Weekly Report on Road analytics

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Outline of peformed task :

- Literature survey
- Anaconda framework setup (with keras, tensorflow 2.0 , NVIDIA GPU drivers, virtual environment) on workstation

Literature Survey:

[7] Network In Network

Fully connected layers are prone to overfitting, Dropout is used as a regularizer which randomly sets half of the activations to the fully connected layers to zero during training. It has improved the generalization ability and largely prevents overfitting.

Min Lin et al. proposed another strategy called global average pooling to replace the traditional fully connected layers in CNN. The idea is to generate one feature map for each corresponding category of the classification task in the last CONV layer. Instead of adding fully connected layers on top of the feature maps, they took the average of each feature map, and the resulting vector is fed directly into the softmax layer.

One advantage of global average pooling over the fully connected layers is that it is more native to the convolution structure by enforcing correspondences between feature maps and categories. Thus the feature maps can be easily interpreted as categories confidence maps. Another advantage is that there is no parameter to optimize in the global average pooling thus overfitting is avoided at this layer.

Futhermore, global average pooling sums out the spatial information, thus it is more robust to spatial translations of the input. We can see global average pooling as a

structural regularizer that explicitly enforces feature maps to be confidence maps of concepts (categories).

To study the regularization effect of global average pooling, they replaced the global average pooling layer with a fully connected layer, while the other parts of the model remain the same. They evaluated this model with and without dropout before the fully connected linear layer. Both models are tested on the CIFAR-10 dataset, and a comparison of the performances is shown in Table.

Method	Testing Error
mlpconv + Fully Connected	11.59%
mlpconv + Fully Connected + Dropout	10.88%
mlpconv + Global Average Pooling	10.41%

Pre-processing dataset :

- 50 x 50 fixed size input images
- “lanczos” resampling technique
- Dataset splits into training and validation by 80:20 ratio
- class weights are explicitly provided for loss function as belows:
    - Bicycle : 3.831857162941094,
    - Bus : 6.674257728803183,
    - Car : 0.2600267124594543,
    - Motor : 1.2915393181225863,
    - Truck : 3.0834323208326264,
    - Van: 1.550728966645331

Configuration of Alexnet :

- 5 CONV layers
- Batch normalization
- “Relu” activation for all layers except output layer
- “Softmax”’ activation for output layer
- Uses dropout (=0.4) as regularizer
- 2 FC(dense) layers of 4096 neurons
- optimizer='adam' ,
- loss='categorical_crossentropy' ,

Tentive list of tasks for next session :

- Implement Alexnet for 50 x 50 images
- Introduce biased loss function