

# Joint RGB-Spectral Decomposition Model Guided Image Enhancement in Mobile Photography

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## 1 Comparison

### 1.1 Part-1: Segmentation-JDM

Two changes were made in decode-head module of Segmentation-JDM model. First, The loss function was changed from Cross Entropy Loss to Focal Loss with  $\gamma$  equal to 2. Second, dilation of 2 was added to convolutional layers of FCN. Following Results were observed:

Model	iterations	building	plant	sky	trunk	road	mIoU
Paper	14000	87.53	91.01	95.87	31.14	89.11	78.93
Mine	12000	88.04	91.26	94.39	35.18	90.08	78.94
Modified ( $\gamma = 2.0$ )	12000	88.38	90.08	84.22	24.57	84.76	74.4

Table 1: Evaluation of modified segmentation-JDM and it's comparison with previous model

As we can see, The modified model performed poorly compared to original model. There are following possible reasons for this.

1. Focal loss works best in case of sever imbalance in classes. In our case class imbalance might not be sever enough for focal loss to outperform cross entropy loss.
2. Focal loss highly emphasizes on difficult samples so model might be struggling to generalize for other easy classes.
3. I only trained for  $\gamma = 0.5, 1.0, 2.0$  and  $3.0$ . There might be some other gamma for which focal may perform better.

### 1.2 Part-2: JDMHDRNet

In the SPSA module of JDM-HDRNet, activation function was changed from leaky-relu to gelu. Following results were observed:

Model	Epochs	$PSNR^*$	$SSIM^*$
HDRNet	6000	27.75	0.939
$JDM - HDRNet^*$ (Paper)	6000	30.14	0.968
$JDM - HDRNet^*$ (Mine)	3000	29.01	0.967
$JDM - HDRNet^*$ (Modified)	2000	29.13	0.967

Table 2: Training with Ideal Priors

Due to time limitations, I could not train for whole 6000 epochs to compare with paper's results, but we can clearly see that modified model reached better PSNR value in less epochs compared to when I trained paper's model in phase-1. Hence we can safely say that modified model will atleast reduce training time if not outperform the original model. Either way, it is a improvement over paper's model.