CV2015Spring—Assignment #3

Due: June 18, 2015 (12:00AM)

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June 22, 2015

1. Grab Cut

In this part, I choose to adjust three parameters:

- threshold
- size of rectangle
- iteration times

Then, compute the mean value of evaluation result from all images and draw PRF bar graph to evaluate each parameter.

In the followings, I will introduce the evaluation of each parameters.

1.1 Threshold

1.1.1 Step 1: Input image and use image signature

Use all input images from the dataset PASCAL (850 images totally) to obtain the saliency maps by signature. In this step, I adjust the threshold in signature to obtain different saliency maps. The threshold is adjusted from 0.2 to 0.8 and the interval is 0.1. Therefore, I can get 7 kinds of saliency maps. The result is shown in Figure 1.

1.1.2 Step 2: Draw rectangle and implement segmentation

From last step, I have obtained all saliency maps in different threshold. Then, I can use the saliency maps as initialization in grabcut and implement segmentation. And grabcut will get different results corresponding to the threshold set in saliency map. And I transform the segmentation images to binary images as inputs in evaluation. The results are shown in Figure 2 and Figure 3.

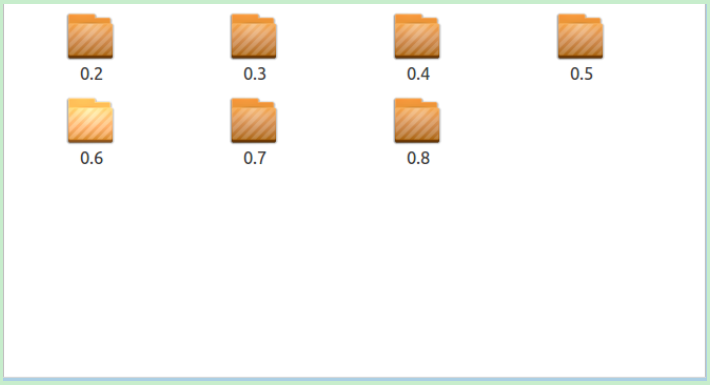


Figure 1: Different threshold folders.

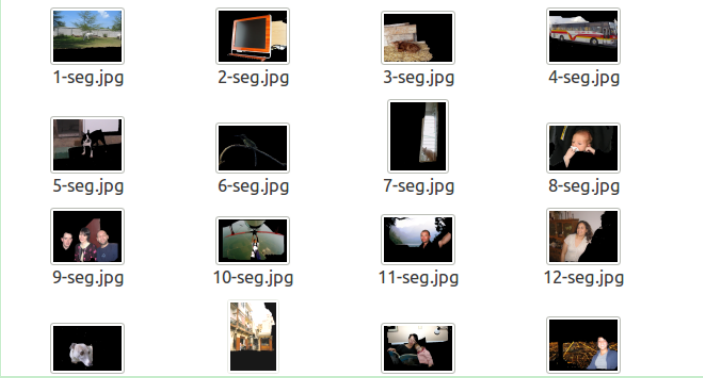


Figure 2: Segmentation results in "0.2" folder.

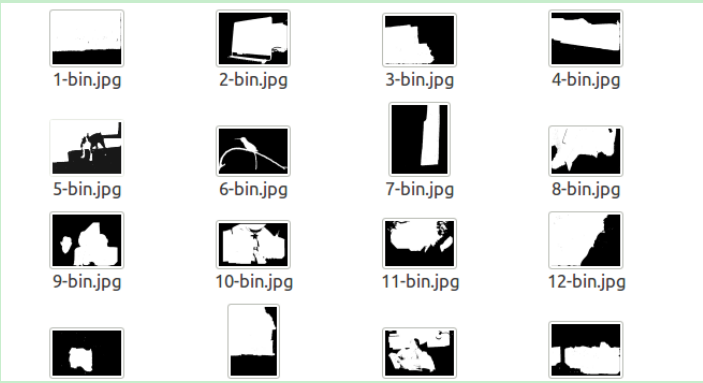


Figure 3: Segmentation binanry images in "0.2" folder.

1.1.3 Step 3: Evaluate segmentation result and draw PRF bar graph

The binary images obtained from last step can be computed to get the values of precision, recall and F-measure. So the PRF bar graph can indicate the evaluation of threshold.

From the PRF bar graph, it can be seen that the value of presion is increasing, the value of recall is decreasing and the value of F-measure is decreasing with the increasing threshold. The threshold is low, the saliency region may be bigger and it contains more objects. So the value of presion may be low

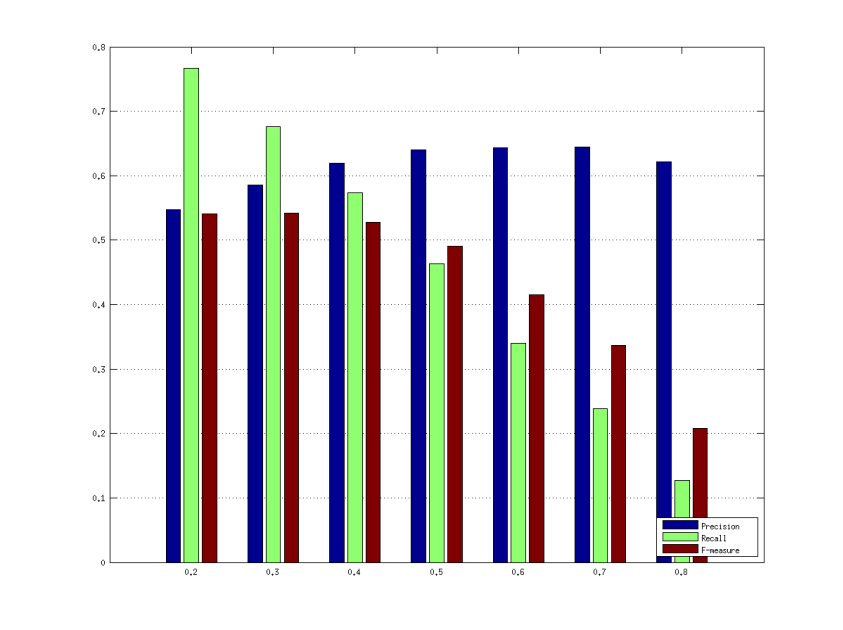


Figure 4: PRF bar graph of threshold evaluation.

and the value of recall may be high from the segmentation results. According to the value of F-measure, threshold, which is set as 0.3 or 0.4, may be more appropriate in this dateset.

1.2 Size

1.2.1 Step 1: Input image and use image signature

Use all input images from the dataset PASCAL (850 images totally) to obtain the saliency maps by signature. In this step, I set threshold as 0.2 to get big saliency regions to contains as more objects as possible.

1.2.2 Step 2: Draw rectangle and implement segmentation

From last step, I have obtained all saliency maps. In this step, I draw a rectangle to contain saliency regions and the rectangle can be used to initialize in grabcut and implement segmentation. I decrease the size of rectangle from 5 to 55 and the interval is 10 to get differenct segmentation results. 5 means length of 5 pixels. So I can obtain 7 kinds of segmentation results and I transform the segmentation images to binary images as inputs in evaluation. The result is shown in Figure 5.

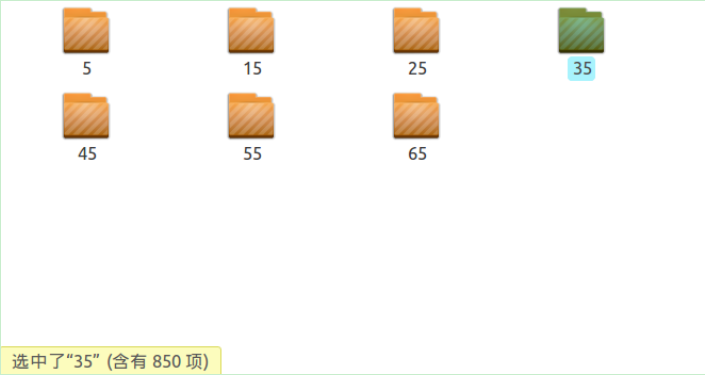


Figure 5: Different size folders.

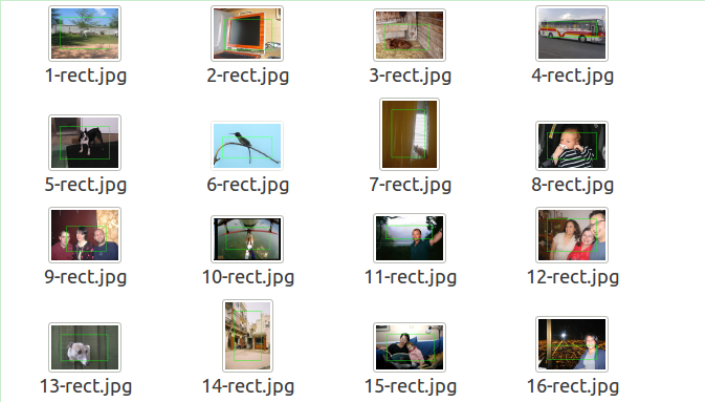


Figure 6: Drawing rectangle results in "25" folder.

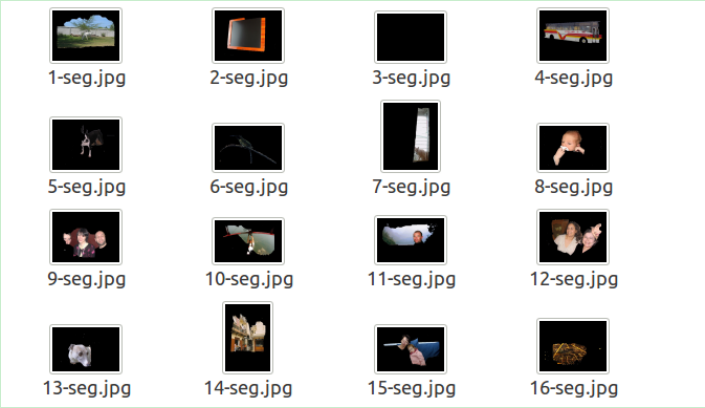


Figure 7: Segmentation results in "25" folder.

1.2.3 Step 3: Evaluate segmentation result and draw PRF bar graph

The binary images obtained from last step can be computed to get the values of precision, recall and F-measure. So the PRF bar graph can indicate the evaluation of size.

From the PRF bar graph, it can be seen that the value of presion is increasing, the value of recall is decreasing and the value of F-measure is decreasing with the diminishing of rectangle. The small

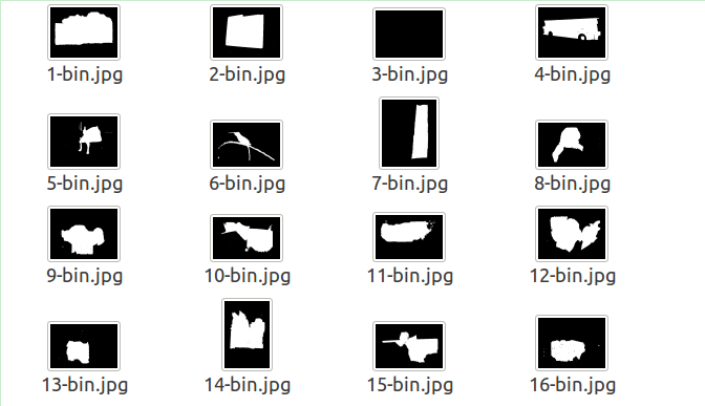


Figure 8: Segmentation binary images in "25" folder.

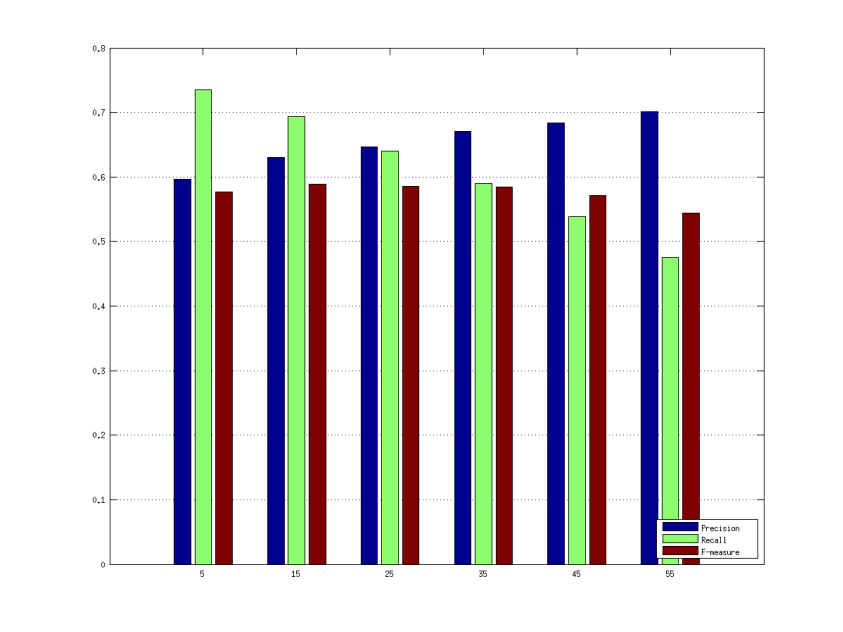


Figure 9: PRF bar graph of size evaluation.

rectangle means that the most saliency object is included in the ractangle. And the smaller size of rectangle is, the higher value of presision is. According to the value of F-measure, when threshold is set as 0.2, the size of rectangle is decreased by 15 pixels length may be more appropriate in this dateset.

1.3 Iteration times

1.3.1 Step 1: Input image and use image signature

Use all input images from the dataset PASCAL (850 images totally) to obtain the saliency maps by signature. In this step, I set threshold as 0.4 to get big saliency regions to contains as more objects as possible.

1.3.2 Step 2: Draw rectangle and implement segmentation

From last step, I have obtained all saliency maps. In this step, I adjust the iteration times from 2 to 8 and the interval is 1 to get differenct segmentation results. So I can obtain 7 kinds of segmentation results and I transform the segmentation images to binary images as inputs in evaluation. The result is shown in Figure 10.

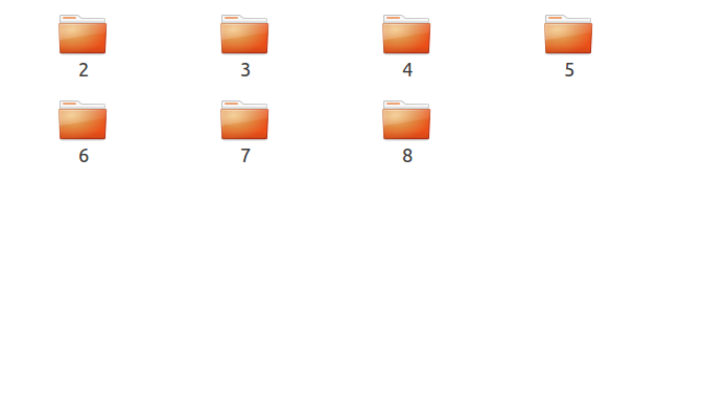


Figure 10: Different iteration times folders.

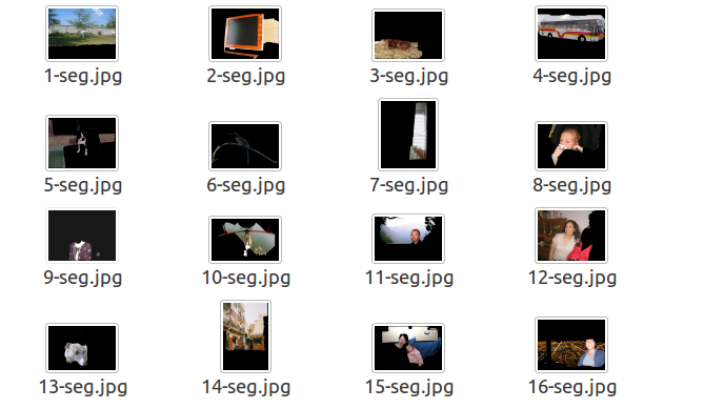


Figure 11: Segmentation results in “5” folder.

1.3.3 Step 3: Evaluate segmentation result and draw PRF bar graph

The binary images obtained from last step can be computed to get the values of precision, recall and F-measure. So the PRF bar graph can indicate the evaluation of iteration times.

From the PRF bar graph, it can be seen that the value of presion is increasing, the value of recall is decreasing and the value of F-measure is decreasing with the increasing time. Actually, the iteration times is very signicant in grabcut, but from the PRF bar graph, it may no affect the results as expect.

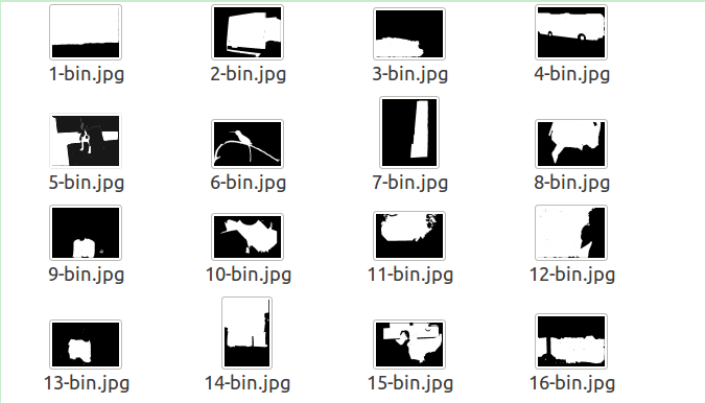


Figure 12: Segmentation binanry images in "5" folder.

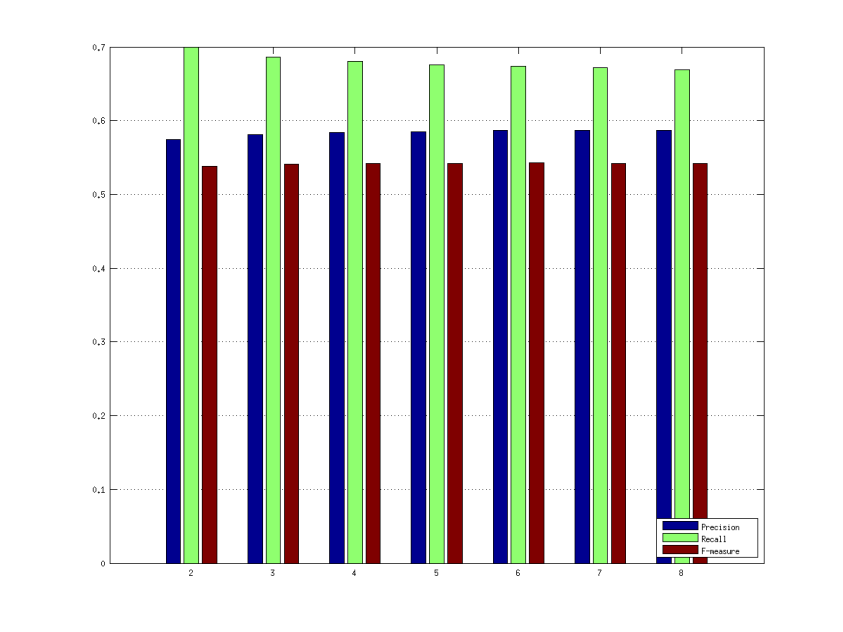


Figure 13: PRF bar graph of iteration times evaluation.

Saliency map determines the initialized rectangle and it will affect iteration times in grabcut. If the rectangle contains other objects, the more interation times may not work. Therefore, it seems that iteration times do not affect the grabcut obviously, but it is true that iteration times is quite important.

2. Mean shift

In this part, I choose to adjust three parameters:

- Spatial radius
- Color radius

Then, compute the mean value of evaluation result from all images and draw PR curve to evaluate each parameter.

In the followings, I will introduce the evaluation of each parameters.

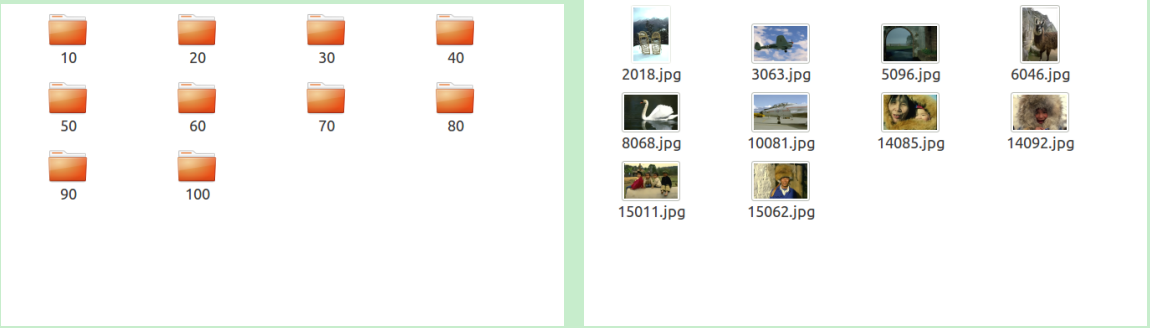
2.1 Spatial radius

2.1.1 Step 1: Input image

I just pick 10 images to evaluate in BSDS500 dataset due to the long running time of program. Use these images from the dataset to implement segmentation.

2.1.2 Step 2: Segment via mean shift

In this step, you need to adjust the spatial radius (hs) from 10 to 100 and the interval is 10. The color radius is set as 10 in mean shift to get different segmentation results. The result is shown in Figure 14.



(a) (b)

Figure 14: The hs folders and segmentation result.

2.1.3 Step 3: Evaluate segmentation result with groundtruth

In this step, I evaluate the different segmentation results from last step. I choose BDE and GCE to evaluate the segmentation results. The result is shown in Figure 15.

2.2 Color radius

2.2.1 Step 1: Input image

I just pick 10 images to evaluate in BSDS500 dataset due to the long running time of program. Use these images from the dataset to implement segmentation.

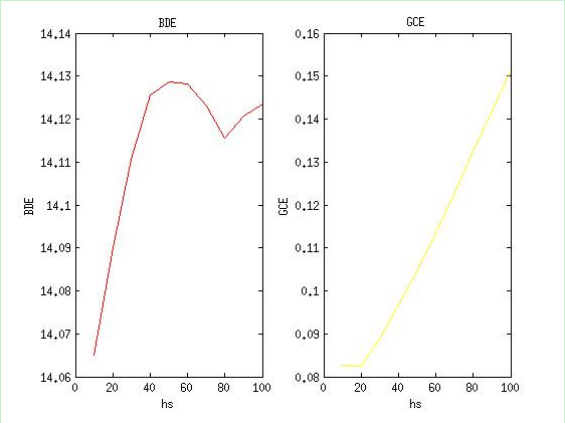
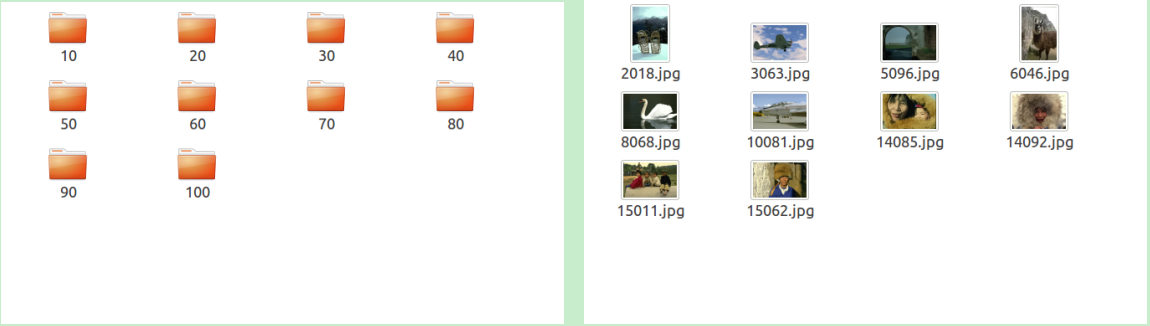


Figure 15: Line chart of BDE and GCE

2.2.2 Step 2: Segment via mean shift

In this step, you need to adjust the color radius (hr) from 10 to 100, the interval is 10 and the spatial radius is set as 40 in mean shift to get different segmentation results. The result is shown in Figure 16.



(a) (b)

Figure 16: The hr folders and segmentation results.

2.2.3 Step 3: Evaluate segmentation result with groundtruth

In this step, I evaluate the different segmentation results from last step. I choose BDE and GCE to evaluate the segmentation results. The result is shown in Figure 17.

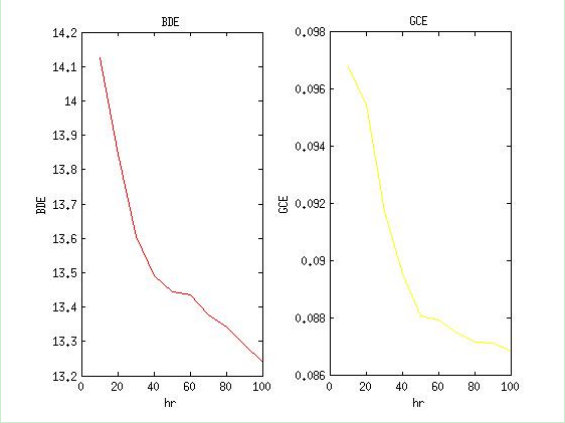


Figure 17: Line chart of BDE and GCE