



German Conference on Bioinformatics

## WS8: Spatial domain identification: computational methods for discovering tissue architecture

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## Part I

### Introduction to spatial domain identification

# Spatial domains/tissue domains

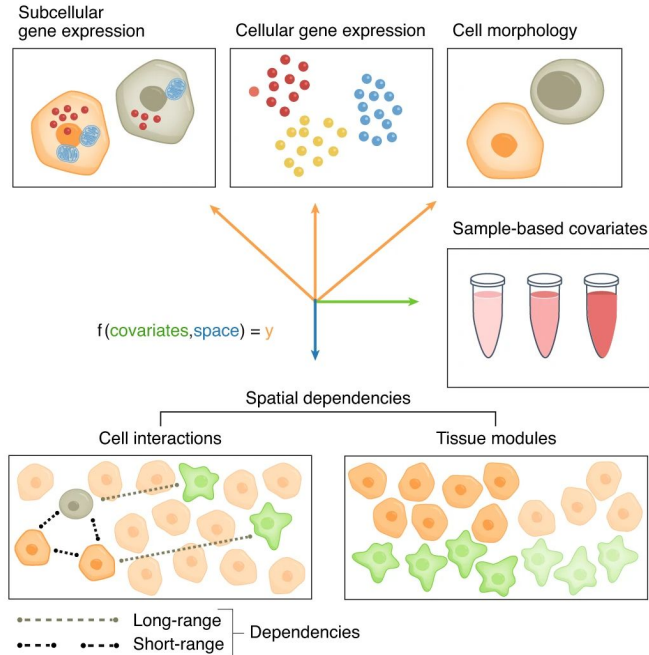
“Coordinated by different cell states with varying gene expression patterns, spatial domains are higher-order functional units that recurrently distribute across tissue space, and have close relationships with tissue physiology”

Mender

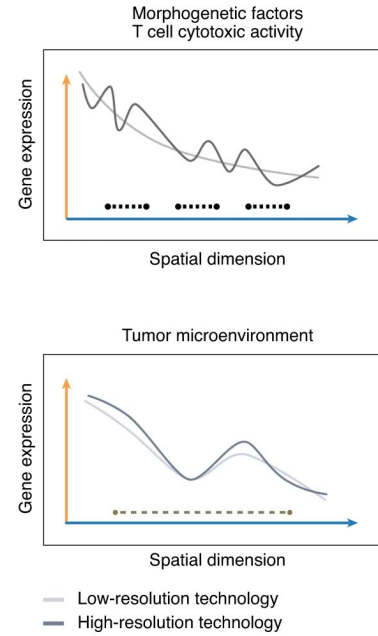
Yuan, 2024, *Nature Communications*

# Spatial domains/tissue domains

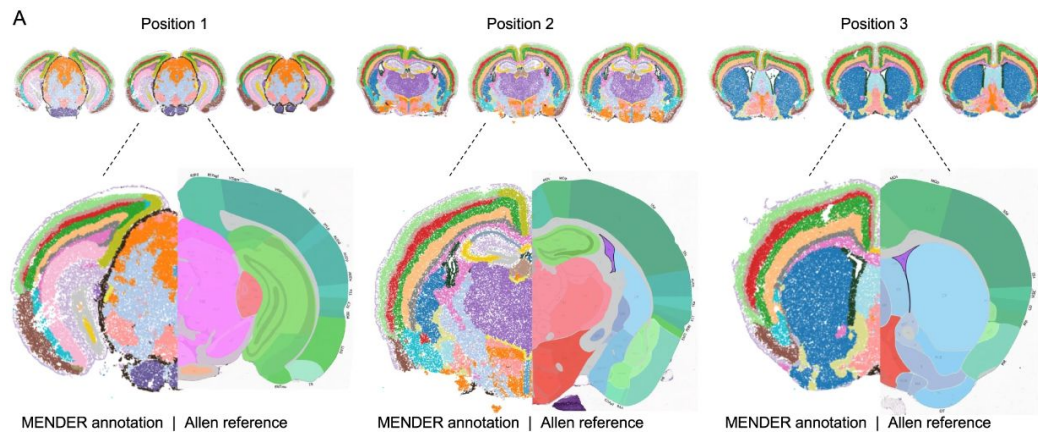
**a** Dependencies of cellular components of variation



**b** Dependencies in length scale

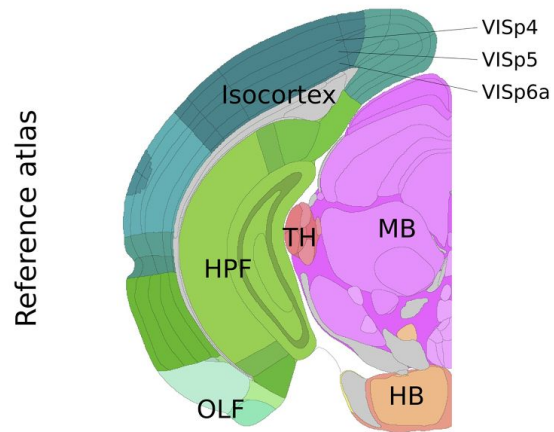


# Examples



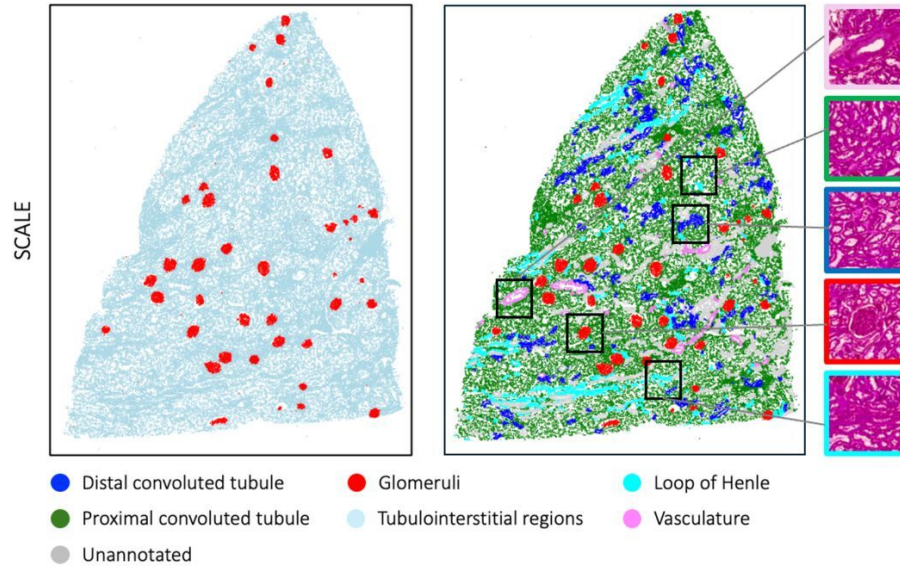
Yuan, 2024, *Nature Communications*.

# Examples



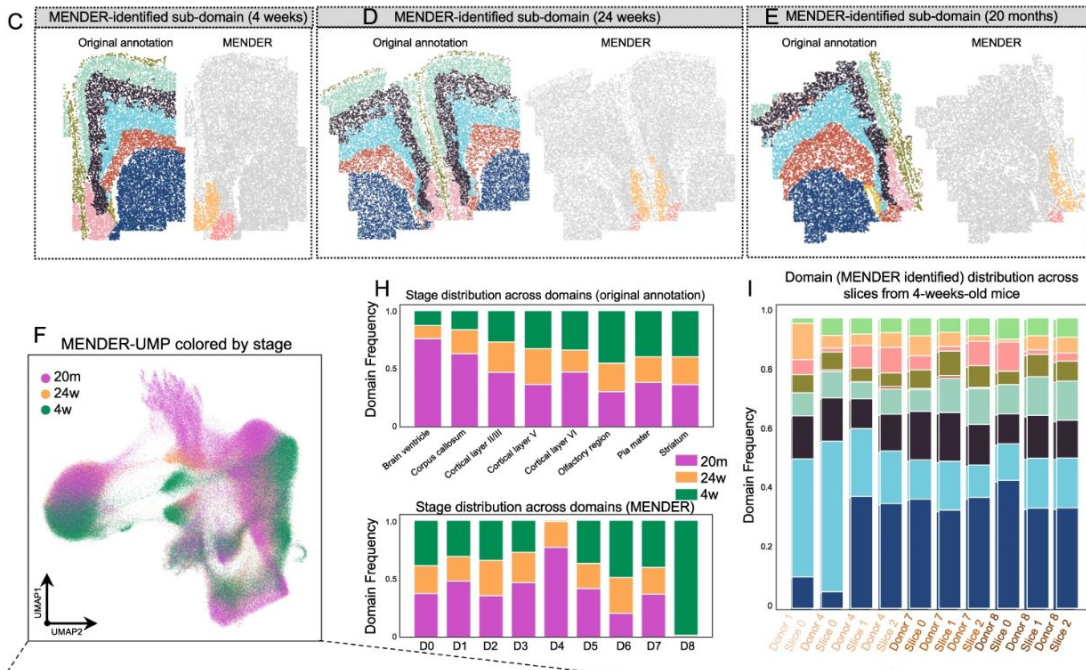
Schaub & Yousefi et al., 2025, Bioinformatics  
Allen Brain Atlas: Wang et al., 2020, *Cell*  
(<https://mouse.brain-map.org/static/atlas>)

# Examples



Schaub & Yousefi et al., 2025, *biorxiv*.

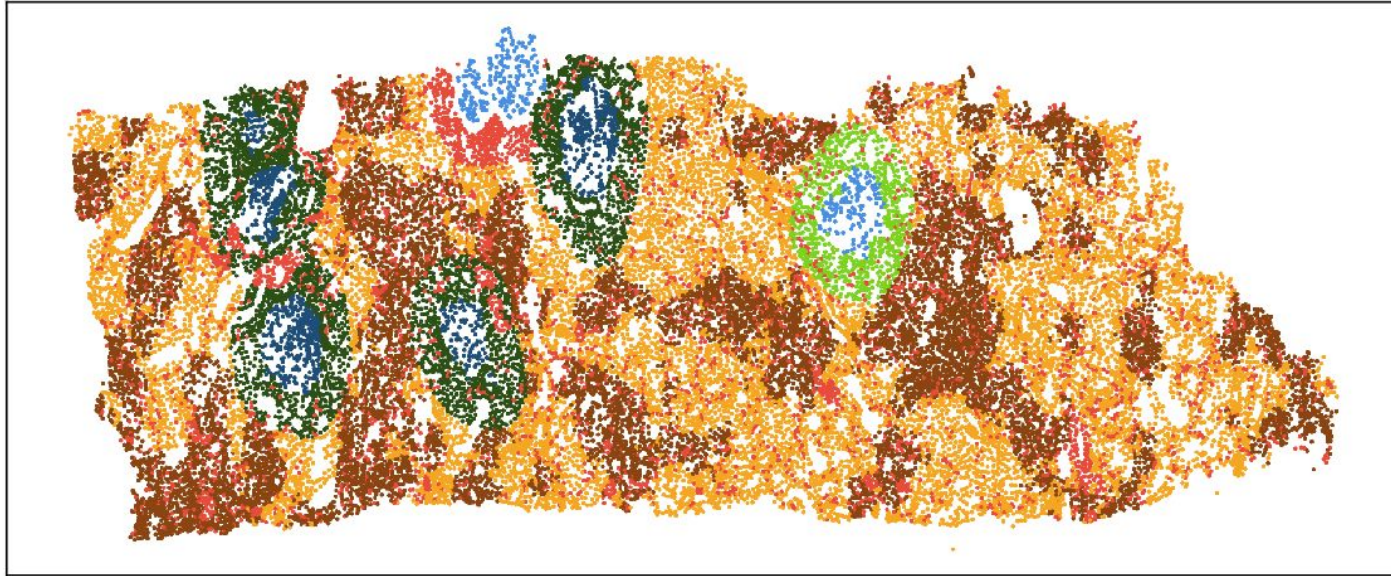
# Examples



Yuan, 2024, *Nature Communications*.



# Examples

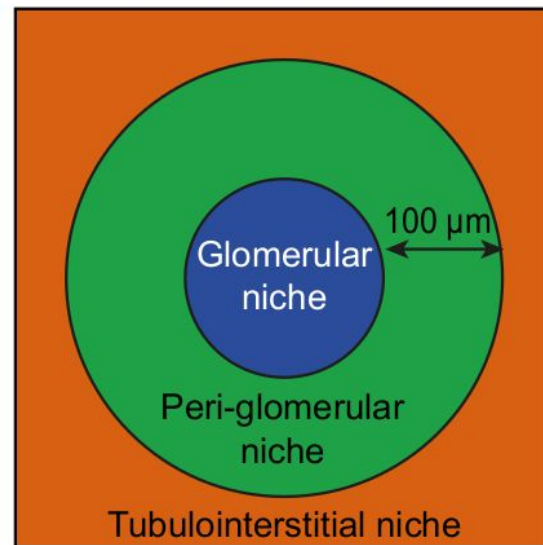
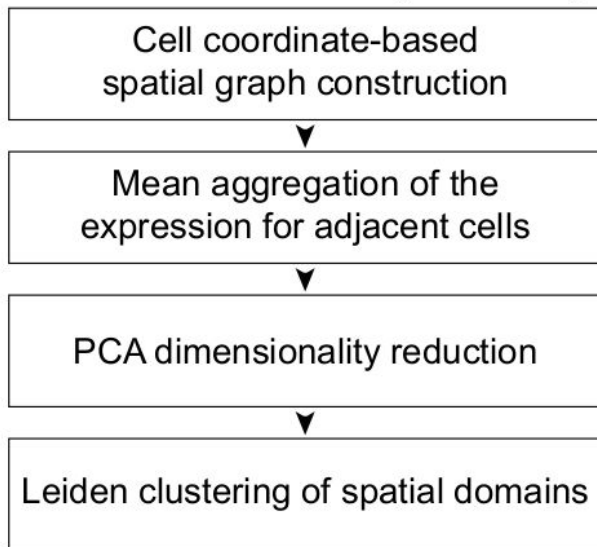


- Normal glomerular
- Normal periglomerular
- Normal tubulointerstitial
- Inflamed glomerular
- Inflamed periglomerular
- Inflamed tubulointerstitial
- Vasculature/Other

Huiying & Khatri et al., *Unpublished*

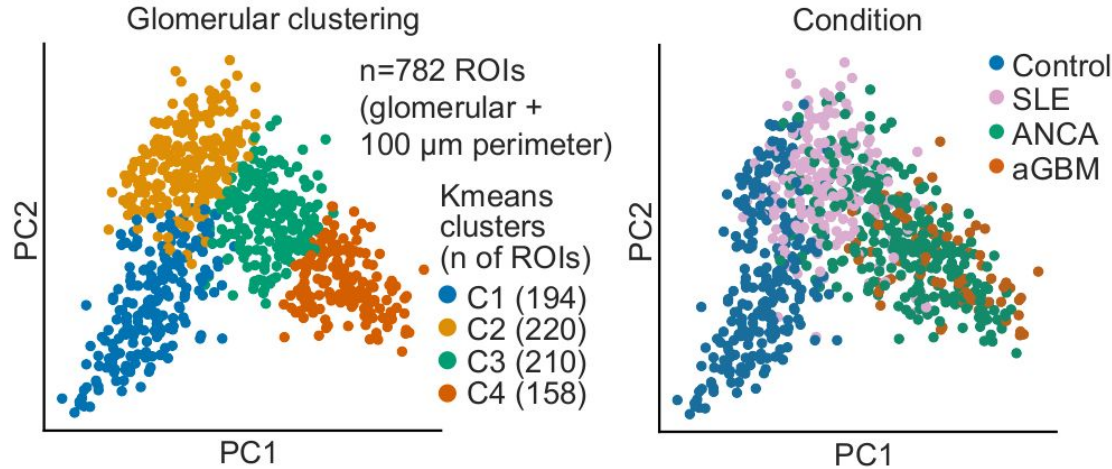
# Examples

## Glomerulus annotation (NichePCA)



Sultana, Khatri & Yousefi et al., 2025. *Nature Immunology*. In press.

# Examples



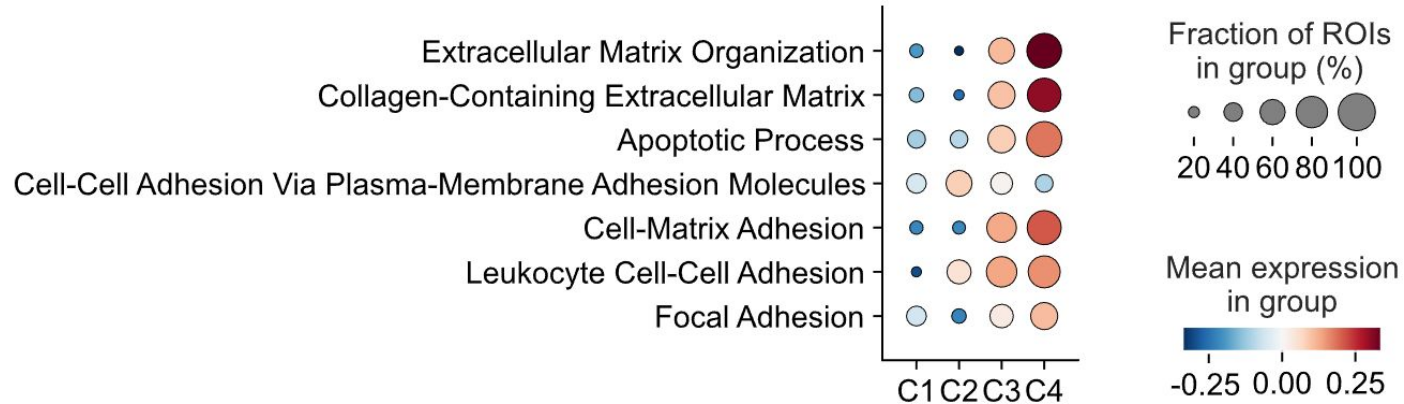
Distribution of conditions (%)

	C1	C2	C3	C4
Control	89.69	27.73	0.48	0.00
SLE	5.15	57.27	25.24	3.16
ANCA	4.64	14.55	58.57	69.62
aGBM	0.52	0.45	15.71	27.22

Cluster

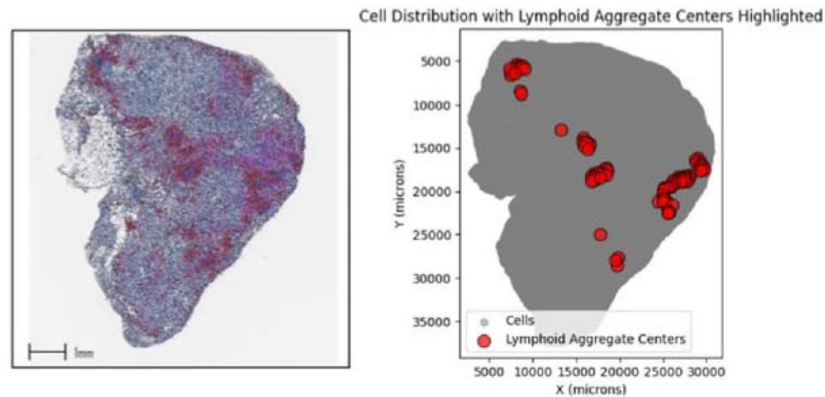
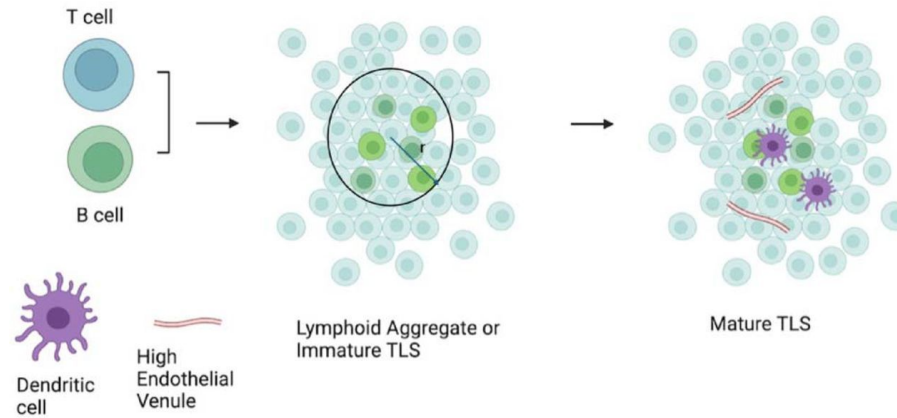
Sultana, Khatri & Yousefi et al., 2025. *Nature Immunology*. In press.

# Examples



Sultana, Khatri & Yousefi et al., 2025. *Nature Immunology*. In press.

# Examples



TLS\_Finder  
Koksoy et al., 2024. *biorxiv*.

# Related terms

Niche, compartments, zones ...

Questions?