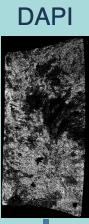
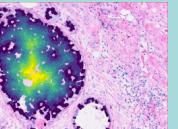
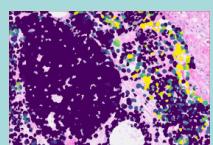
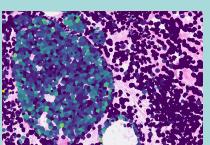
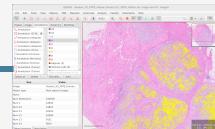


**a****Import ST dataset****Spatial Transcriptomics Dataset**

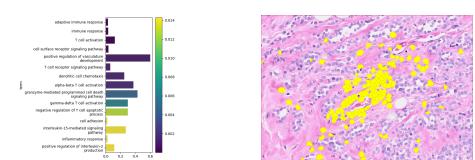
Transcriptomics Data

SIFT &  
bUnwrapJSpatial  
Alignment  
Data**QuST: QuPath Extension  
for Loading ST Data****Preprocessing**Cell  
SegmentationDelaunay based  
ClusteringCell Spatial  
ProfilingCell-Cell  
Interaction

Gene Expression

**b****GO Term Retrieval**Single Cell  
Spatial Data

User Inputs for Object Selection incl. single-cell clusters or regions

**Single-Cell Data  
Preprocessing**GENEOLOGY  
Unifying Biology**Gene Ontology Enrichment Analysis**GO  
Terms**c****LLM-based interpretation****Large Language Model****GOEA****Corresponding Cell Locations****LLM Interpretation**

The adaptive immune response is a critical biological process that involves the activation of T cells, including both alpha-beta and gamma-delta T cells, through the T cell receptor signaling pathway. This process is facilitated by cell surface receptor signaling pathways and is crucial for the body's defense against pathogens. Dendritic cell chemotaxis plays a significant role in this process, guiding immune cells to the site of infection. The activation of T cells also leads to the positive regulation of vasculature development, promoting blood vessel growth and aiding in the delivery of immune cells. Additionally, the immune response involves the production of granzymes, which initiate programmed cell death in infected cells. The negative regulation of the cell apoptosis process ensures the survival of these crucial immune cells. Cell adhesion is another important aspect of the immune response, allowing cells to bind to each other and to the extracellular matrix. The interleukin-15-mediated signaling pathway and the positive regulation of interleukin-2 production are involved in the proliferation and differentiation of T cells. Lastly, the inflammatory response, a key component of the immune response, helps to eliminate pathogens and repair tissue damage. From a clinical perspective, understanding these processes can provide insights into the development of therapies for immune-related diseases.

**LLM-based Interpretation**