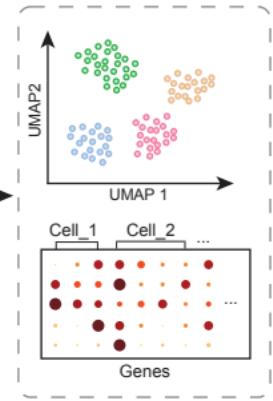
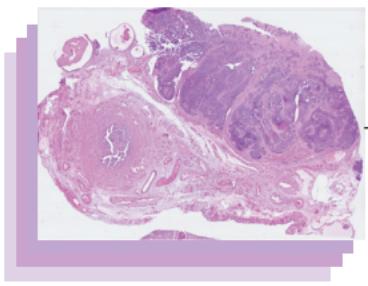


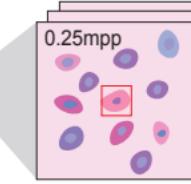
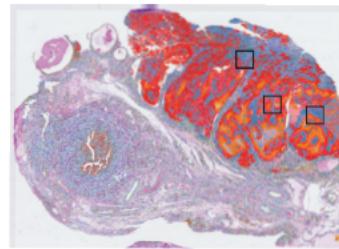
Cell Type Annotation



Cluster 0:
Marker_Genes
Score_wilcox
Score_logreg
...

Labeled by Active
Marker Genes

Cluster 0: Epithelial_Tumor
Cluster 1: Macrophage
Cluster 3: Fibroblast
...



Patches with
Center Cells

Patches	Cell Type	Cell Centroids
1024	Tumor	(1063, 2745)
1024	T-Cell	(7153, 6914)
1024	Endothelial	(2032, 5435)
1024	TAFs	(2032, 6240)
1024

Three Stage Model Training

Cell Patch Extraction

224 pixels

Stage1:
Path_local



Register Token 1
Register Token 2
Register Token 3
...
Register Token 8

FiLM

λ

γ

CLS
Mean
Pooling
...

FiLM

λ

γ

UNI_LN

Path A ckpt

Linear Head

ckpt

MLP

ckpt

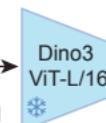
Stage3: Fusion Gate

$\mathcal{L}_{gate-fuse}$

T Cell
TAFs
Epithelial
Other 13 Types

Prob_A(K)
conf_A
Prob_B(K)
conf_B

1024 pixels



Stage2:
Path_Global