E9 246 Advanced Image Processing

Assignment 2

Due Date: 24 Feb, 2025

General Instructions:

- You can use Google Colab. You can use any opensource deep learning libraries like PyTorch, TensorFlow, etc.
- Along with your code, you should also submit a report (brief and to-the-point) with all the results and inferences.
- Put all your files into a single zip file and submit the zip file. Name the zip file in the format *AIP2_YourName*.

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1 Classical Method (N-Cut) (20 Marks)

(a) Implement the N-Cut algorithm to segment the images into two or more segments (More than two segments for at least one image). Test it on the images given here.
(b) Perform N-Cut with two different similarity measures. Compare the output results.
(c) Implement the above for different sets of σ's and observe the effect.
(d) Qualitatively analyze all the results.

2 Fully Convolutional Networks (FCNs) (30 Marks)

(a) Take a FCN Resnet50 model pretrained on the PASCAL VOC dataset (from PyTorch), and evaluate the pixelwise accuracies and mean IOUs on any ten val set images. You can download the dataset and the segmentation labels from here.
(b) Take a VGG16 model pretrained on ImageNet. Modify the last FC layers and convert it to a FCN-32S Network to perform Image Segmentation.
(c) Implement a FCN-16S model using skip connections with the same VGG16 model as above.
(d) Perform (b) and (c) on the dataset given here. Evaluate the pixelwise accuracy and meanIOU on the test set.
(e) Compare the results of these two variants of FCNs both qualitatively and quantitatively, and comment on the importance of skip connections.