



St. Anna Kinderkrebsforschung
CHILDREN'S CANCER RESEARCH INSTITUTE

Interactive Seurat Visualisation using Vitesse and CellxGene

Internship presentation 22 February 2024



Table of Contents

1. Aims and Objectives of my Project
2. Tools Explored
3. Cellxgene (+ Extensions)
4. Vitessce
5. Demonstration

Aims and Objectives

Visualisation method for Seurat objects that is:

1. Interactive
2. Web-based
3. Easily shareable
4. Able to display a variety of plot types / embeddings

Aims and Objectives

Visualisation method for Seurat objects that is:

1. Interactive
2. Web-based
3. Easily shareable
4. Able to display a variety of plot types / embeddings

Intended Use:

1. Visual aid for publication (collaborators, readers etc)
2. Exploration of own data

Explored Tools

Tool	Web-based/shareable	Interactive	Range of Figures	User-friendly
Vitessce	✓	✓	✓	
CellxGene		✓	✓	✓
Loupe Desktop App		✓		✓
Single Cell Portal	✓	✓		
Automated Single Cell Analysis Portal	✓	✓		



St. Anna Kinderkrebsforschung
CHILDREN'S CANCER RESEARCH INSTITUTE

CellxGene

CellxGene



- Requirements:
 - .h5ad file and pip install

CellxGene

- Requirements:
 - .h5ad file
- Community Extensions:

Explore CellxGene	CellxGene Visualisation in Plugin	CellxGene Gateway
Annotation, Exploration, data pre-processing	violin, stacked violin, stacked bar, heatmap, volcano, etc. plots	Multiple Datasets



St. Anna Kinderkrebsforschung
CHILDREN'S CANCER RESEARCH INSTITUTE

Explore CellxGene (exCellxGene)

Create new category

Leiden cluster

1

Fuse labels

Delete labels

Leiden clustering

Categorical

Maturation_phase

Phase

barcode_id

barcode_label

barcode_seq

batch

cell_class

citr_split

citrin_state

data_of_birth

facs_gate_id

fish

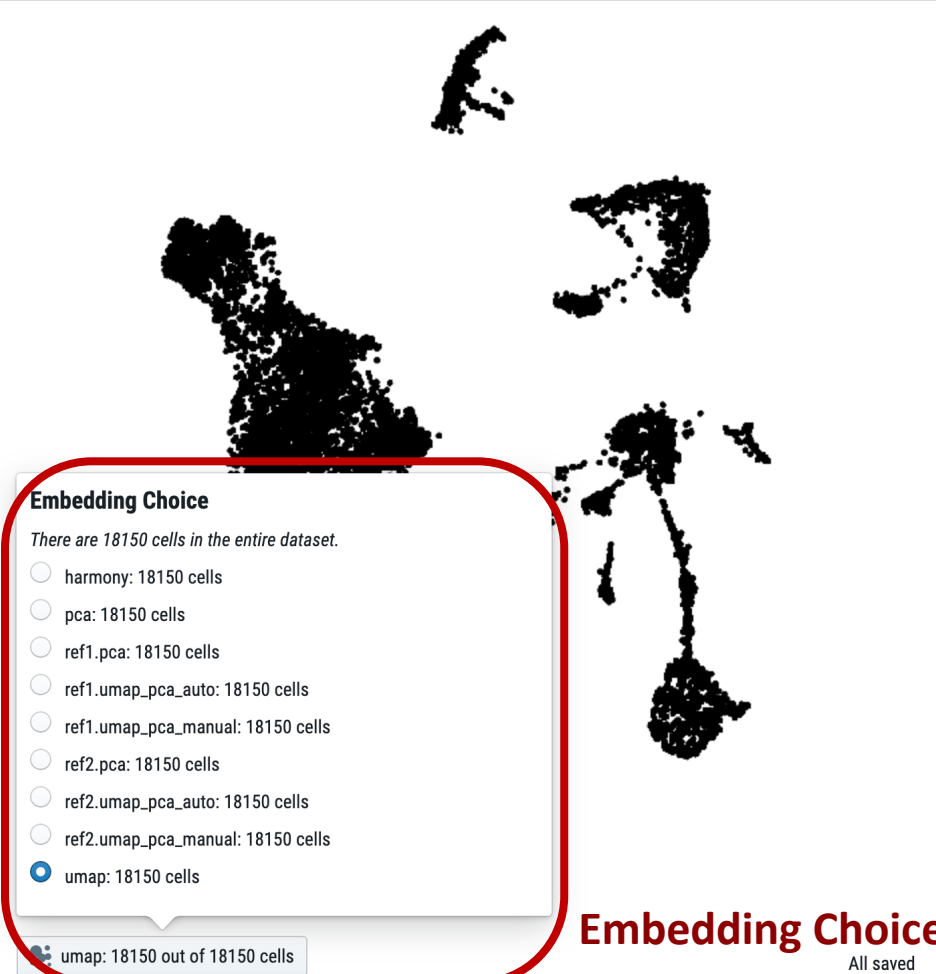
fish_genotype

fish_tank

orig.ident

pool

predicted.ref1_cell_type



Embedding Choice

There are 18150 cells in the entire dataset.

harmony: 18150 cells

pca: 18150 cells

ref1.pca: 18150 cells

ref1.umap_pca_auto: 18150 cells

ref1.umap_pca_manual: 18150 cells

ref2.pca: 18150 cells

ref2.umap_pca_auto: 18150 cells

ref2.umap_pca_manual: 18150 cells

☒ umap: 18150 cells

umap: 18150 out of 18150 cells

Embedding Choice

All saved

All genes

M1

M2

M3

NADPH_oxidase

cell_cycle_proliferation

granule-related

inflammation

migration

oxidative_stress

regulators

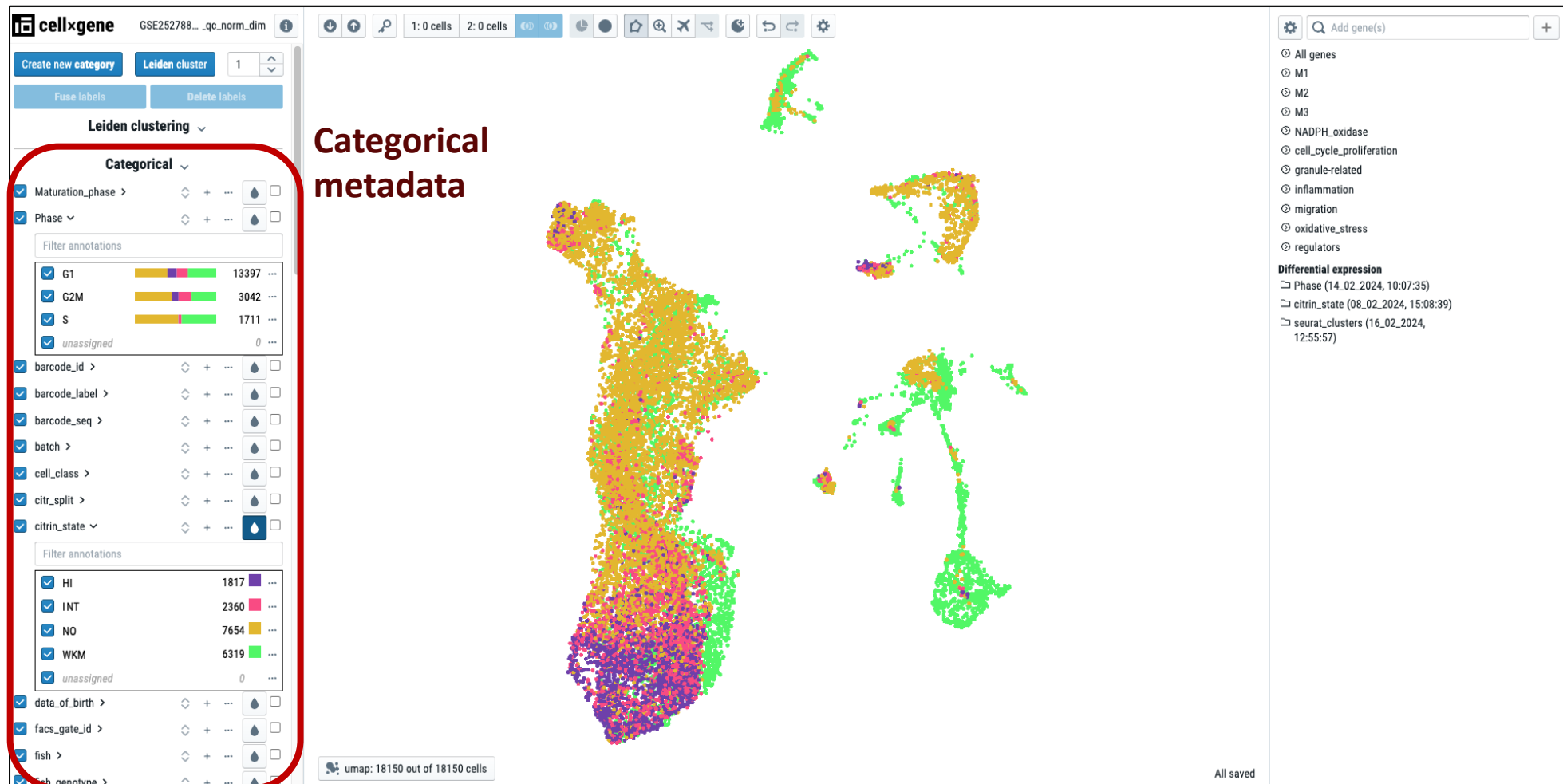
Differential expression

Phase (14_02_2024, 10:07:35)

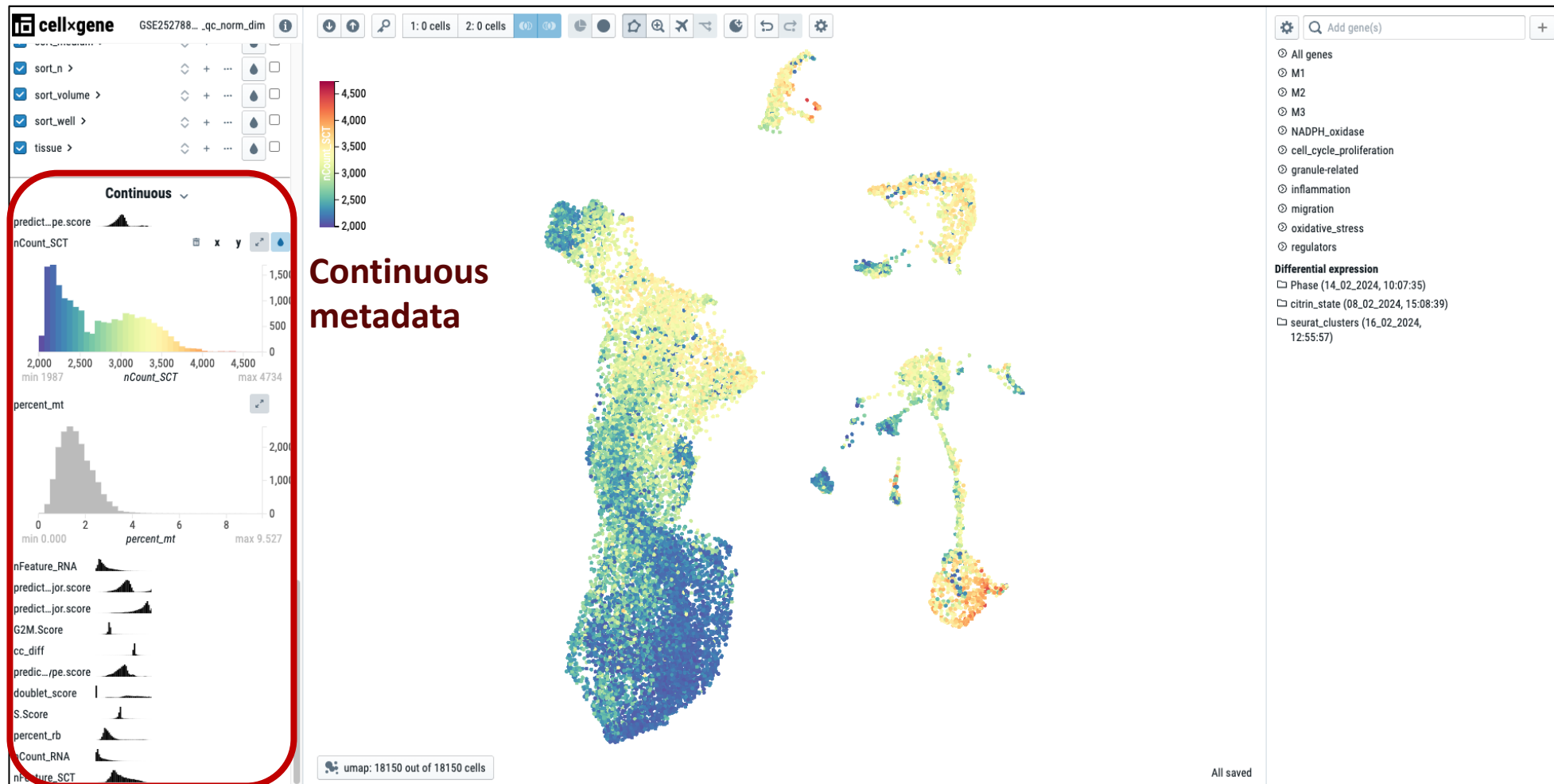
citrin_state (08_02_2024, 15:08:39)

seurat_clusters (16_02_2024, 12:55:57)

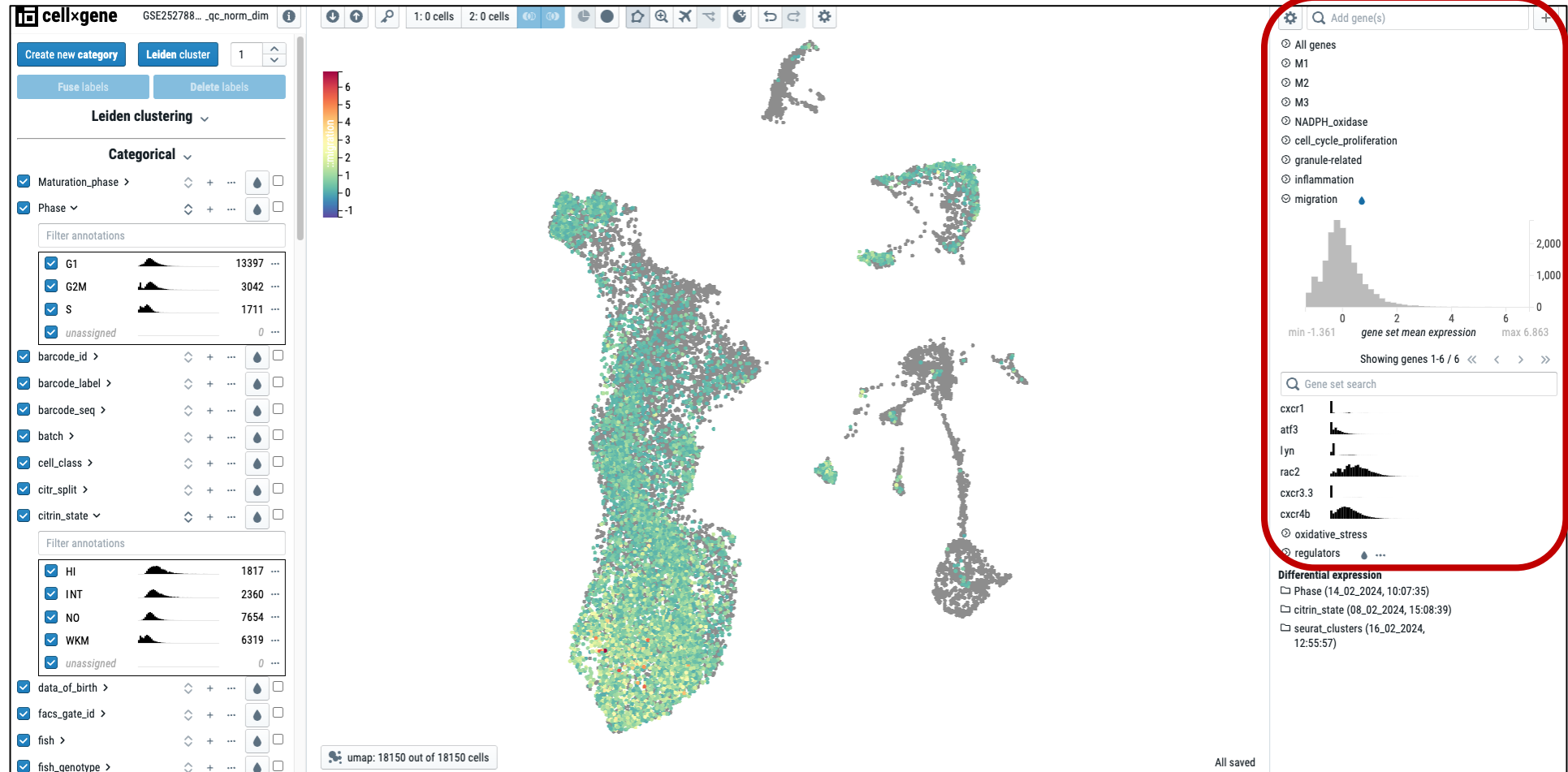
exCellxGene



exCellxGene

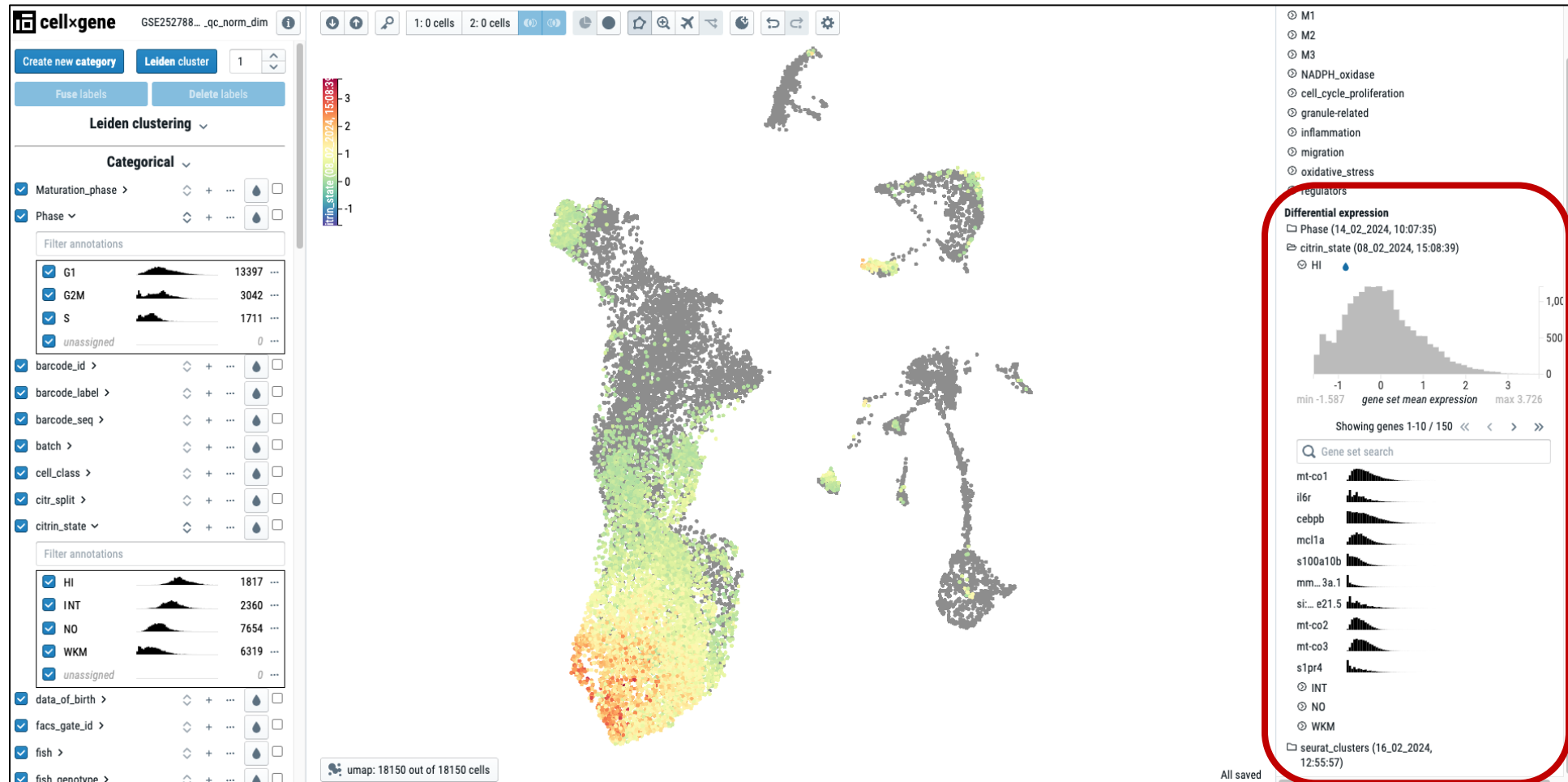


exCellxGene



Manually
managed
gene sets

exCellxGene



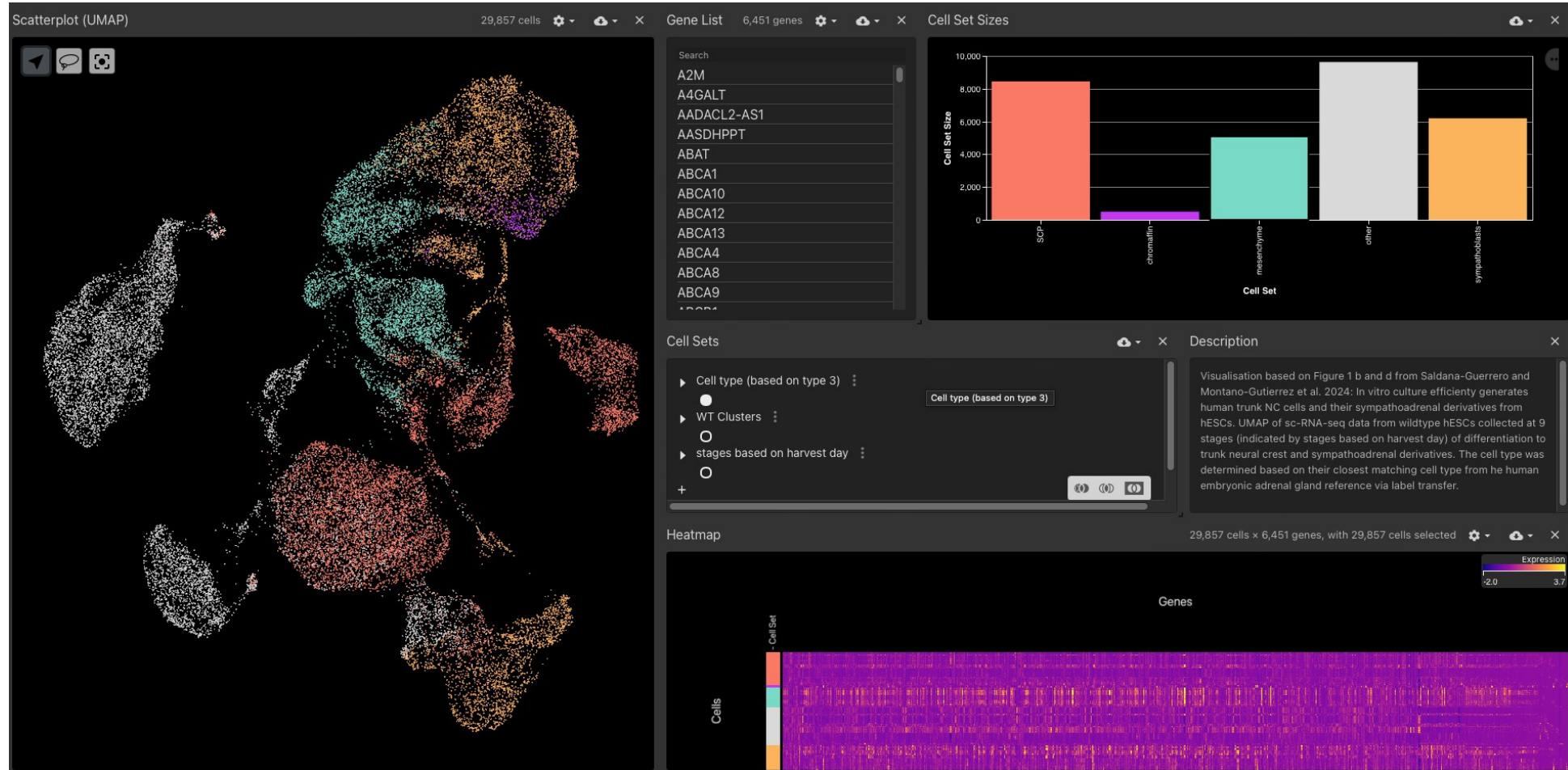
Differentially
expressed
genes



St. Anna Kinderkrebsforschung
CHILDREN'S CANCER RESEARCH INSTITUTE

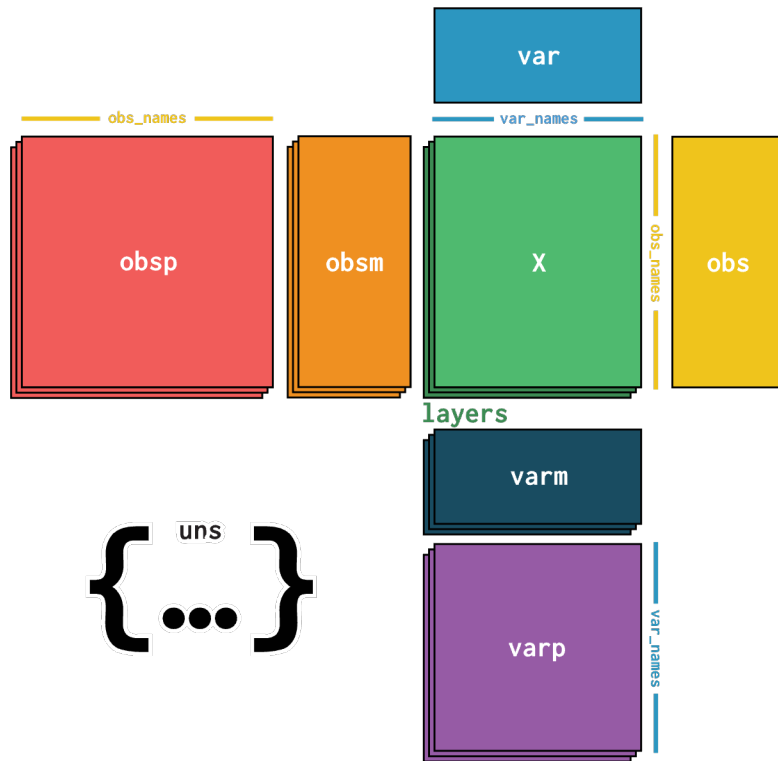
Vitessce

Widget / View types



Vitessce file requirement

- Anndata-Zarr store



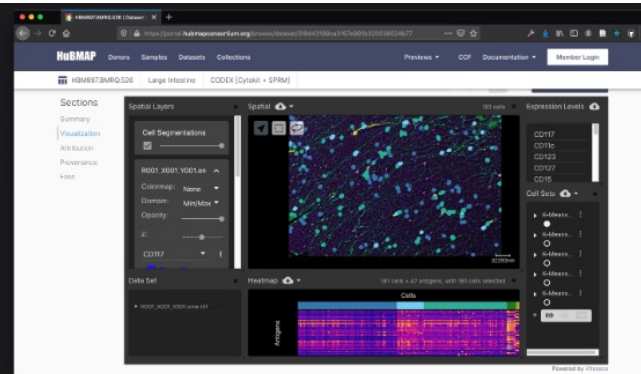
- Vitessce R and Python package to transform Seurat/.h5ad

```
adata_path <- file.path("data", "example", "example.h5ad.zarr")
vitessceAnalysisR::seurat_to_anndata_zarr(so, adata_path)
```

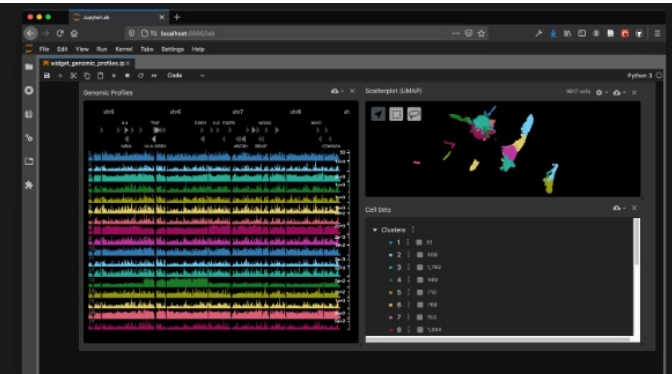
Vitessce Platforms



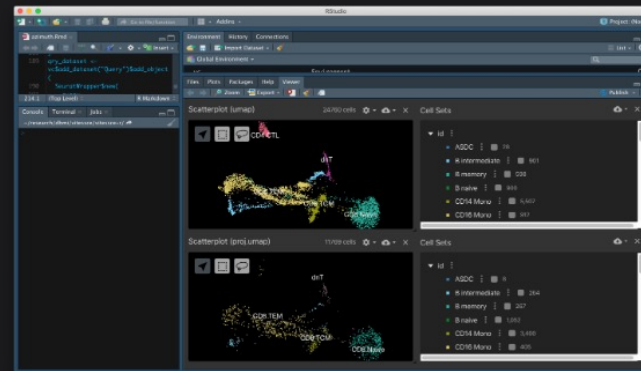
Vitessce as a web application



Vitessce as an embedded web component (HuBMAP Portal)



Vitessce as an ipywidget in JupyterLab



Vitessce as an htmlwidget in RStudio

Vitessce Data Hosting

Locally	Static Web Servers
http-server	GitHub Pages, AWS S3 Buckets, Google Cloud
Not yet published data	Published and non-confidential data
Only shareable with file transfer	Shareable with unique vitessce.io url

Vitessce Config.JSON

The config specifies the:

1. Dataset
2. Visualisation types (widgets)
3. Linking widgets
4. Design (colours, layout)

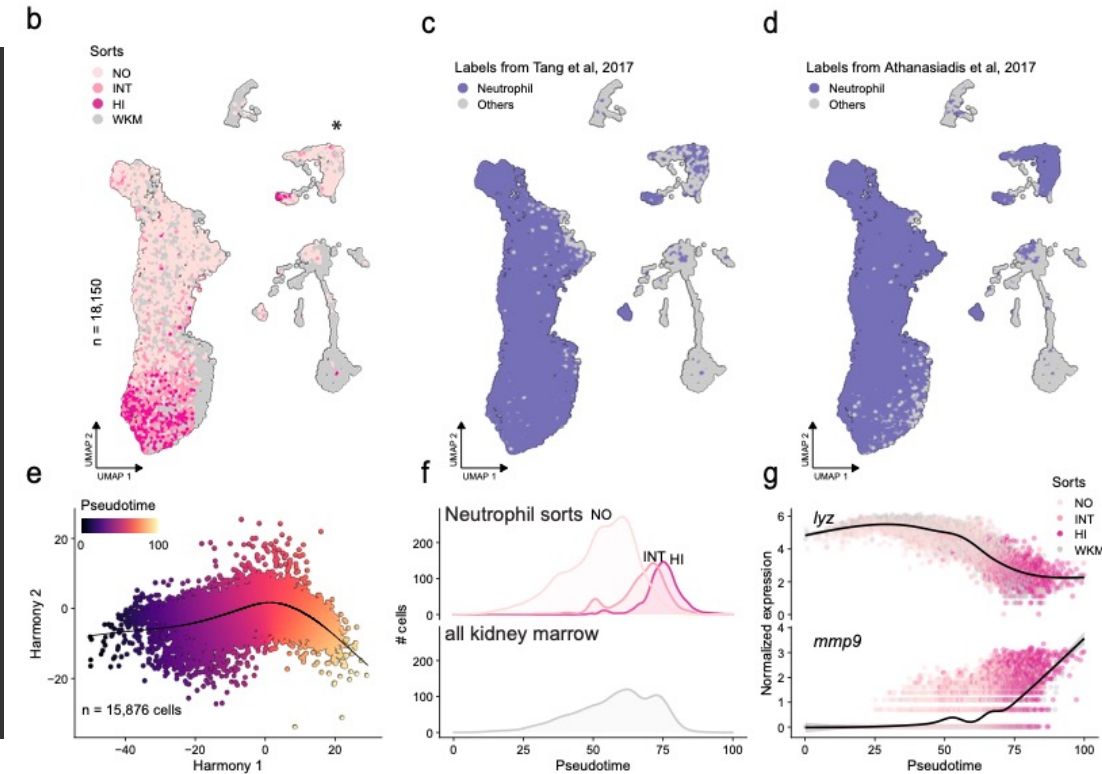
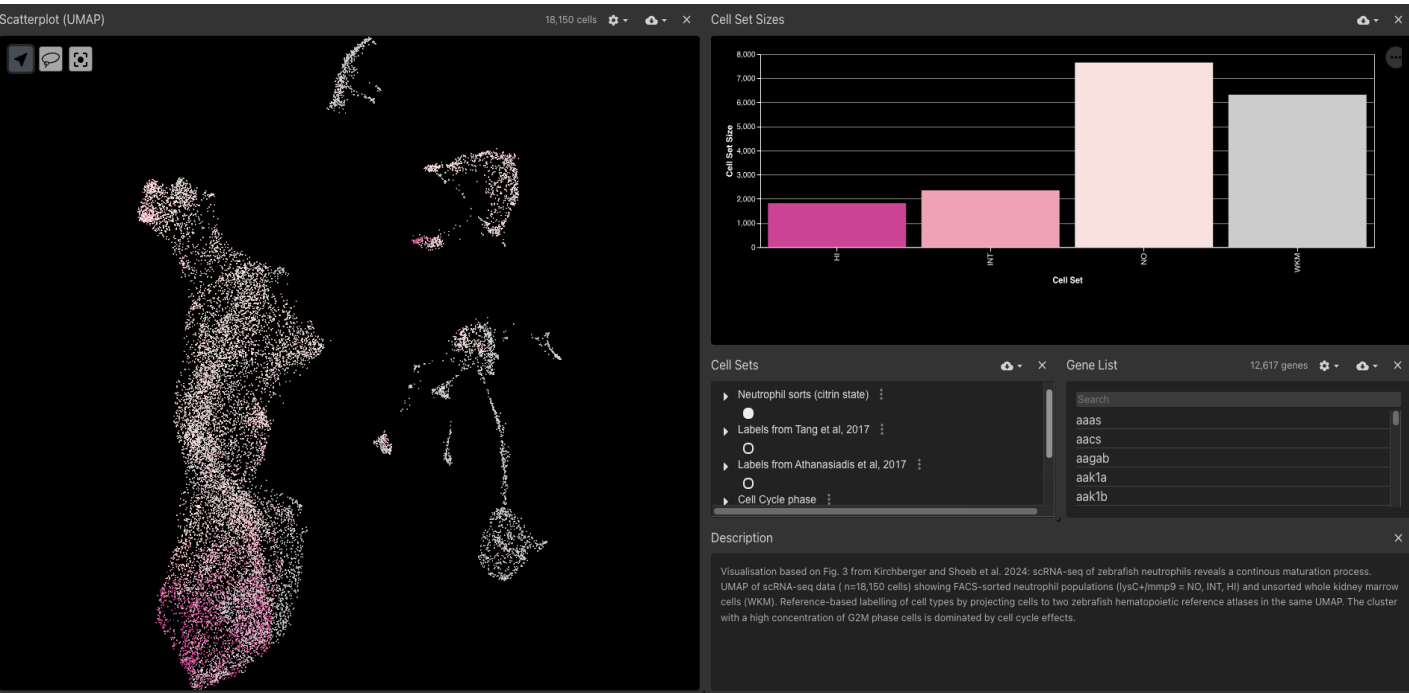
```
{ "version": "1.0.16",  
  "initStrategy": "auto"  
  "name": "Zebrafish Neutrophil Figure 3",  
  "description": ""Visualisation based on Fig. 3 from Kirchberger and Shoeb et al. 2024",  
  
  "datasets": [{  
    "uid": "A", "name": "My dataset",  
    "files": [{  
      "fileType": "anndata.zarr",  
      "url": "https://esztersojtory.github.io/vitessce_data/zfish.h5ad.zarr",  
      "options": {  
        "obsEmbedding": [{...}],  
        "obsSets": [{...},{}],  
        "obsFeatureMatrix": {...}}}]},  
  
    "coordinationSpace": {  
      "dataset": { "A": "A"},  
      "embeddingType": { "A": "UMAP"},  
      "featureValueColormapRange": {"A": [0.15,0.23]},  
      "obsSetColor": { "A": [ {"path": [], "color": [248, 225, 222 ]}]},  
  
      "layout": [  
        {"component": "scatterplot",  
          "coordinationScopes": {  
            "dataset": "A",  
            "embeddingType": "A",  
            "featureValueColormapRange": "A",  
            "obsSetColor": "A"},  
            "x": 0, "y": 0, "w": 6, "h": 12 ]}]}
```



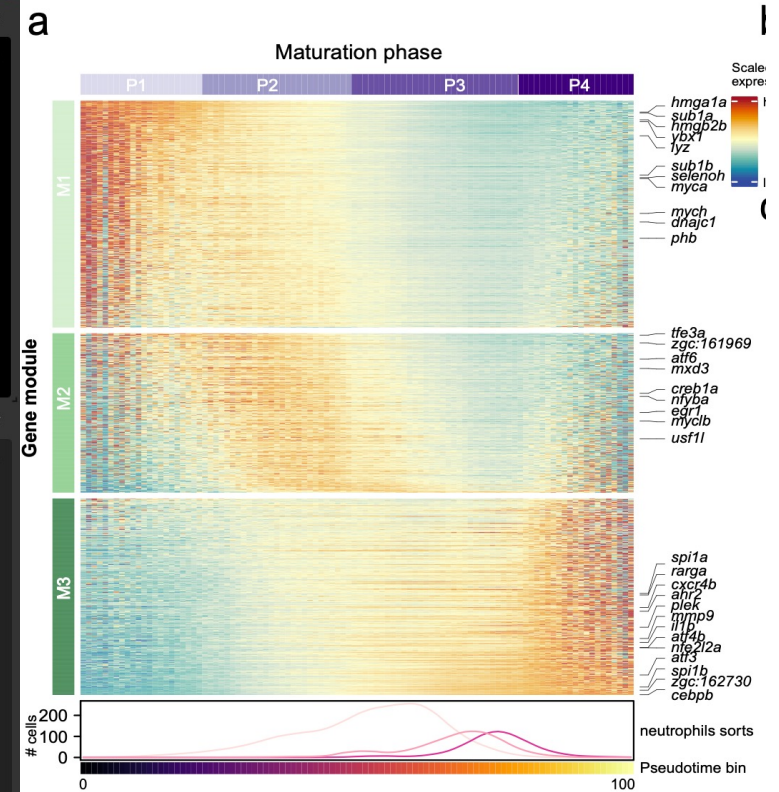
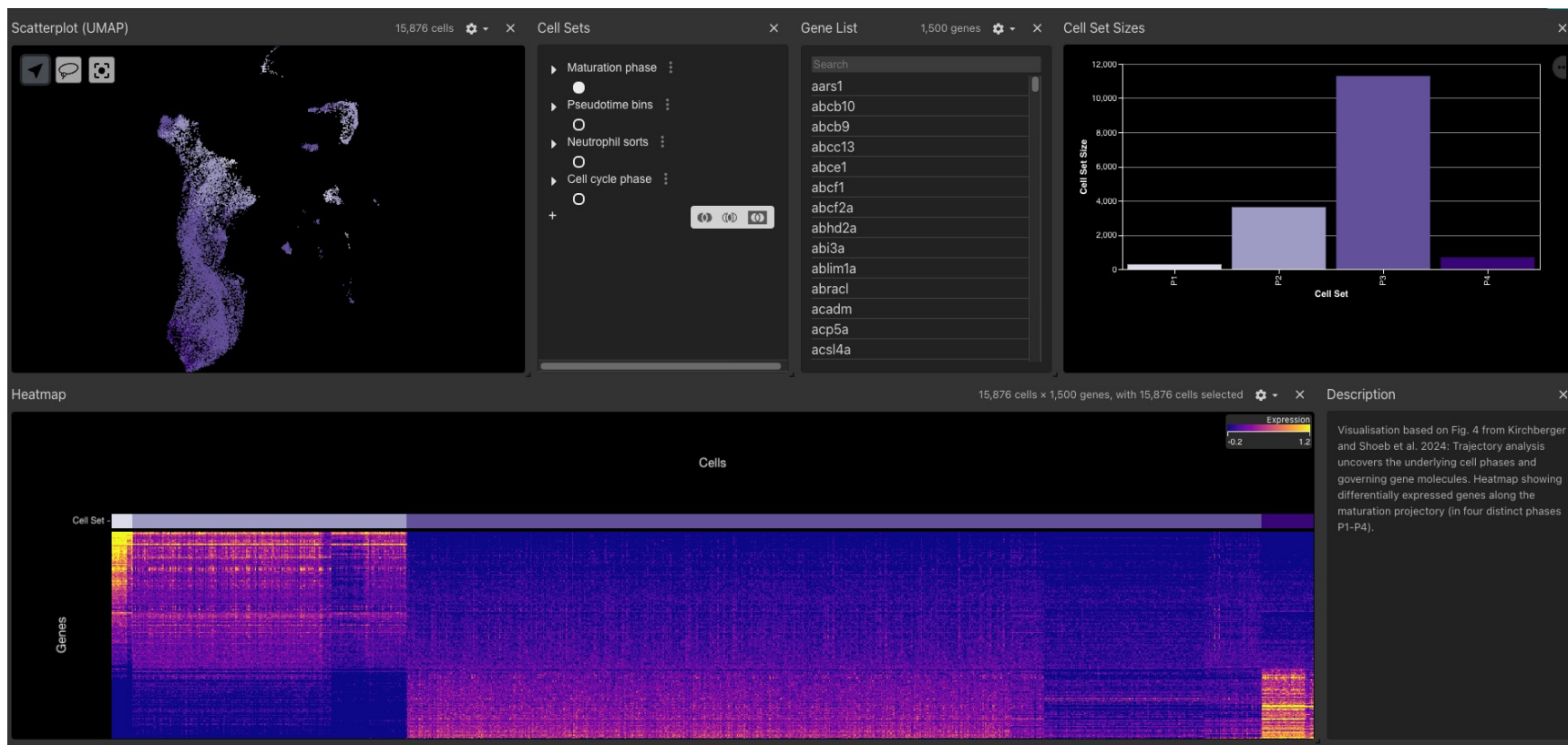
St. Anna Kinderkrebsforschung
CHILDREN'S CANCER RESEARCH INSTITUTE

Applied Examples

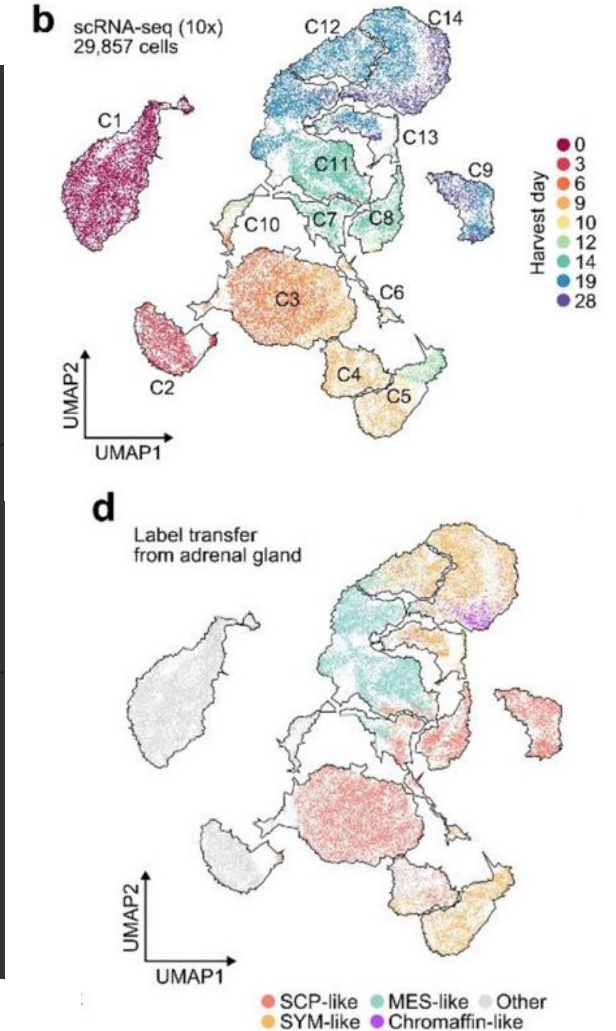
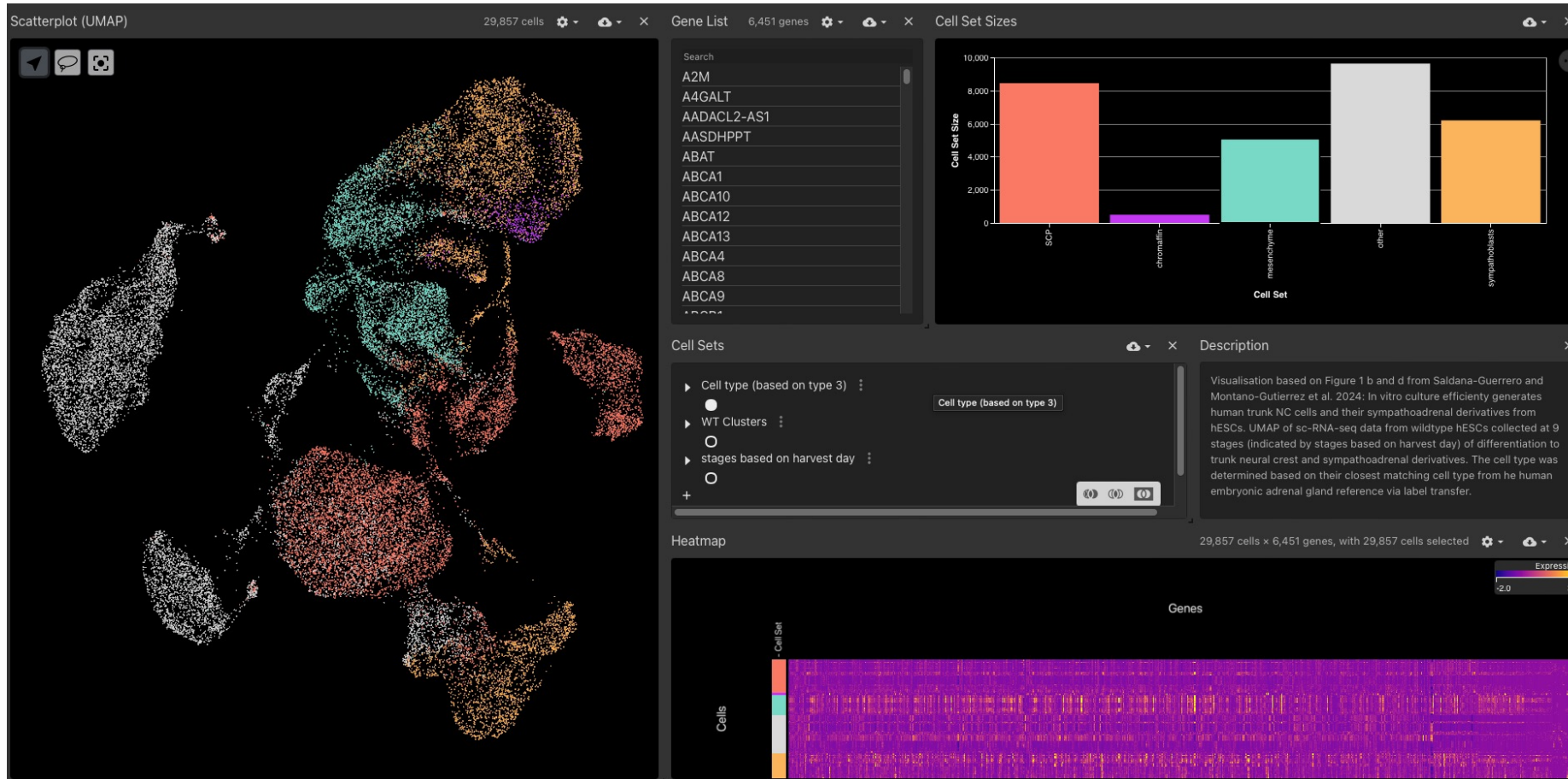
Mohamed's zebrafish dataset (Fig 3)



Mohamed's zebrafish dataset (Fig 4)



Luis' Wildtype Dataset





St. Anna Kinderkrebsforschung
CHILDREN'S CANCER RESEARCH INSTITUTE

Demonstration



St. Anna Kinderkrebsforschung
CHILDREN'S CANCER RESEARCH INSTITUTE

Thank you

Contact:

12202454@students.meduniwien.ac.at

esojtory1@gmail.com

GitHub: esztersojtory