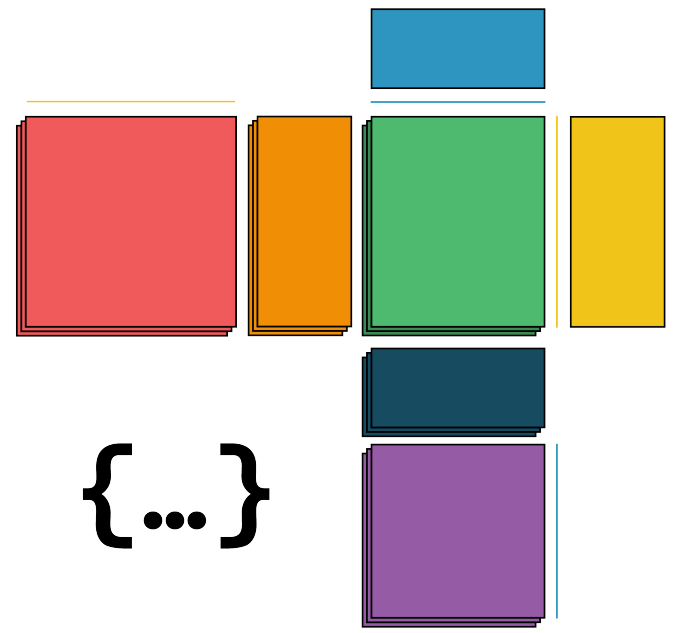


external file formats

.CSV
.tsv
.loom
CellRanger output
...

anndata in memory & on disk


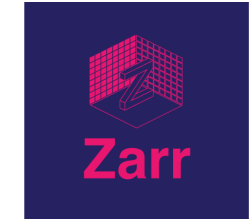
AnnData



{...}

external applications

cellxgene
R
ITESSCE
...

.h5ad 
.zarr 

```
X: csr_matrix  
layers  
counts: csr_matrix  
obs: dataframe  
celltypes: categorical  
obsm  
pca: array  
varm  
pcs: array  
obsp  
connectivities: csr_matrix
```

Python APIs

scanpy    **scvi-tools**
 **PyTorch**  **UMAP**  **scikit-learn**
...