**Fuel Efficiency Prediction Notebook**

| **Criteria** |
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| Programming Code Assignment  Complete Tasks 1-5 in the Object Detection Notebook |
| Algorithm Understanding  How does Transfer Learning work? When to use Transfer Learning?  Transfer Learning is used when we want to perform a ML task like the one done by an already trained model, but for a different set of samples from those that the model was trained with. In essence, we are trying to take advantage of an already trained model and used it for a similar task, without having to do redo the whole training.  Transfer Learning works by taking an already trained model, keeping the (trained) weights of the first layers fixed and just train the last layers of the model with the new set of samples. These last layers can be the same as from the original model or we can change/ update them to the needs that we currently have. For example, we can change the number of neurons in the output layer to suit the type of result we are looking for; a single neuron for a simple detection task or several neurons for a clasifier job. |
| Interview Readiness  When training a Convolution Neural Network in the parameters what do each of the letters mean, for example NHWC?  A convolution is defined by the size of the inputs and the filters, and other convolution behavior information such as the strides and zero padding sizes.  The size of the input picture is summarized by NHWC: Number of samples in the batch, Height, Width, and the number of Channels of the image. The size of the filters is summarized by their height (R) and width (S, and mostly S = R). The number of channels is the same as those for the images. K denotes the number of filters applied to each image during the convolution. |
| Interview Readiness  How does an SSD (single shot multi box detector) object detection model work?  A Single Shot multi box Detector works by generating a (fixed default) number of bounding boxes for an input image and applying a detector function to each box to determine the scores for the presence of a certain object(s) category(ies). The SSD model also adjusts the size of the bounding boxes to better fit the detected object shape. |
| Algorithm Understanding  What is Intersection over Union and why do we use Intersection over Union?  Intersection Over Union measures the ratio of the area of intersection of two bounding boxes in an image, divided by the area of the union of the two intersecting bounding boxes (equal to the sum of the areas of both boxes less the intersection area). If two bounding boxes overlap completely both areas will be the same and the IoU will be equal to one. If the two bounding boxes do not overlap the IoU will be zero; the intersection area will be zero and the divisor area will be the sum of the areas of both bounding boxes.  In ML, IoU is used to measure the accuracy of a detection model using prediction bounding boxes. The resulting bounding box prediction for an object is compared to the ‘ground truth’ bounding box, which is the ‘labelled’ box from the testing set for which the model is giving the prediction. An IoU closer to one means the predicted box is accurately detecting the object. |