

## I. SOME SAMPLE IMAGES OF TWO DATASETS

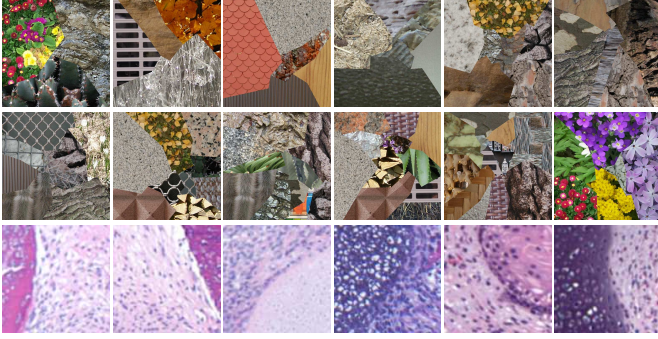


Fig. 1. Sample images of Prague (1st-2nd rows) and Histology (3rd row).

## II. RING REGION PARTITION IN ROBUST ANALYSIS AND PERFORMANCE IN BIASED NUMBER OF ANNOTATIONS

Fig. 2(a) shows the ring region partition in robust analysis. Fig. 2(b) shows the performance of our method in biased number of annotations. We tested two cases: (1) Label -: randomly remove a marked point; (2) Label + : a point is randomly added as a marked point. The average performance over 20 runs is taken as the result. We can see that the robustness of our method in the ‘Label +’ case is higher.

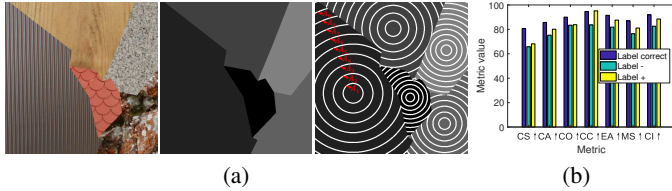


Fig. 2. (a) Illustration of ring region partition. Left: input image. Middle: truth label map. Right: ring region partition. (b) Influence of biased annotations. ‘Label correct’ indicates that the number of regions are labeled exactly, ‘Label -’ indicates that there is one point missing when labeling, and ‘Label +’ indicates that there is one more labeled point.

## III. PARAMETER INFLUENCE ANALYSIS

To test the influence of the parameters in our method, we varied one parameter while fixing others, and then we run our method on the Prague dataset. The results are shown in Fig. 3. It can be seen that the performance of our method is not affected much within a reasonable range of each parameter.

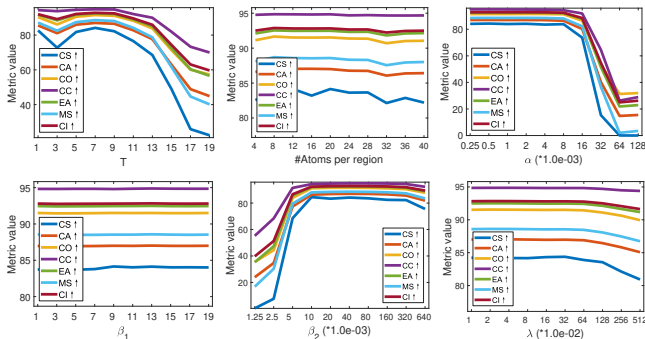


Fig. 3. Influence of parameter selection on Prague dataset.

## IV. TIME ANALYSIS

We tested the running time of each compared method on Prague dataset using a desktop computer with Intel i7-8700K CPU and 16Gb Memory. See Table I for the results. Our method is much faster than MLLIF.

TABLE I  
AVERAGE PER-IMAGE RUNNING TIME ON PRAGUE DATASET

Method	DLSRC	ORT SEG	FSEG	FSEG*	MLLIF	Ours S=1	Ours S=5	Ours S=9
Time(s)	4.15	6.92	2.01	1.36	2640	8.02	34.88	34.93

## V. MORE VISUAL RESULTS



Fig. 4. Results on Prague dataset. Columns from left to right are the input images, ground truth label maps, results of RS, results of VMS, results of DLSRC, results of MLLIF, and results of FCNT-MK respectively.

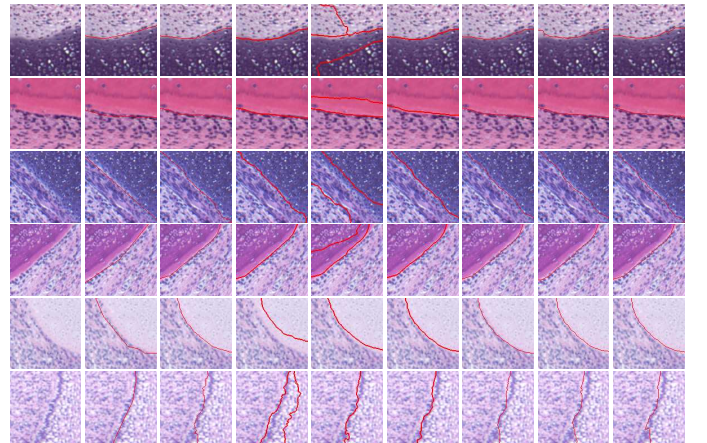


Fig. 5. Segmentation results on Histology dataset. Columns from left to right are the input images, ground truth label maps, results of DLSRC, results of ORTSEG, results of FSEG, results of FSEG\*, and results of the proposed method with  $S=1$ ,  $S=5$ ,  $S=9$  respectively.