar to the original avod model**.
    - Later introduced moe to the model and trained only moe, the results didn't improve either.
- Evaluated MoE with the augmented validation set

Tasks planned for next week:

- Continue to work on Mixture of Experts for better results

Issues / Roadblocks:

- The results of MoE evaluation doesn't look that good. Look into training details and implementation.