

Superpixels on Vesalius

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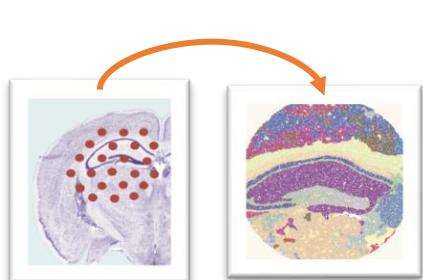
Hyeonkyu Kim

Jaeowwoo Mo

Taehong Min

Jiyeon Park

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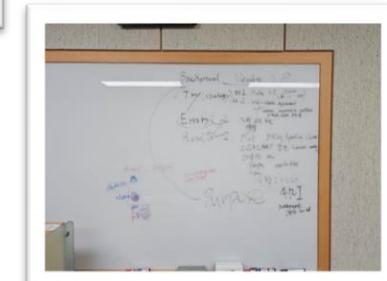
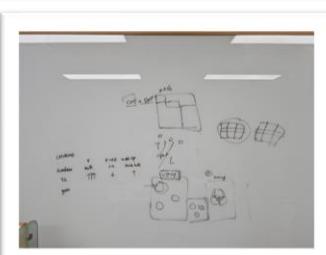
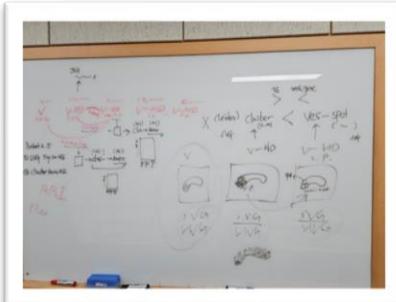
1

Remind project



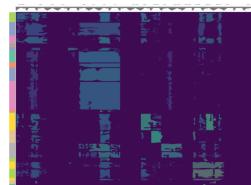
2

Ideas from hackathons



3

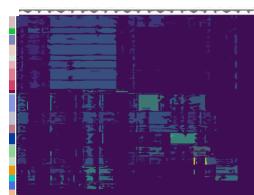
Strategy



Superpixels bulk

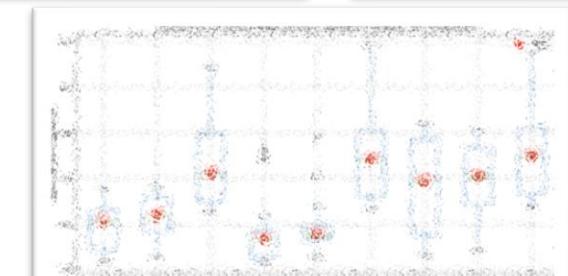
Time 🔥

Analysis resolution 🔥



5

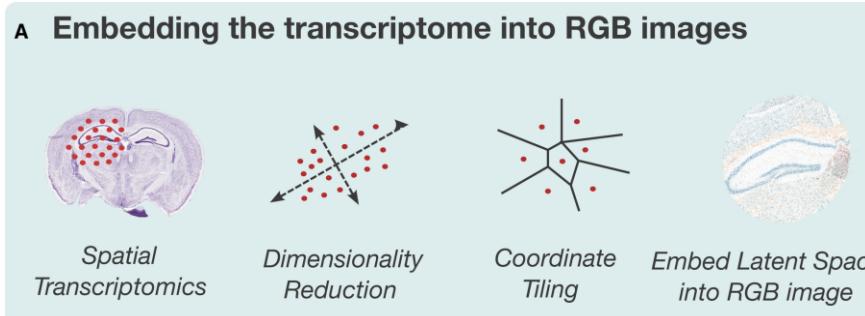
Challenge and Future analysis



4

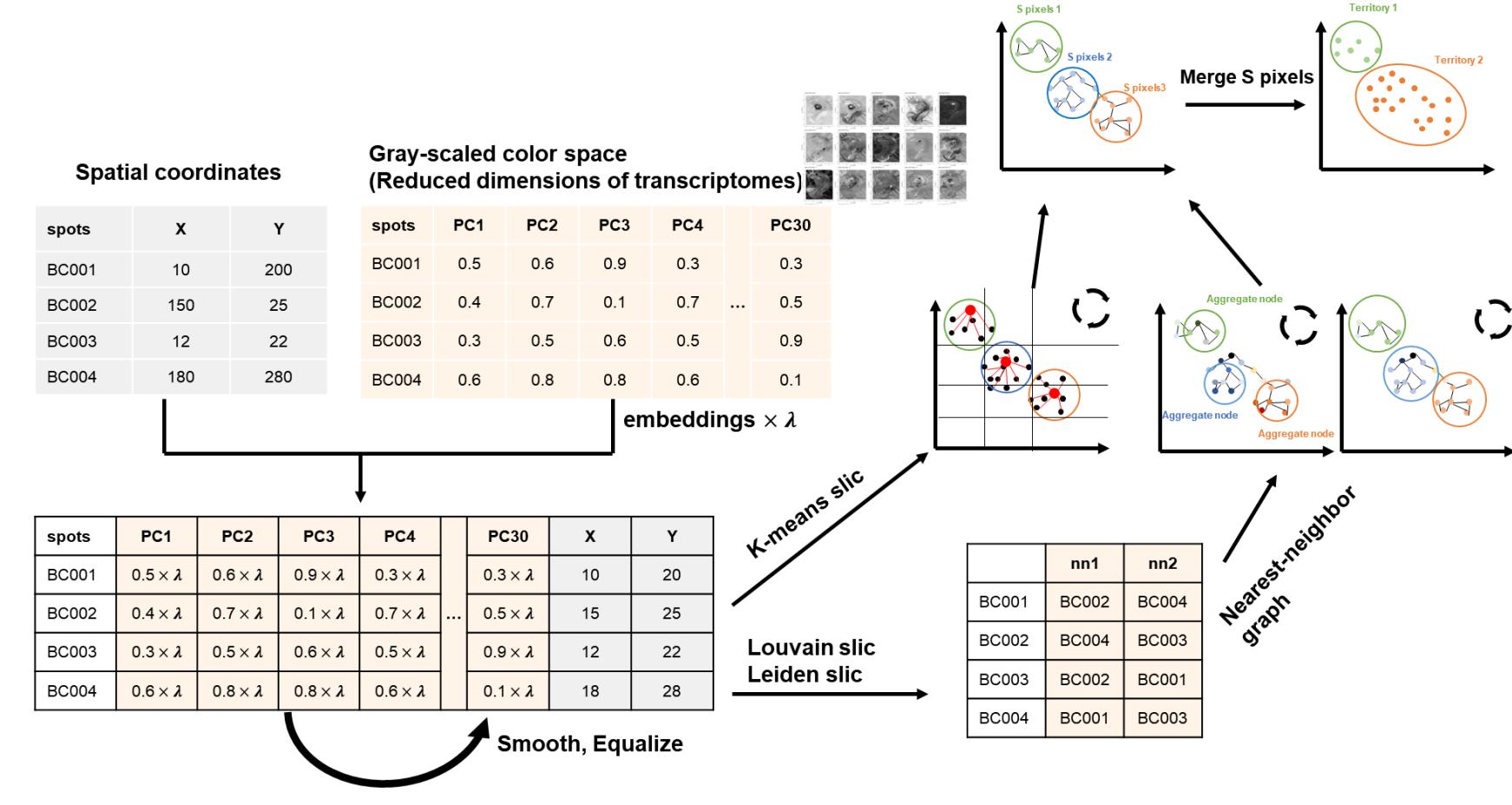
Result

Remind project



Spatial transcriptome
20,000 gene(feature)

spots	Gene1	Gene2	Gene19999	Gene20000
BC001	19	1	4	5
BC002	0	0	...	1
BC003	0	0	15	3
BC004	5	9	7	6



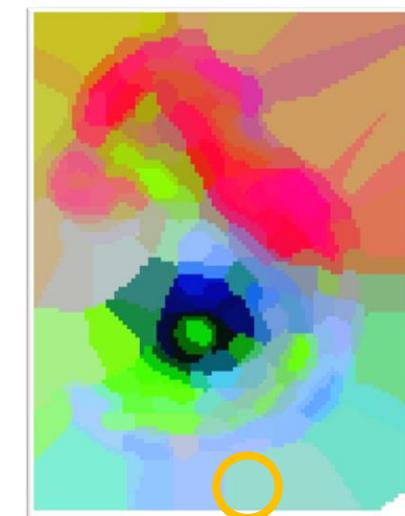
↓
vesalius

Color embedded space (Reduced dimensions of transcriptomes)

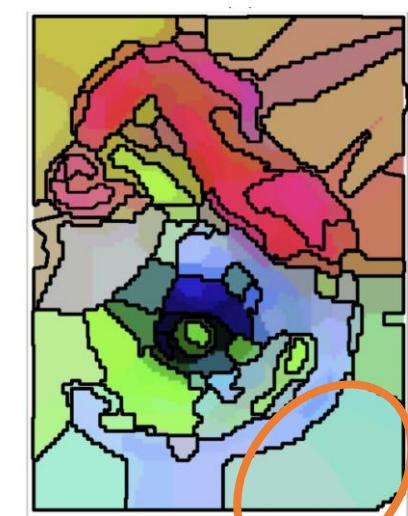
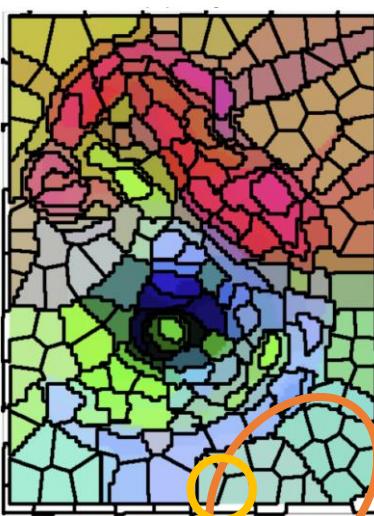
tiles	PC1(R)	PC2(G)	PC3(B)
TL1	0.5	0.6	0.9
TL2	0.4	0.7	0.1
TL3	0.3	0.5	0.6
TL4	0.6	0.8	0.8

Or other PCs sequence(ex. PC2, PC3, PC4)

To image

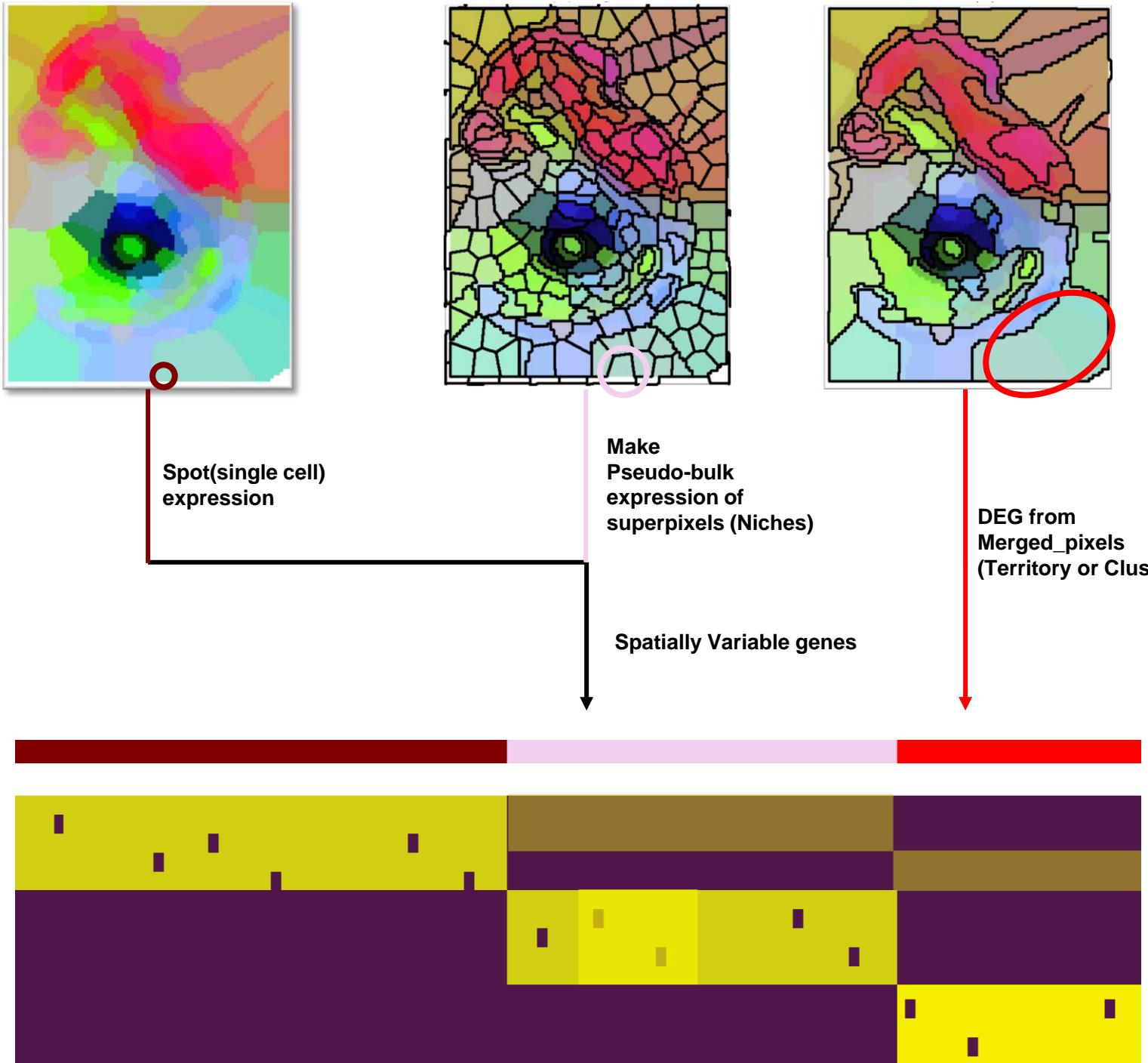


Louvain_slic
Leiden_slic
K-means_SLIC



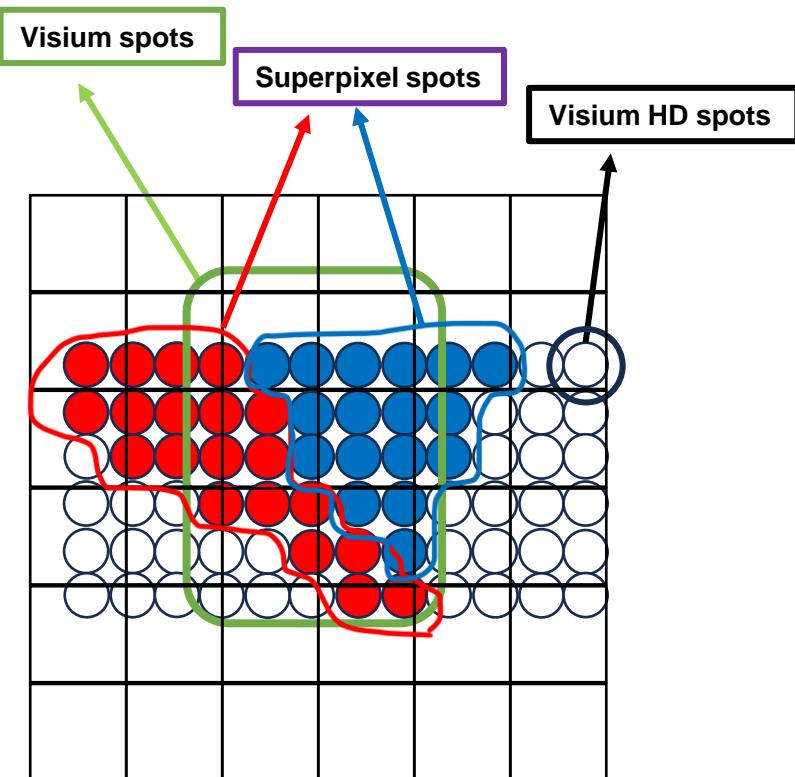
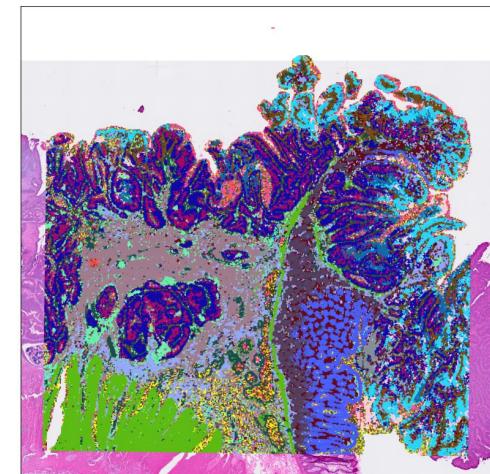
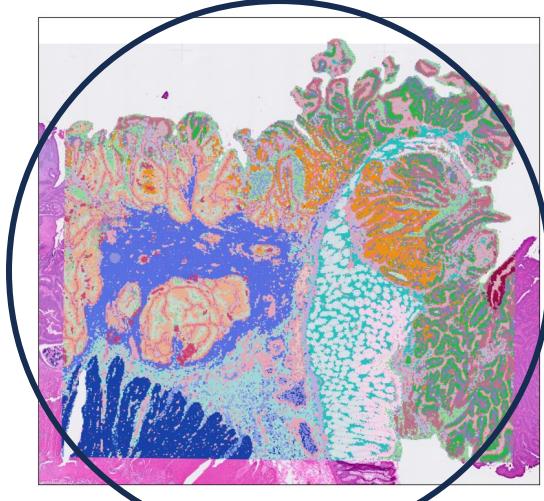
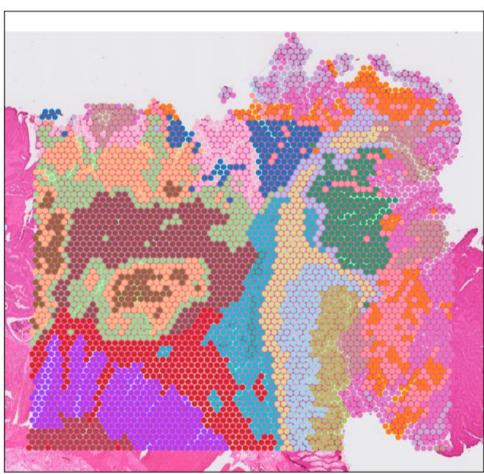
Connected_pixels
Leiden clustering
Louvain clustering
Other method
(Using another image algoriyhm or deep learning)

Remind project



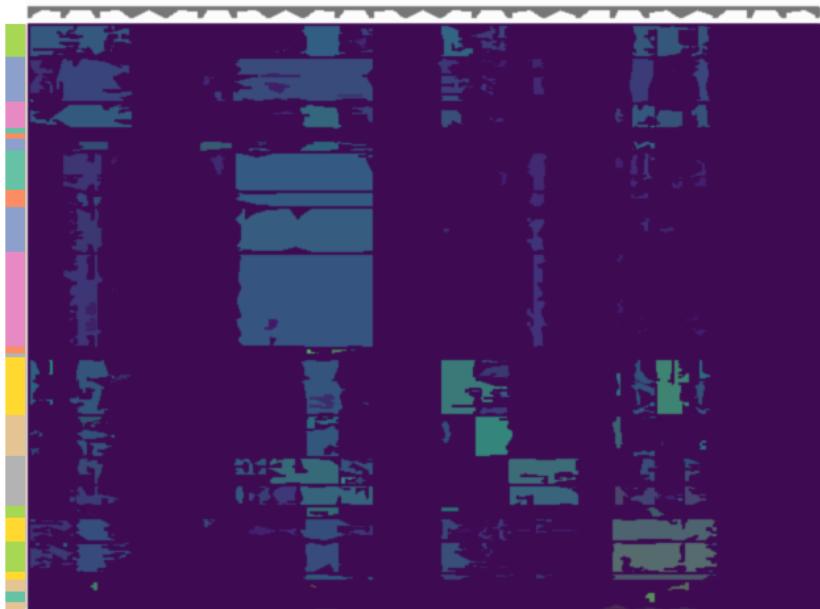
Strategy

1. Analysis of bulked-pixels(Superpixels) expression pattern

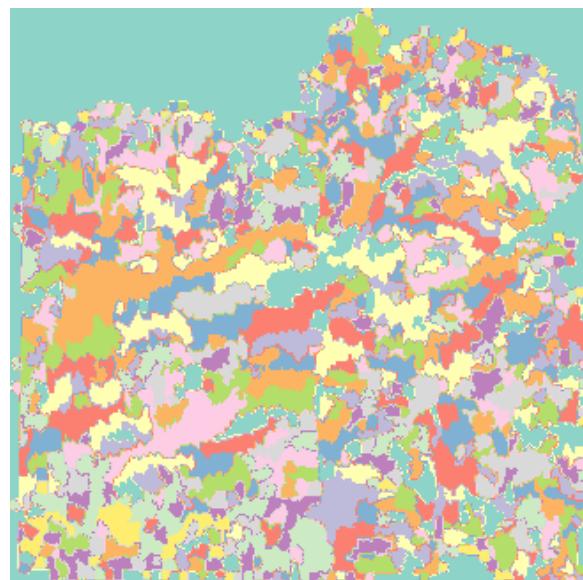
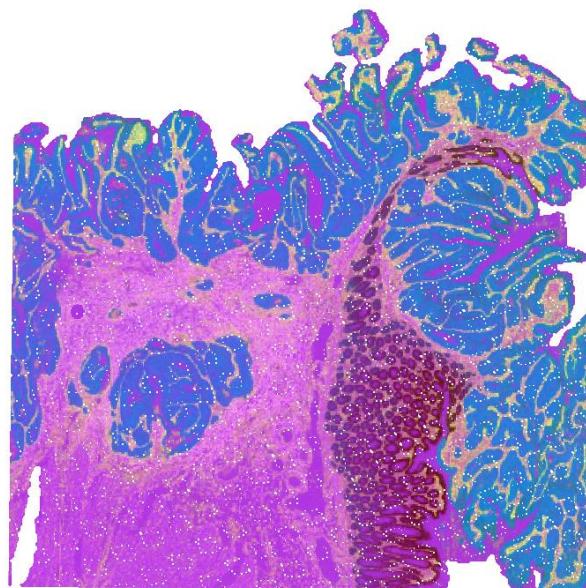
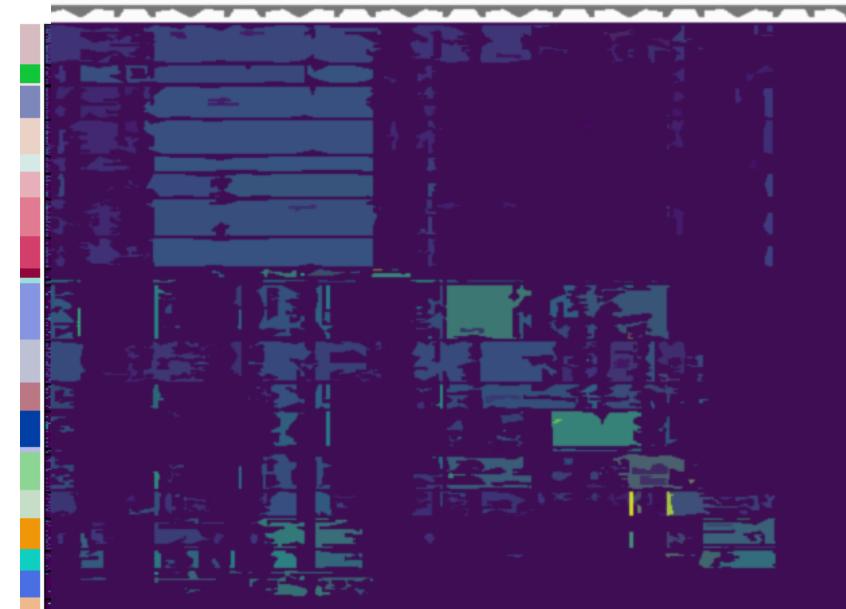


Superpixels might have a different gene expression with spots(single-cell) and Visium(binned bulk)

Visium HD(single cell resolution)

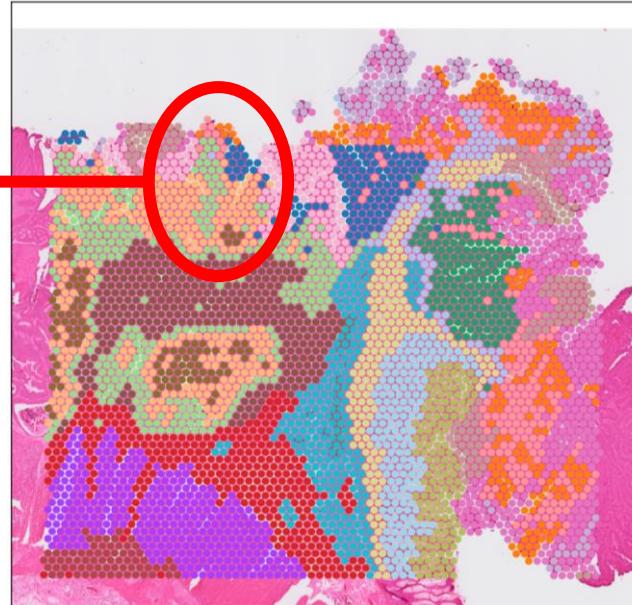


Superpixel bulks(Expression-related bulk)



Strategy

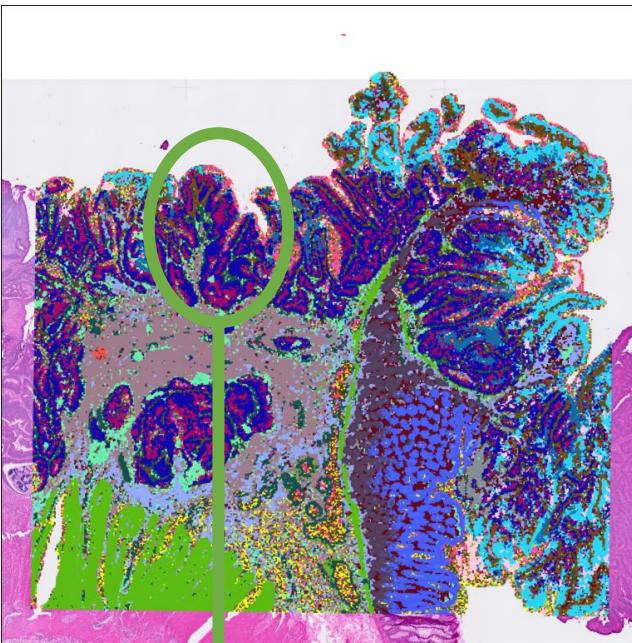
2. Creating bulk spots with superpixels for better and faster analysis



Visium data

Time

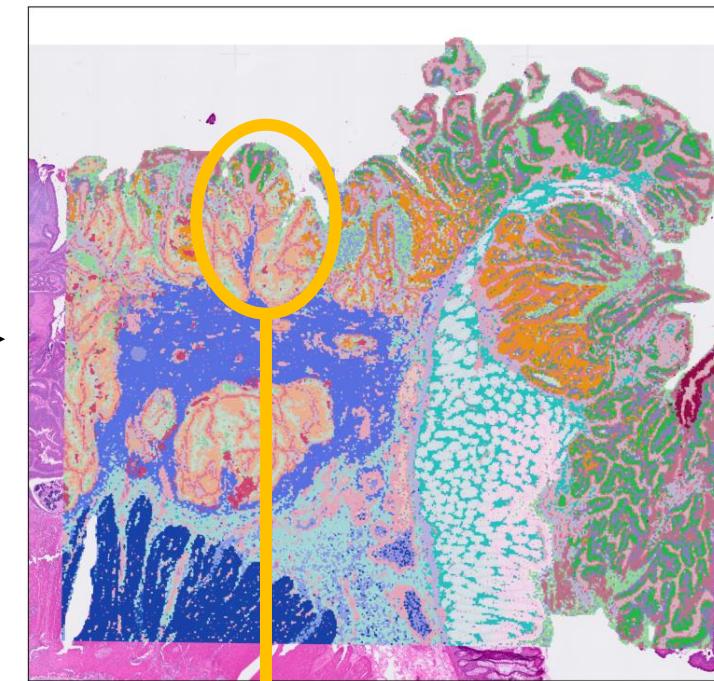
Analysis resolution



Visium HD data

Time

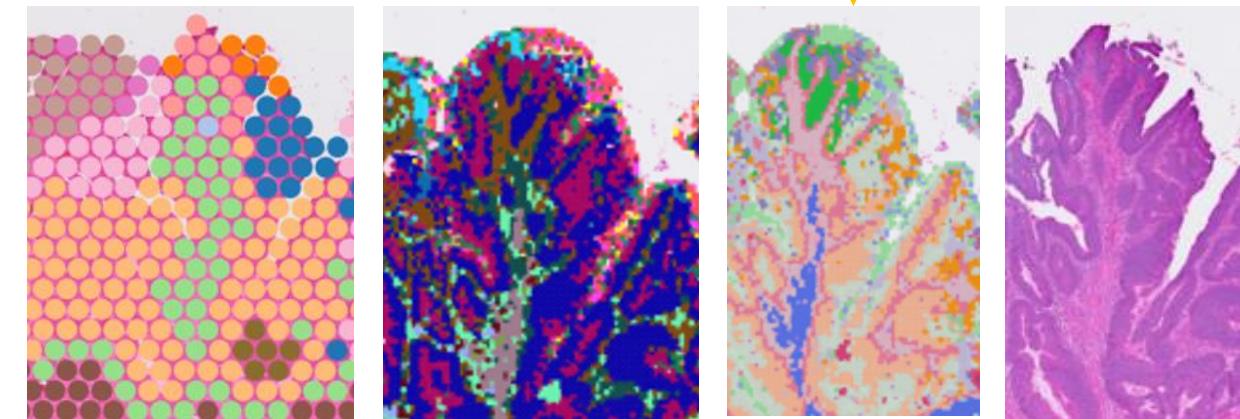
Analysis resolution



Superpixels bulk

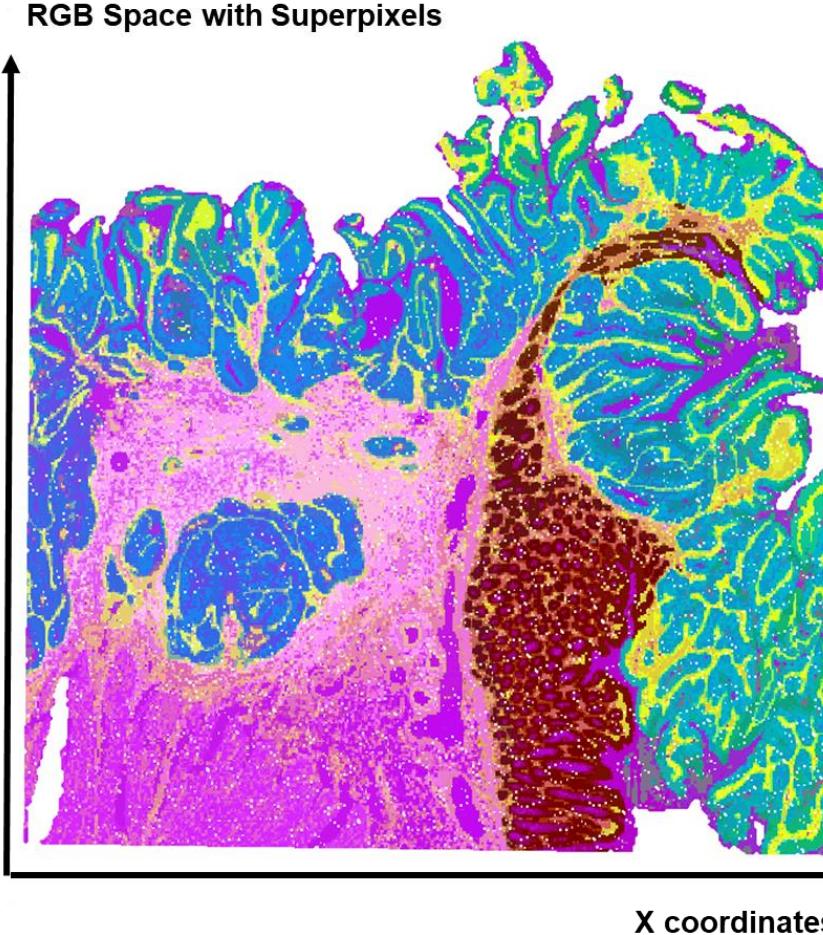
Time

Analysis resolution

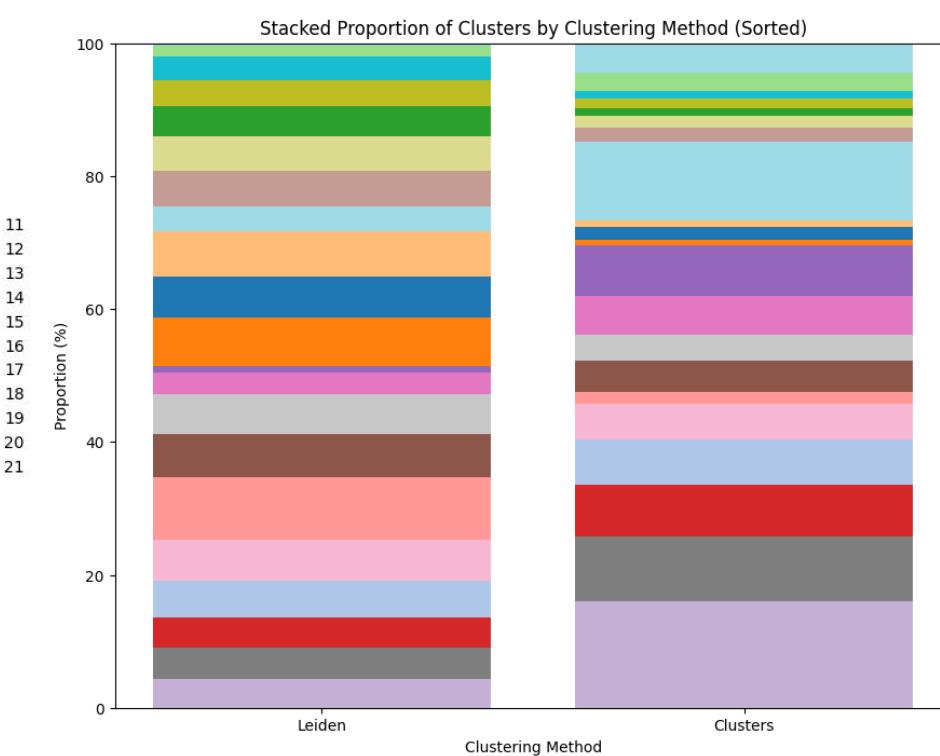
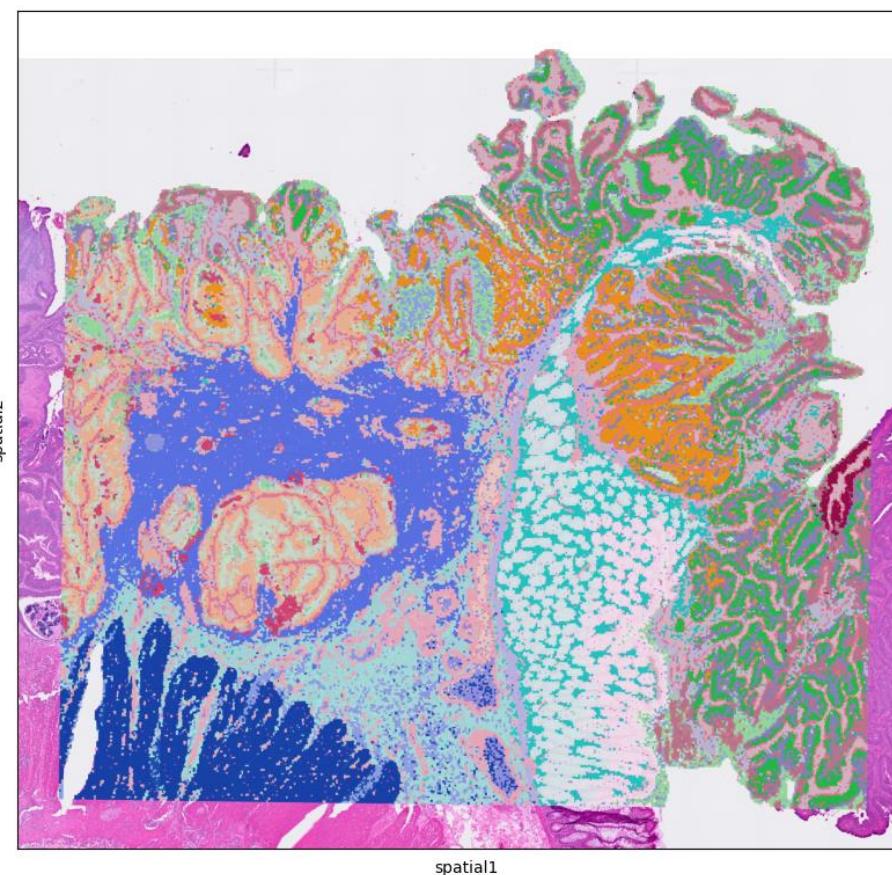


Using SuperPixels

Results 1. Analysis of bulked-pixels(Superpixels) expression pattern

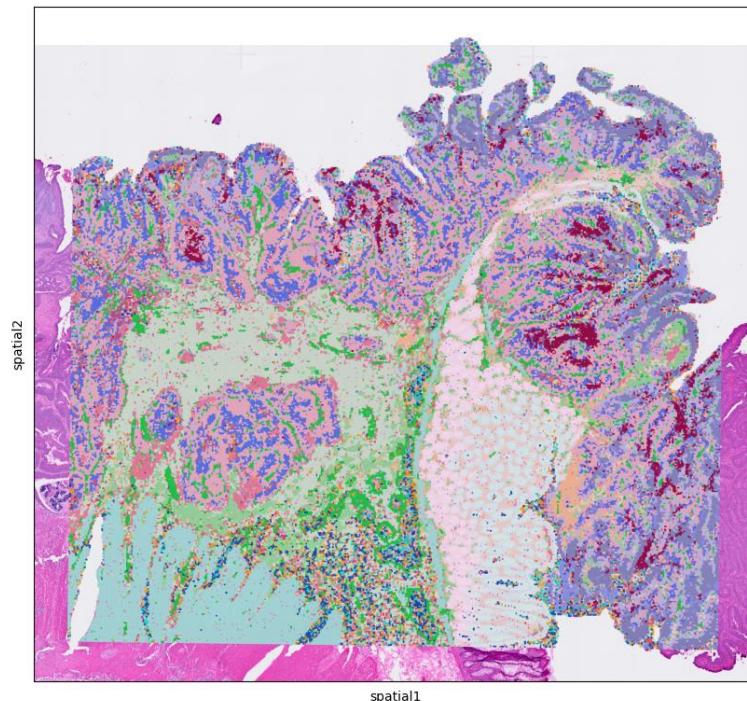


Clustering With
Superpixel bulks(Num of S-pixels : 12,000)

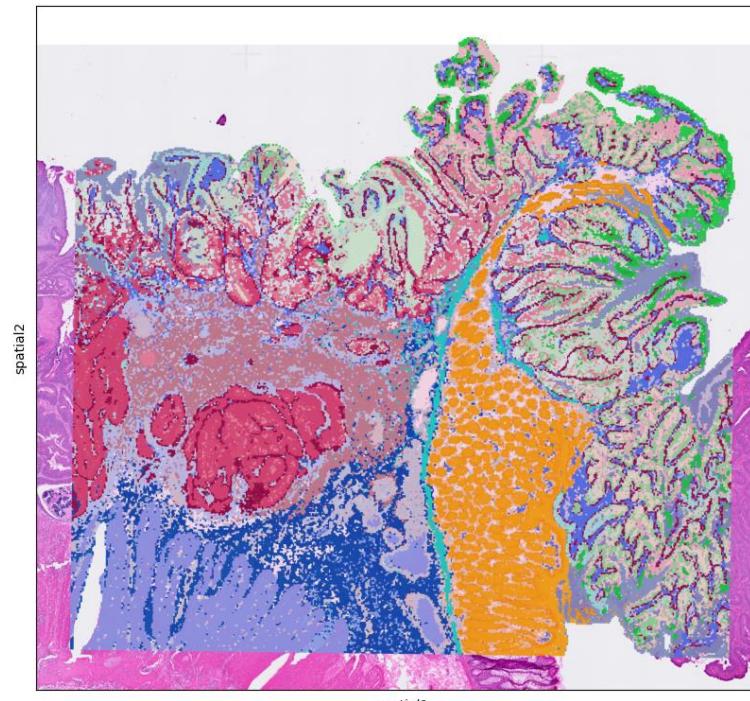


Results 1. Analysis of bulked-pixels(Superpixels) expression pattern

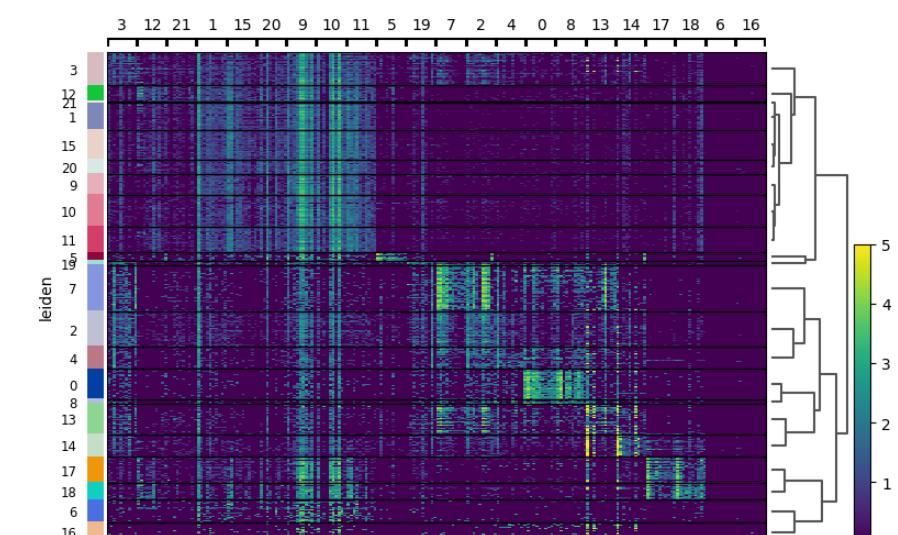
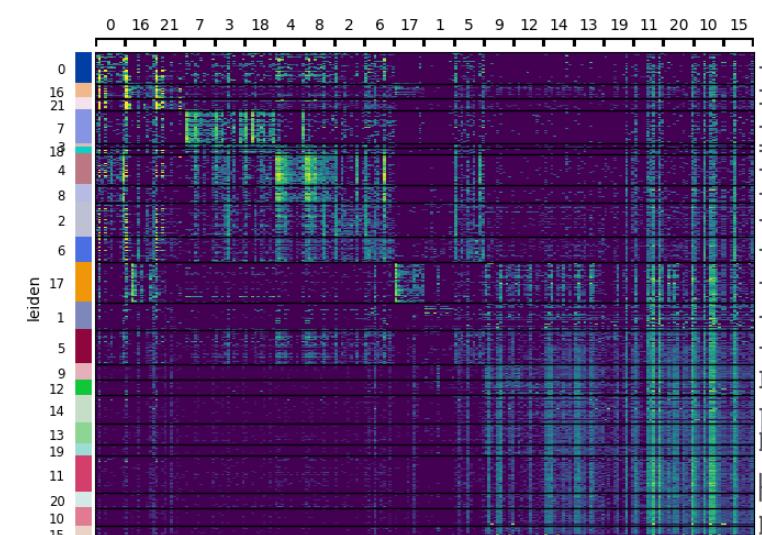
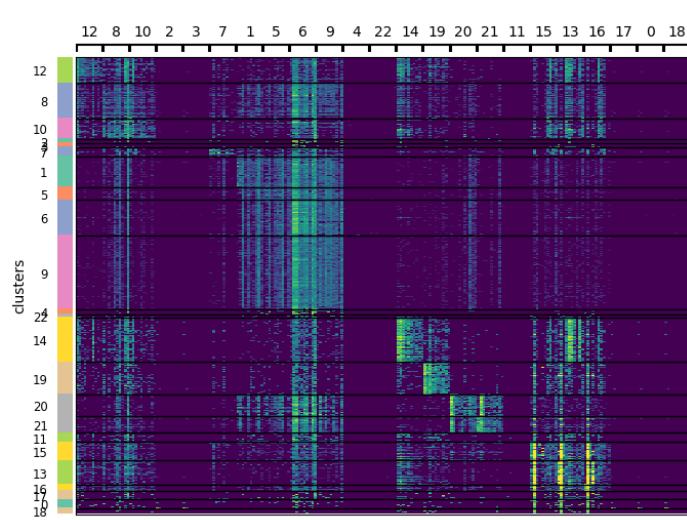
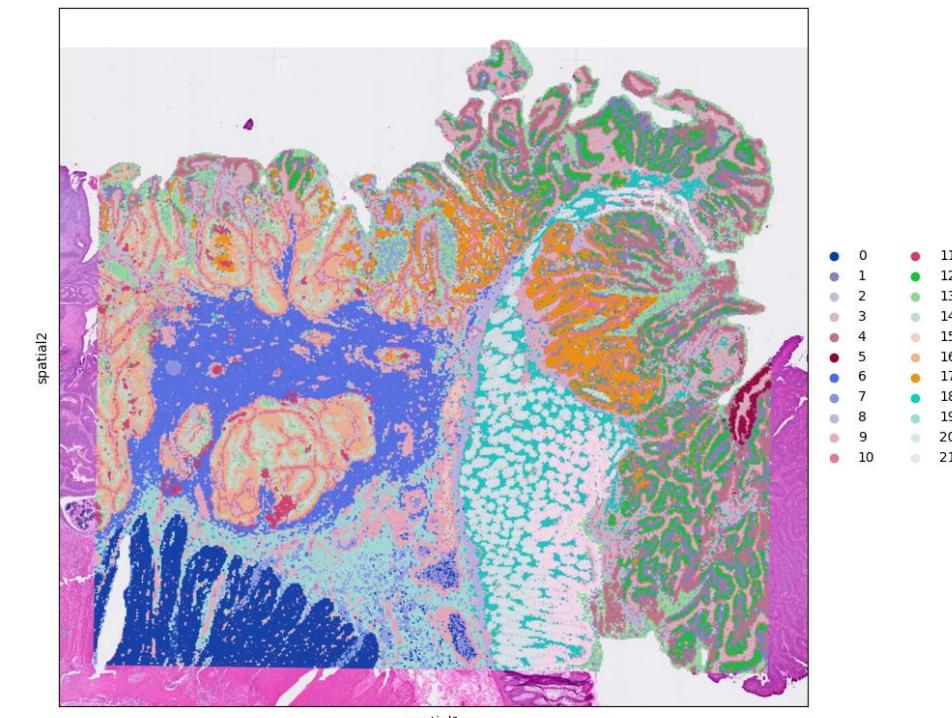
Clustering with
Visium HD spots(single-cell resolution : 129,000)



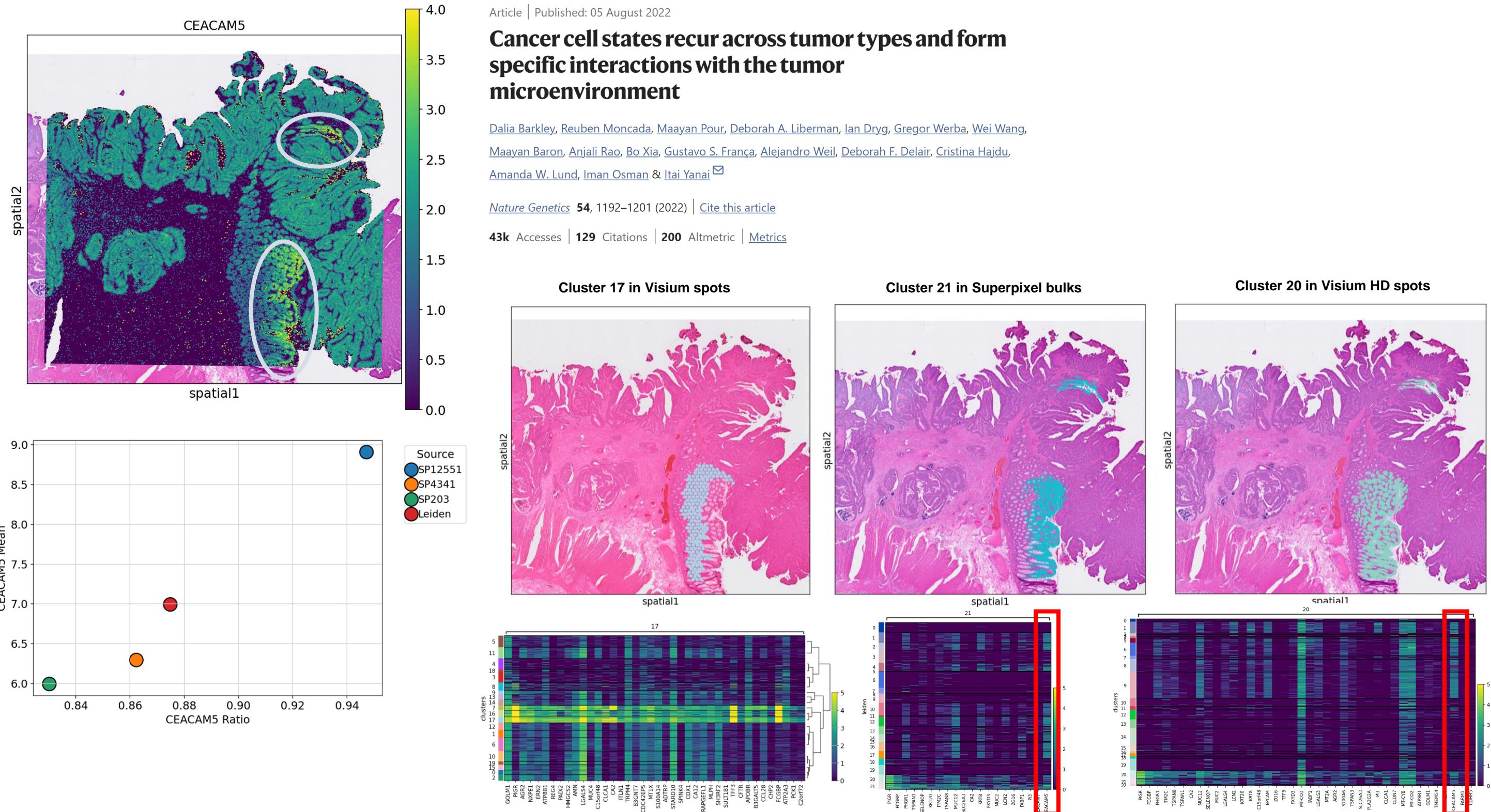
Clustering with
Superpixel bulks(Num of S-pixels : 200)



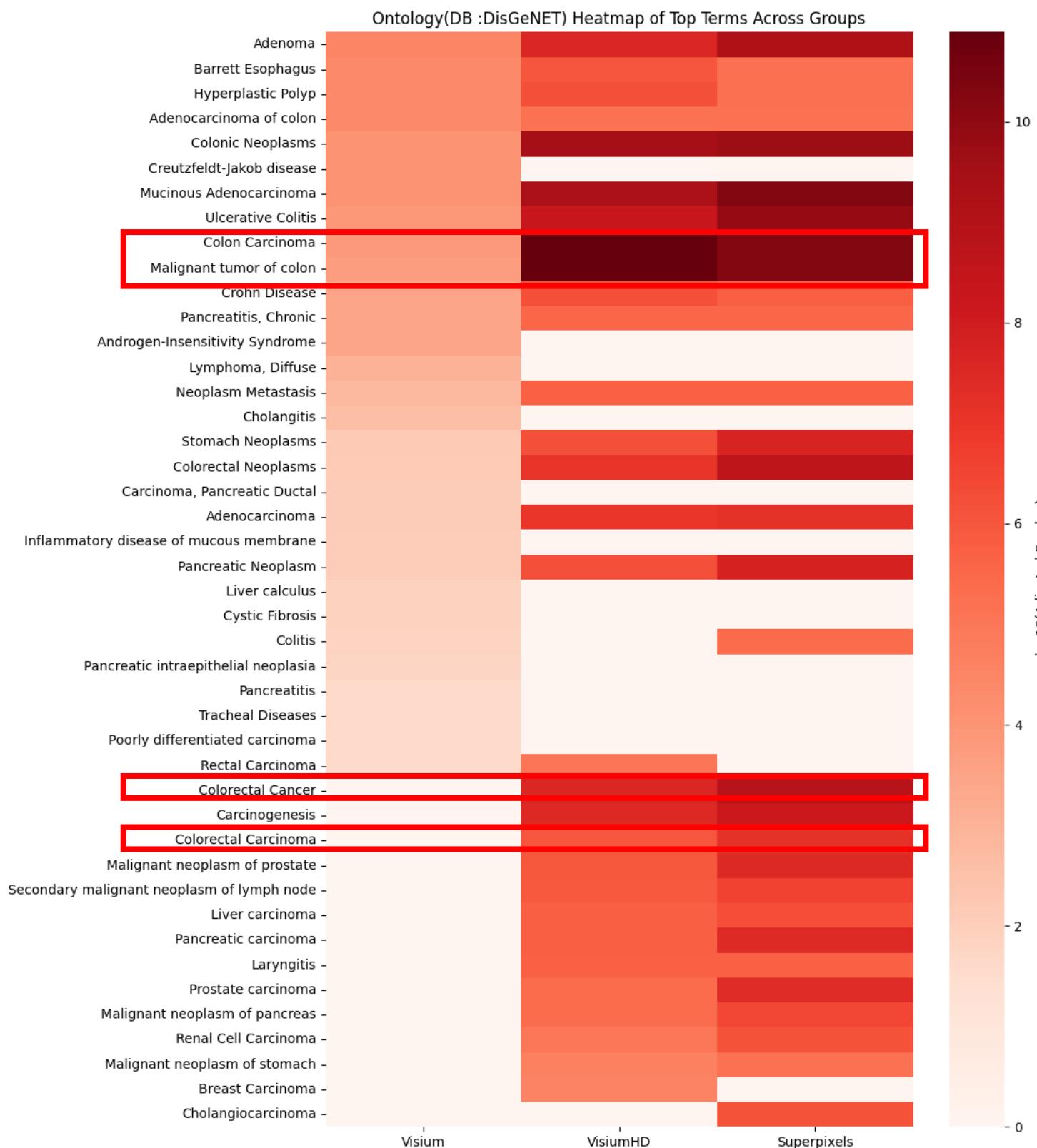
Clustering With
Superpixel bulks(Num of S-pixels : 12,000)



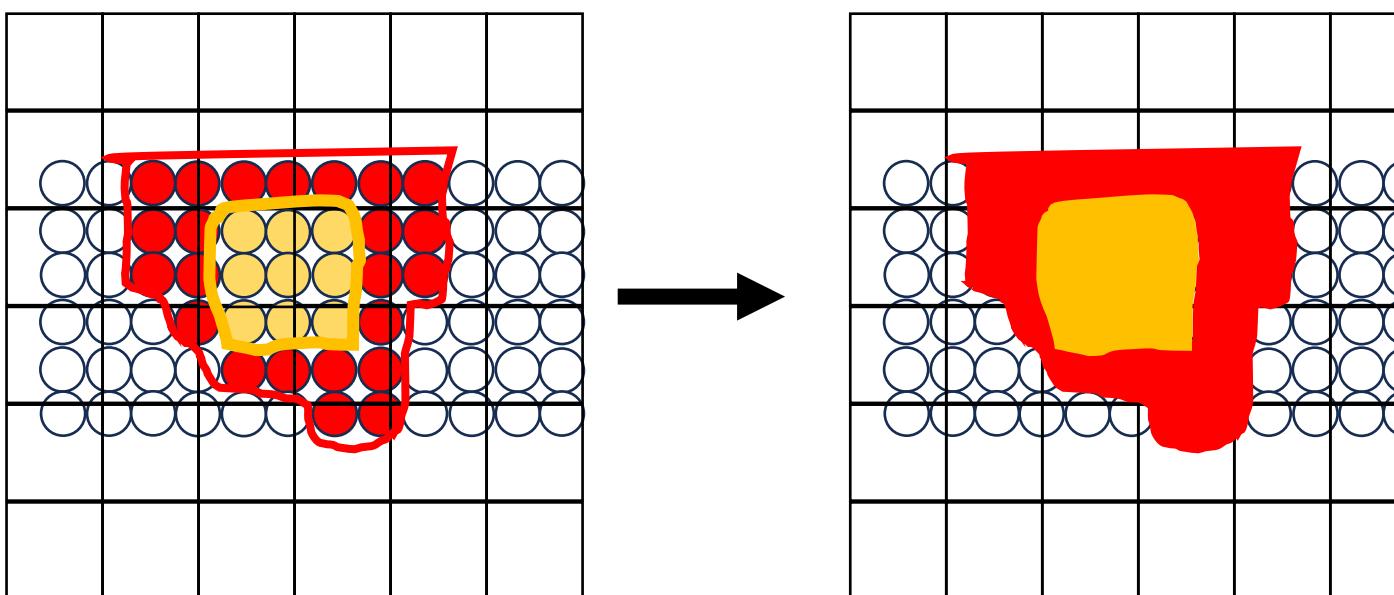
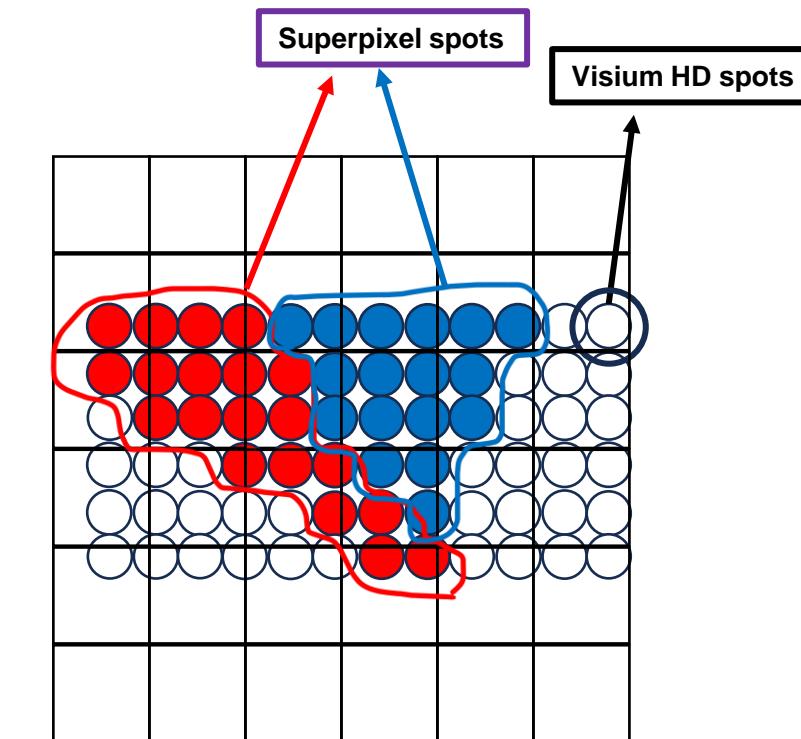
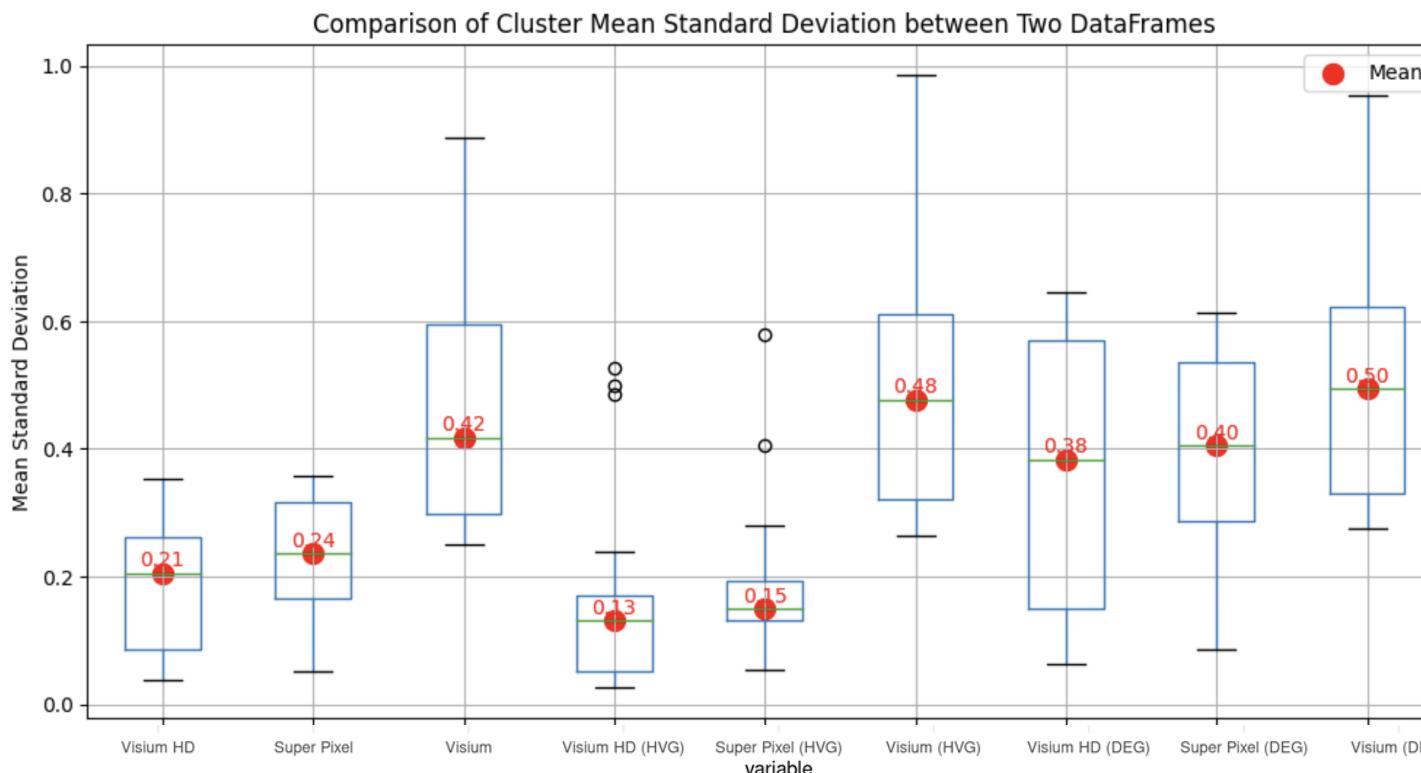
Results 1. Analysis of bulked-pixels(Superpixels) expression pattern



Results 1. Analysis of bulked-pixels(Superpixels) expression pattern



Results 2. Creating bulk spots with superpixels for better and faster analysis



How can we assign coords about superpixel bulks?

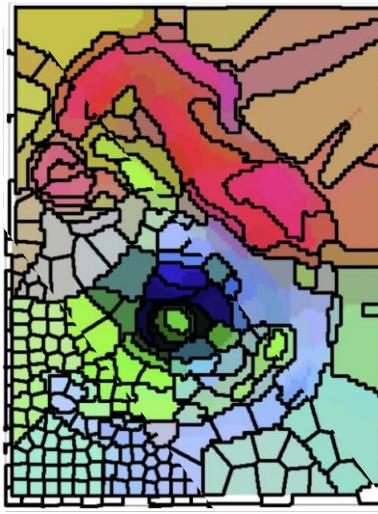
Challenge and Future analysis

Challenges

- 1. How can we assign spatial coordinates about Superpixels bulks?**
- 2. Which resolutions or parameters are golden standard?**
- 3. Is there another method for measuring Superpixels-bulk?**

Future Analysis

- 1. Deep leaning-based image-processing(segmentation) might be better choice.**
- 2. If we find assigning coords, Spatially Variable Genes(SVGs) could be good validation set.**
- 3. Ground-truth data-set maybe help us to define golden standard of parameters.**



Thank You

