

Supplementary Materials for Paper #495. IHCSurv: Effective Immunohistochemistry Priors for Cancer Survival Analysis in Gigapixel Multi-stain Whole Slide Images

YeJia Zhang^{*1,3}, Hanqing Chao^{*1,4}, Zhongwei Qiu^{1,4}, Wenbin Liu², Yixuan Shen², Nishchal Sapkota³, Pengfei Gu³, Danny Z. Chen³, Le Lu¹, Ke Yan^{1,4}, Dakai Jin¹, Yun Bian², and Hui Jiang²

¹ DAMO Academy, Alibaba Group

² Departments of Radiology & Pathology,
Changhai Hospital, Shanghai 200433, China

³ University of Notre Dame, Notre Dame IN 46556, USA

⁴ Hupan Lab, 310023, Hangzhou, China

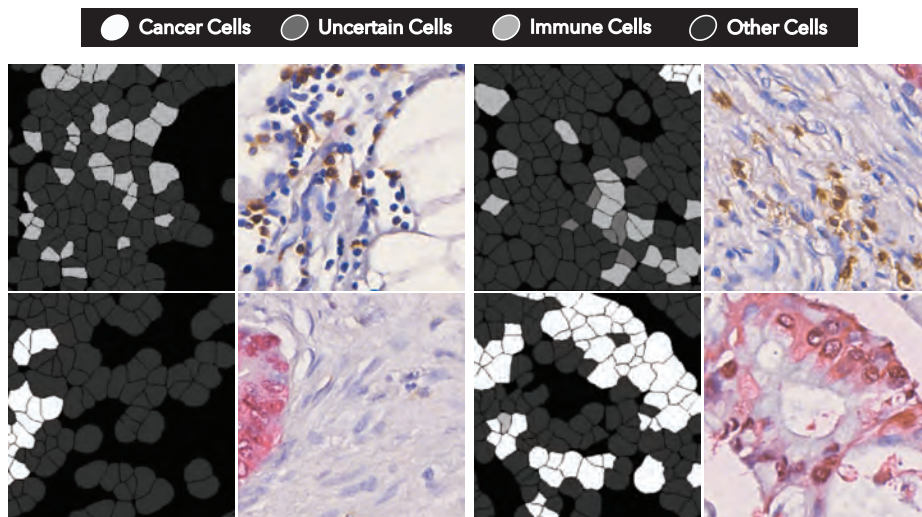


Fig. 1. Visualization of extracted cell masks and types. To retrieve patch-wise cell counts, cells are first detected and segmented using QuPath’s Watershed algorithm with the computed optical densities from the image’s Hematoxylin channel. Next, RGB statistics are extracted from cell nuclei pixels and categorized by thresholding their mean color values. These categories include cancer cells (dyed red), immune cells (dyed brown), uncertain cells (ambiguous cancer or immune cells), and other cells (stromal and other cells without immunohistochemistry stains).

* Contributed equally to this work.

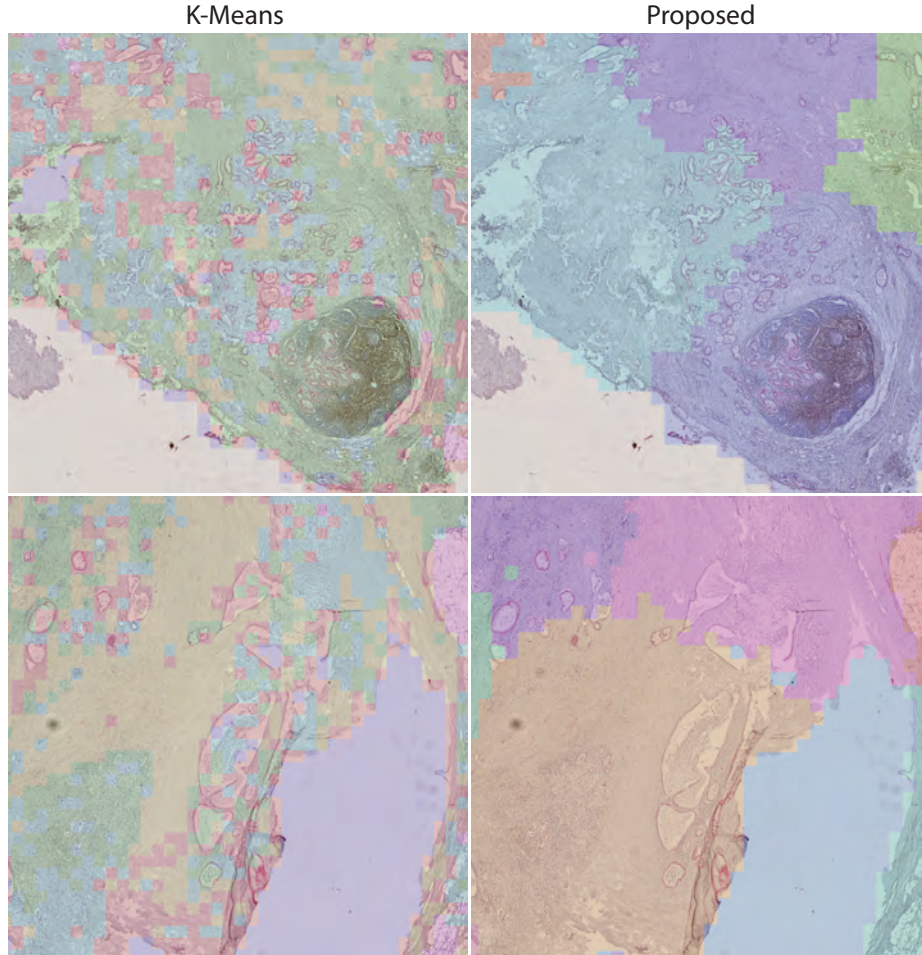


Fig. 2. Comparisons between results from k-means clustering (left column) and from our proposed spatially-constrained spectral clustering method (right column). Both approaches are clustered on 1024-dimensional features from an ImageNet-pretrained ResNet-50 with settings of $K = 6$ for k-means (motivated by previous work such as DeepAttnMISL) and $K = 19$ for our proposed clustering method (using $N_k = 400$ patches per cluster). In the top row, we observe segregated intra-cluster patches around an important tertiary lymphoid structure for k-means while ours not only captures the spatial context around the main structures but also preserves contiguous patches around cancerous ducts. The bottom row demonstrates similar patchiness from k-means while ours not only preserves spatial coherence across cancer cells and stroma but also remains faithful to tissue boundaries.