



SPATIAL TRANSCRIPTOMICS IN THE WEB BROWSER

Creating a cell atlas of the whole human embryo



TRANSCRIPTOMICS



Bulk sequencing

Yields averaged gene expression across entire tissue sample



Single-cell mRNA seq

Dissociate cells from tissue to discern cell types on the basis of gene expression



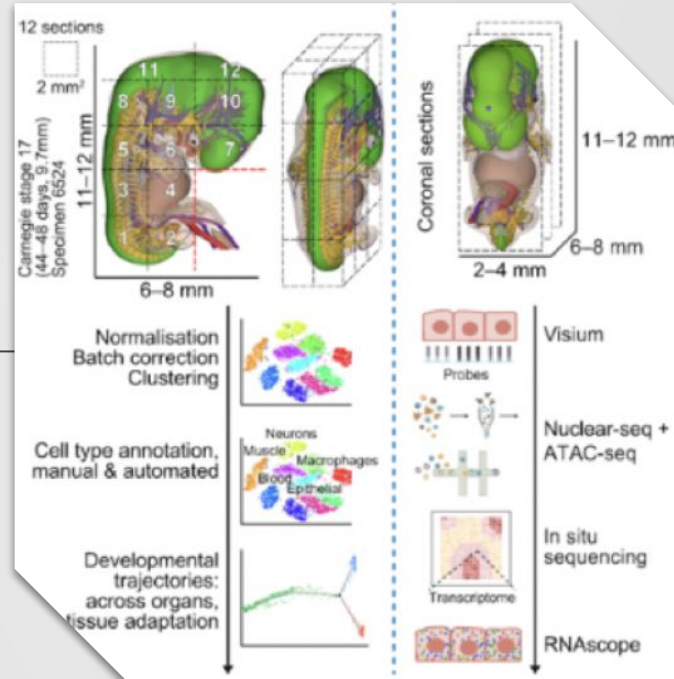
Spatially resolved

Get transcriptomic data and know the positional context of those cells in a tissue

WHOLE EMBRYO PROJECT

HUMAN CELL ATLAS

Profile single cells from dissociated tissues and within intact tissue sections, to reconstruct a three dimensional atlas of the whole human embryo.



WEB PORTAL PROJECT TEAMS



DAVE HORSFALL

Research Software
Engineer, Newcastle
University



OMER BAYRAKTAR

Group leader in Cellular
Genetics, Wellcome Sanger
Institute



MUZZ HANIFFA

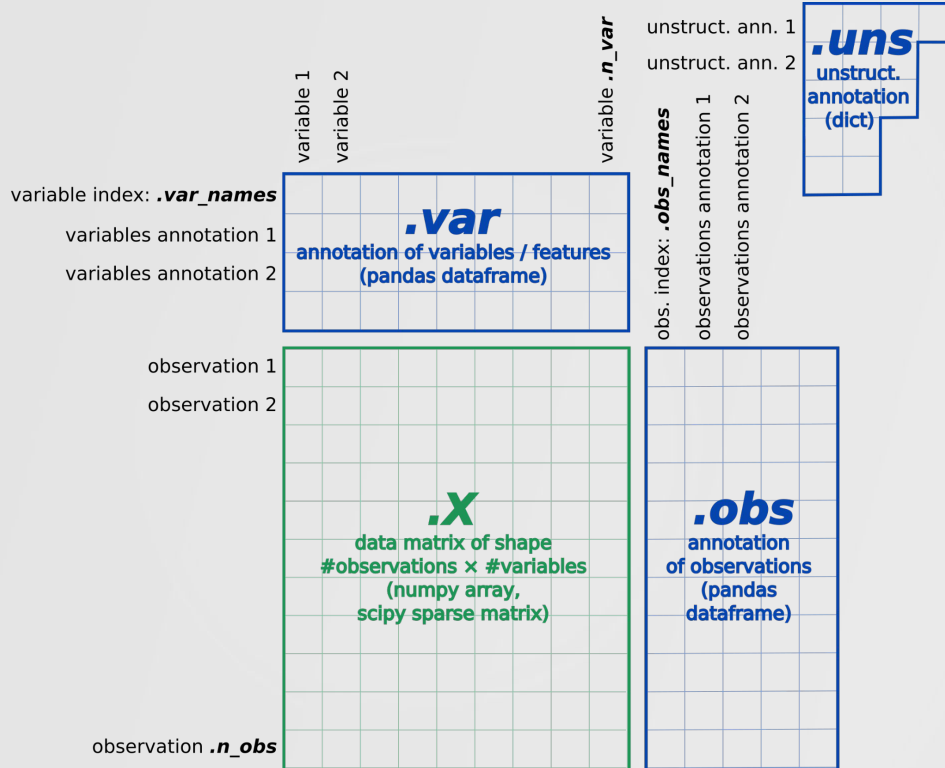
Professor of Dermatology and
Immunology, Newcastle
University & Wellcome Sanger
Institute



JASON SWEDLOW

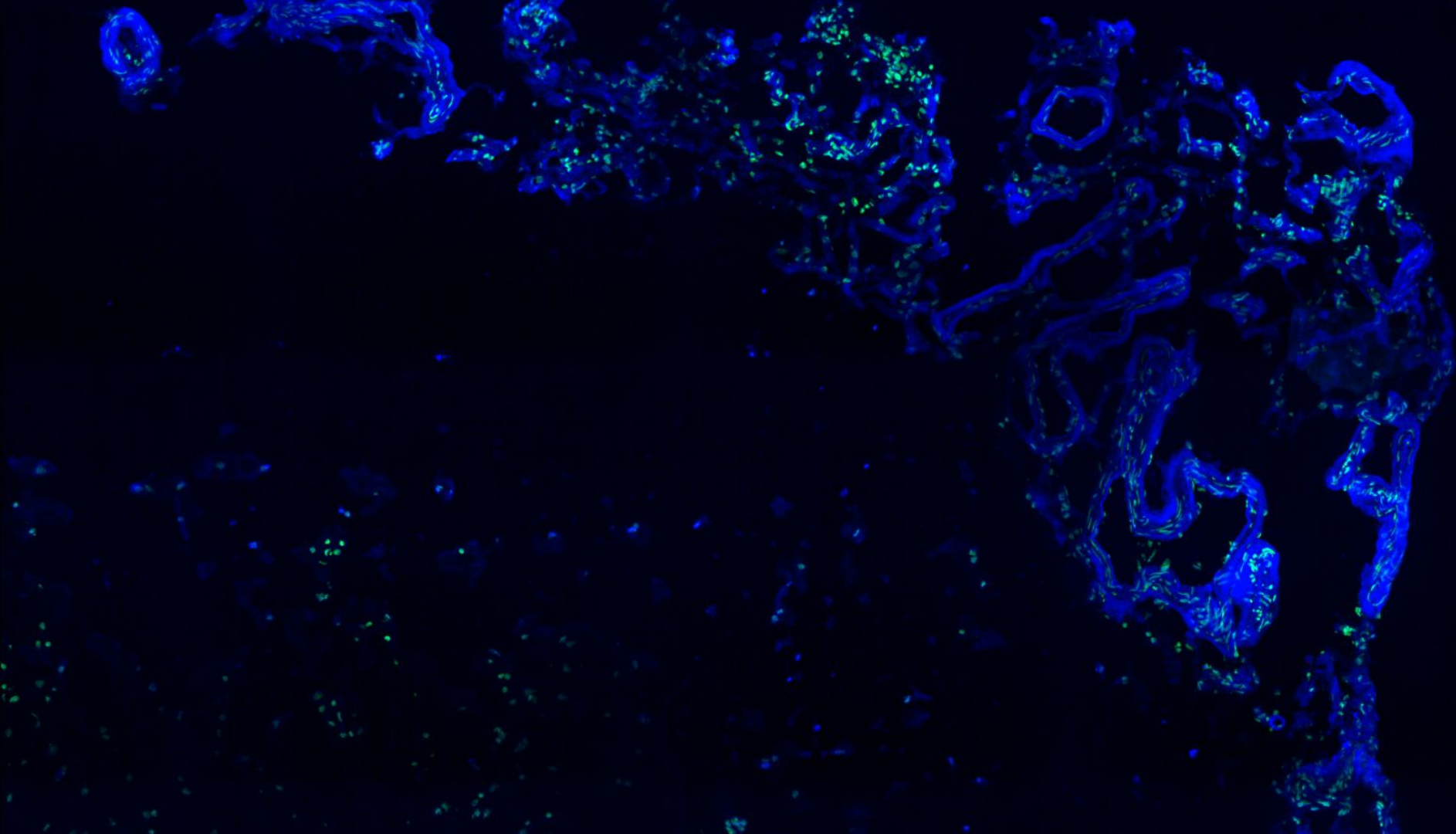
Professor of Quantitative Cell
Biology, Open Microscopy
Environment, University of
Dundee

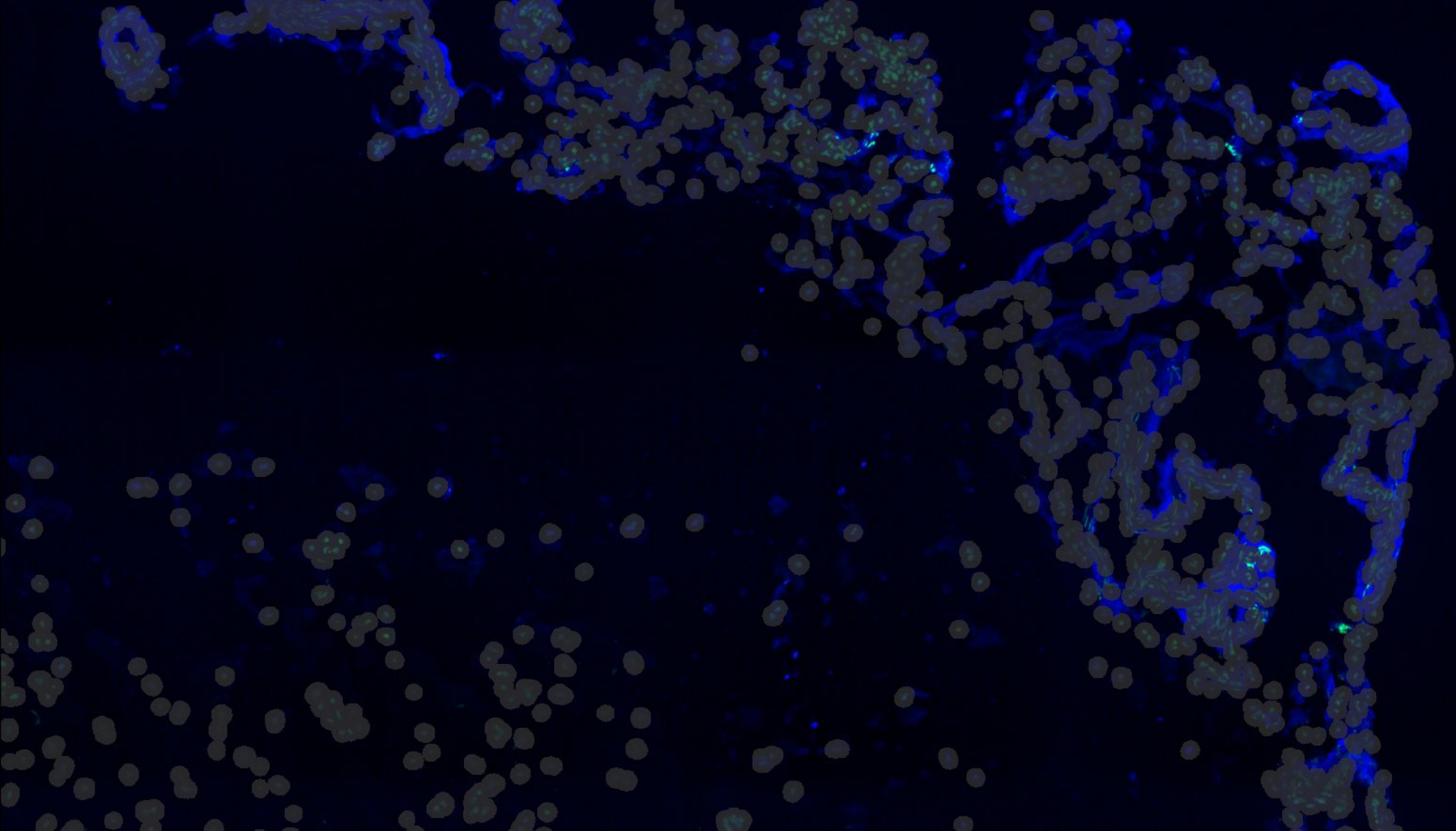
ANNDATA MODEL





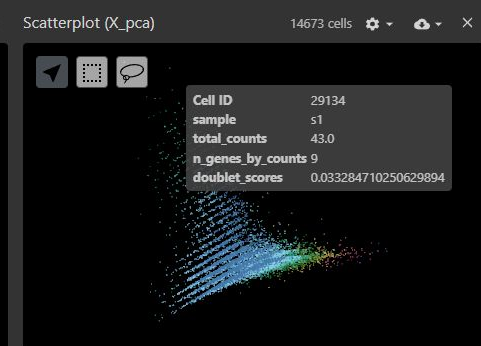
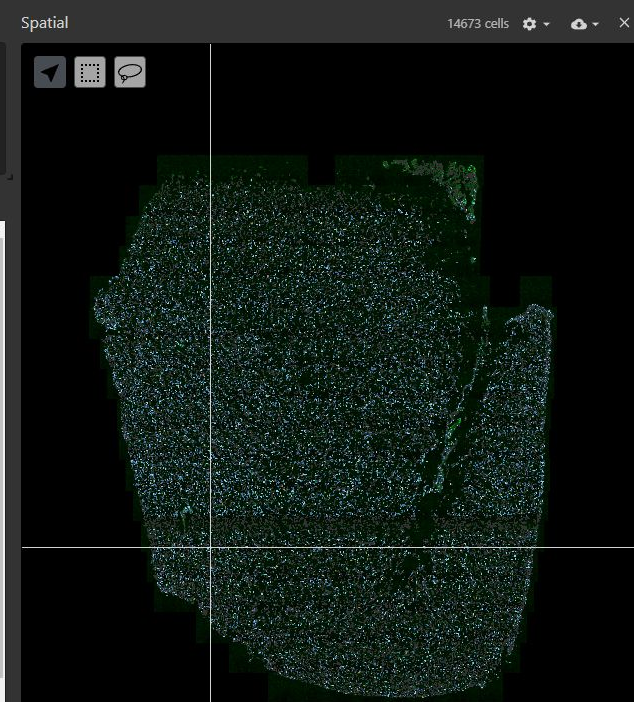
WHAT DATA IS VISUALISED?





Data Set

Sample: benchmrking dataset



Expression Levels

12 genes

Search

- ACTA2
- CALB2
- CSF1R
- NPY_N1C
- NPY_N4F**
- NTS
- PENK
- RELN
- SOX9
- SST_N4F
- TAC3

Spatial Layers

Whole Embryo Samp...

Colormap: None

Domain: Min/Max

Opacity:

Zero Transparent

c01 DAPI

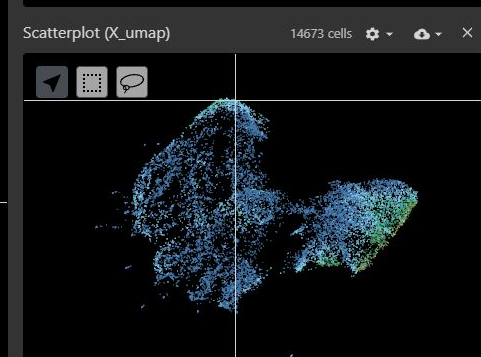
c01 Alexa 488

c01 Atto 425

c01 Alexa 568

+ Add Channel

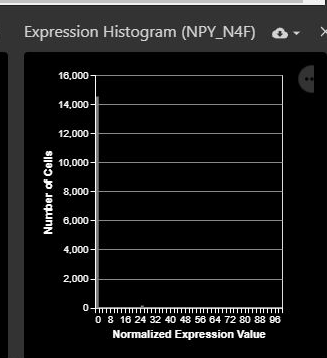
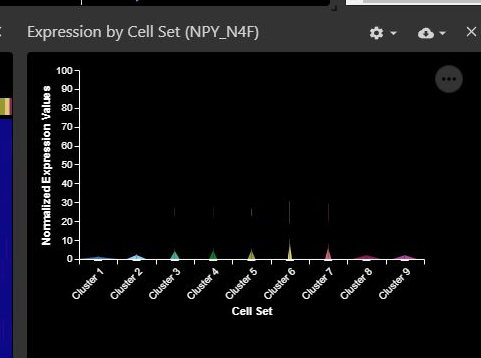
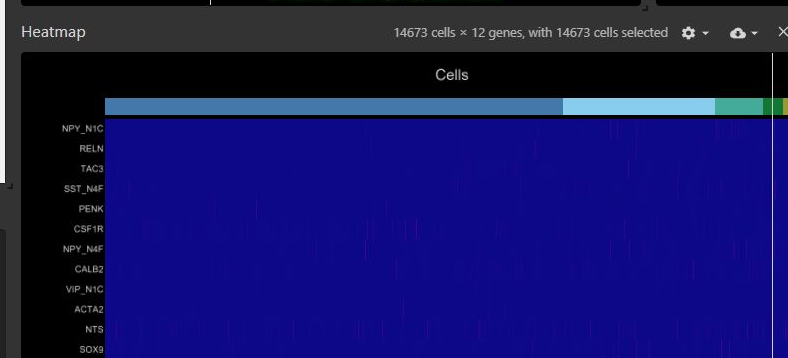
Remove Image Layer



Cell Sets

- Sample
- Total Counts

+



Status

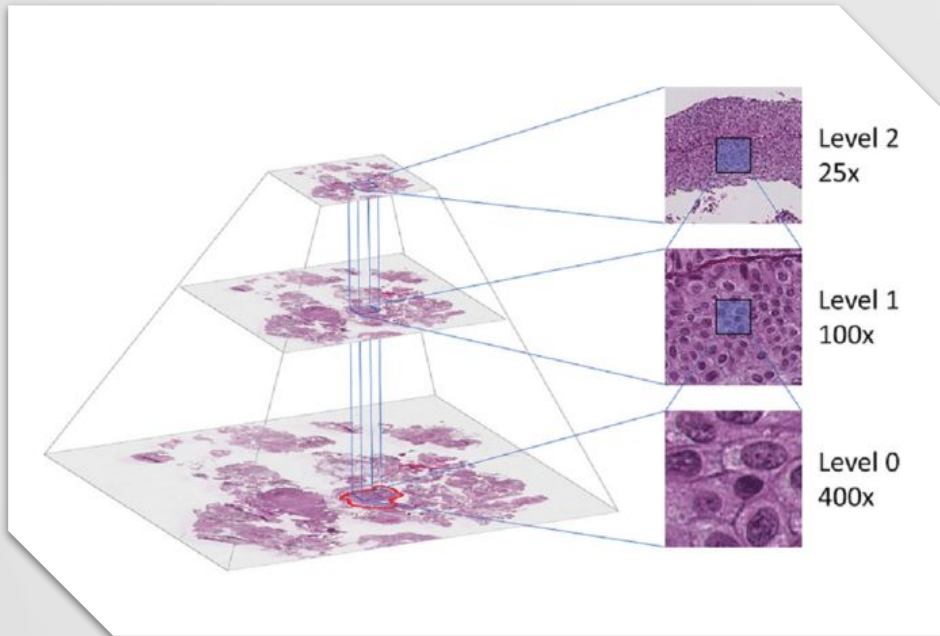
Hovered cell 29134



02

GEOSPATIAL STRATEGIES

PYRAMIDAL IMAGE FORMATS

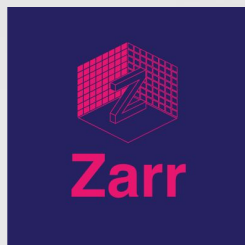


A Multiscale Approach for Whole-Slide Image Segmentation of five Tissue Classes in Urothelial Carcinoma Slides

DOWNSAMPLE

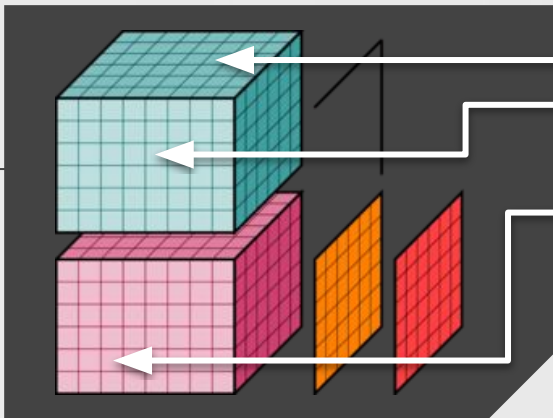
Pyramids are used to improve performance. They are a downsampled version of the original raster dataset, and are designed to support efficient zooming to different spatial resolutions.



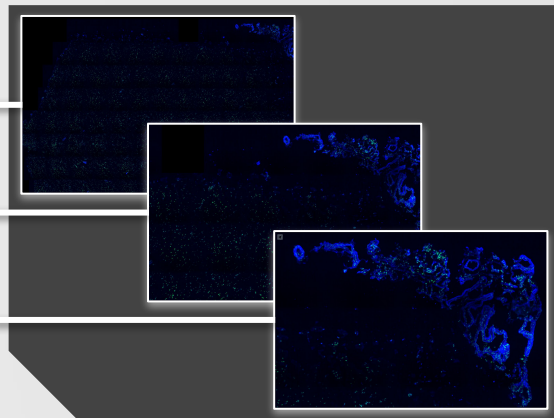


Zarr is a format for the storage of chunked, compressed, N-dimensional arrays.

CLOUD HOSTED ZARR STORE

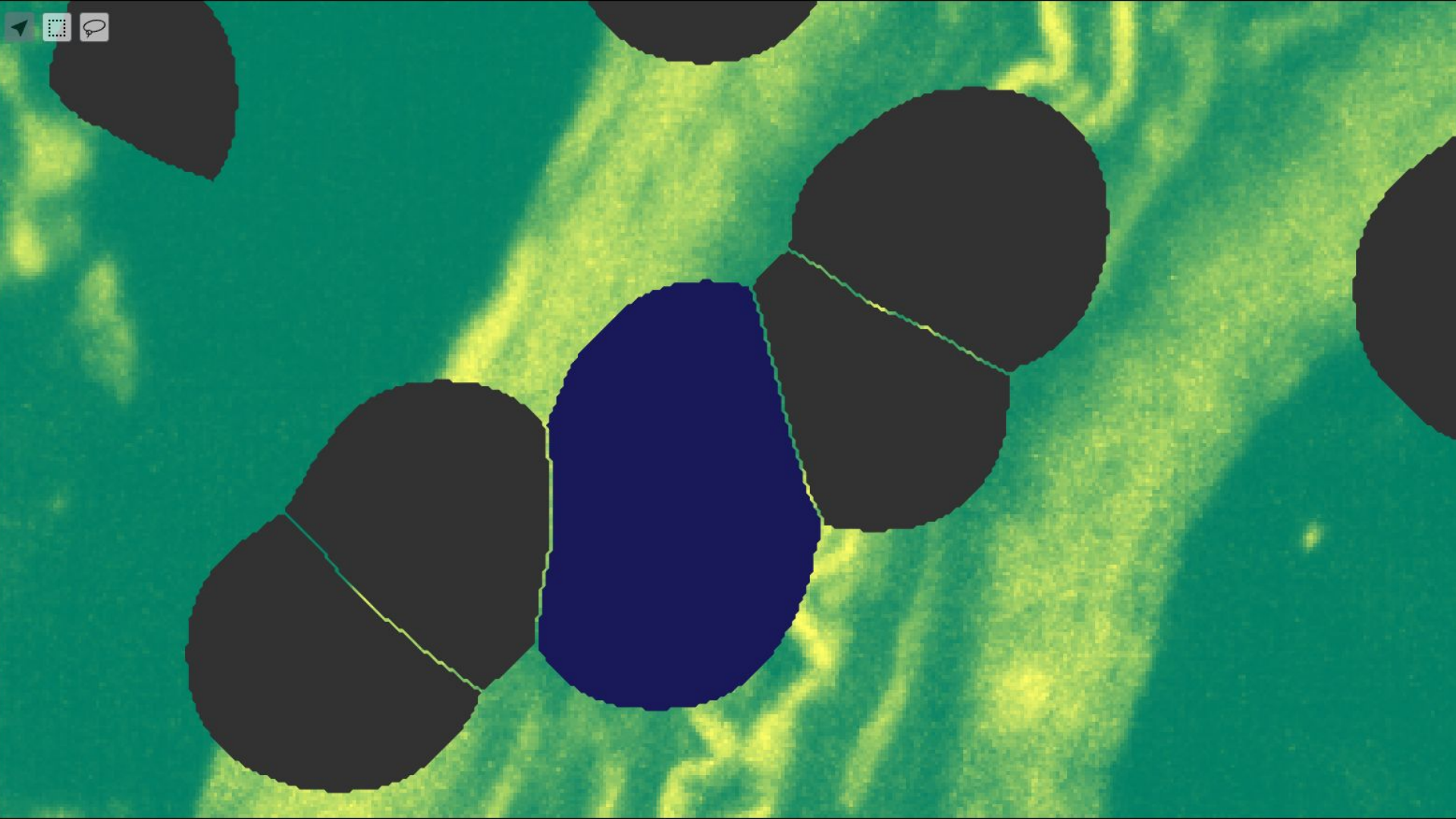


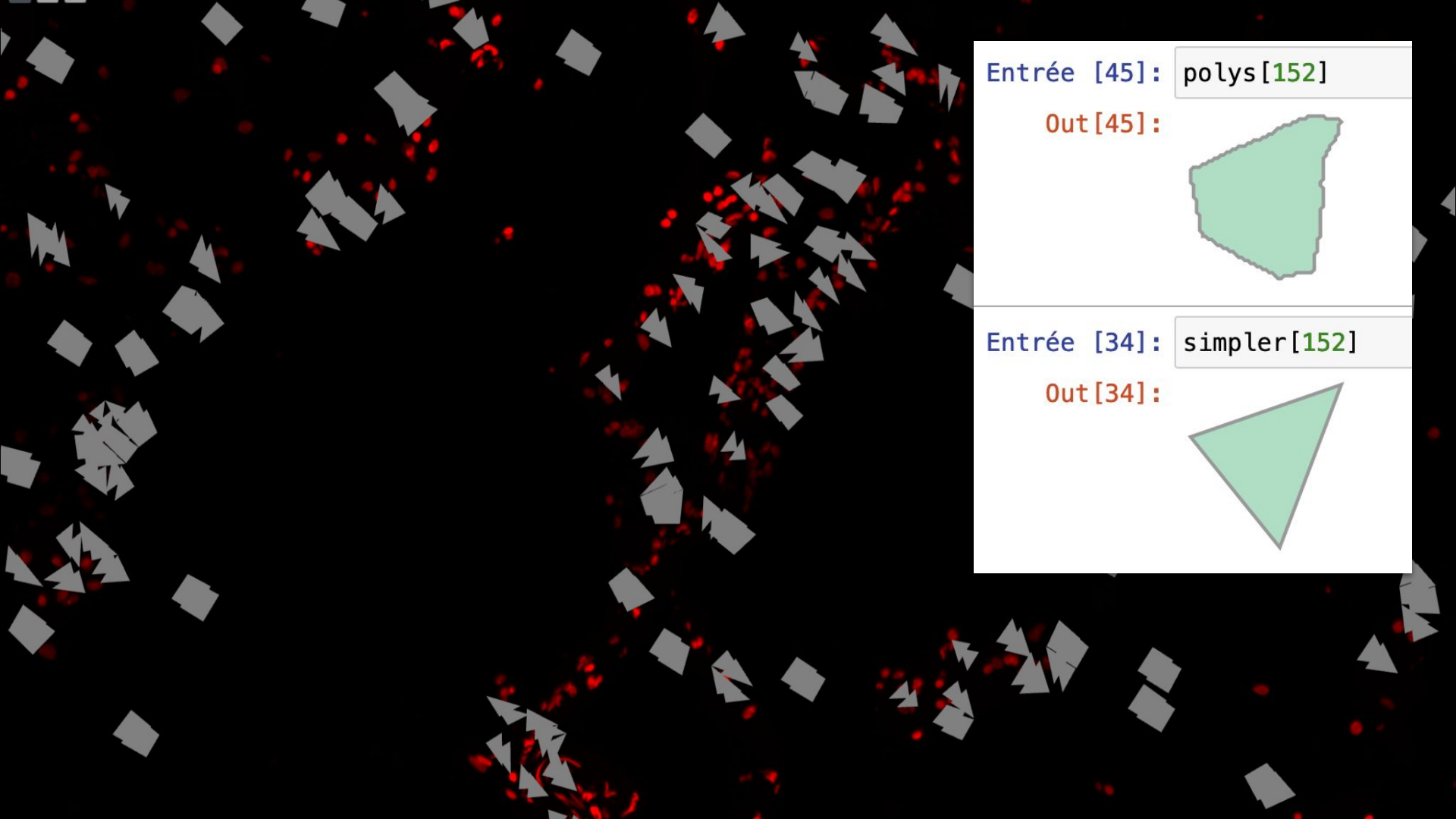
VISUALISATION APP



A stylized world map composed of glowing blue and green vector shapes on a black background. The map is formed by numerous small, interconnected circular and polygonal shapes that create the outlines of continents and countries. The colors are primarily a vibrant blue with some green highlights, giving it a digital or data-driven appearance. The map is centered on the Atlantic Ocean, with North and South America on the left and Europe and Africa on the right.

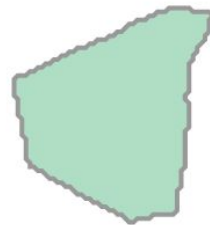
VECTOR LAYERS





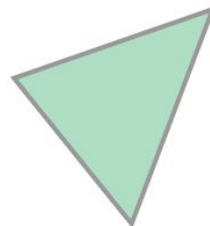
Entrée [45]: polys[152]

Out [45]:



Entrée [34]: simpler[152]

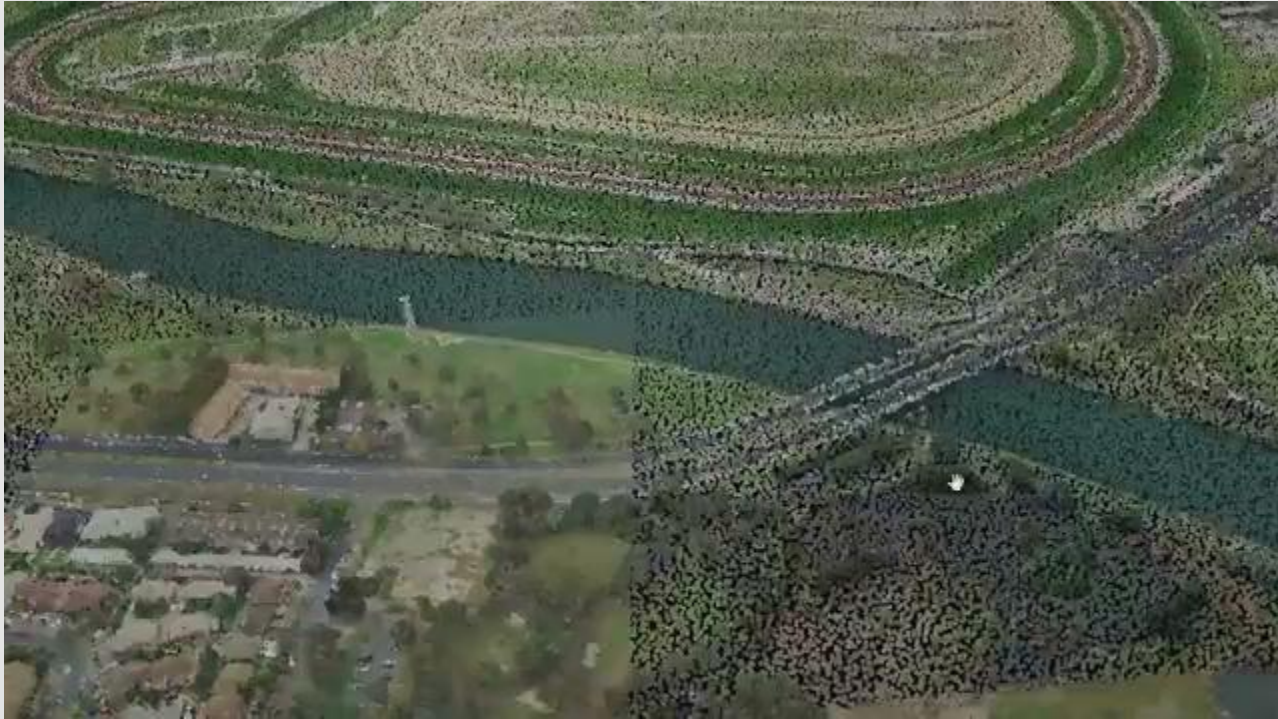
Out [34]:



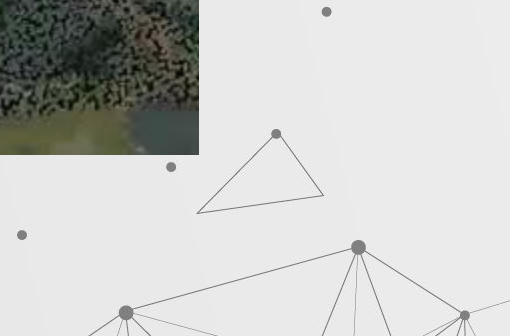


03

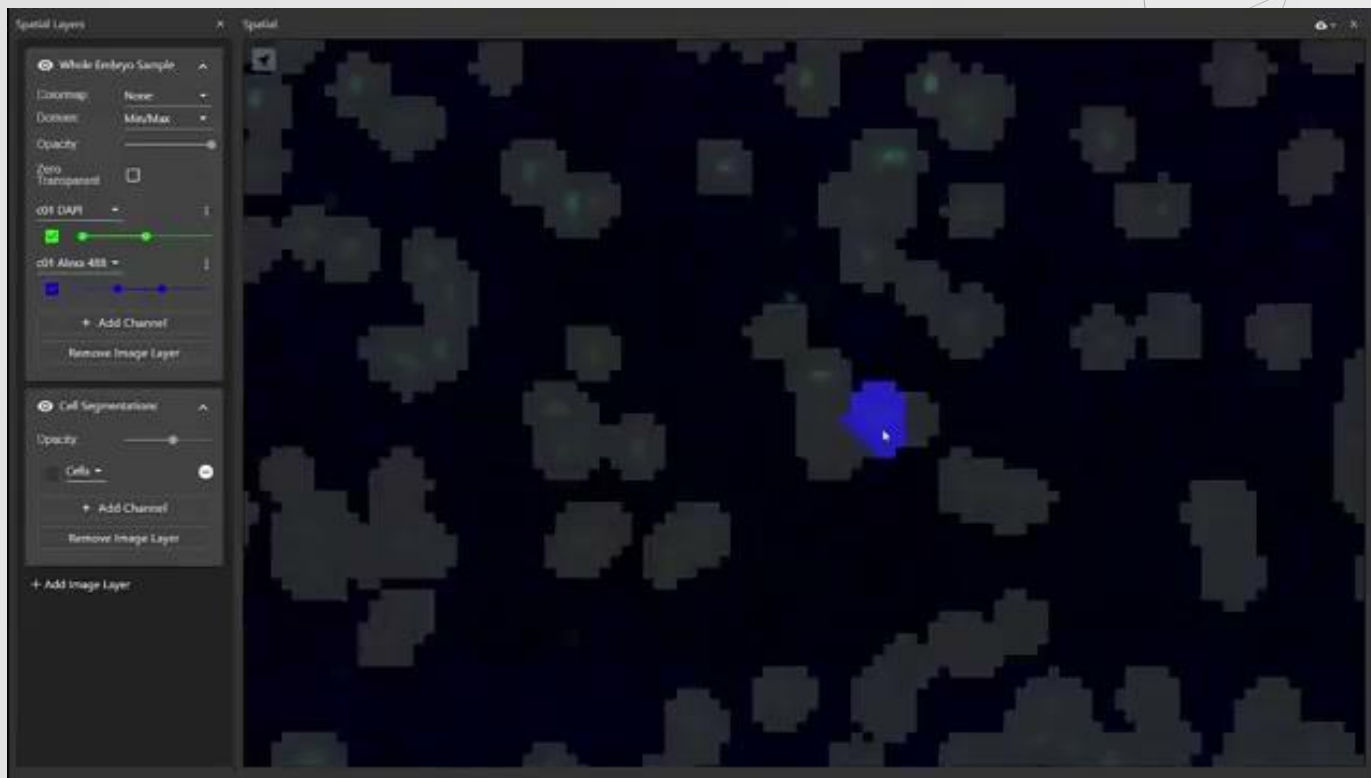
3D POINT CLOUDS

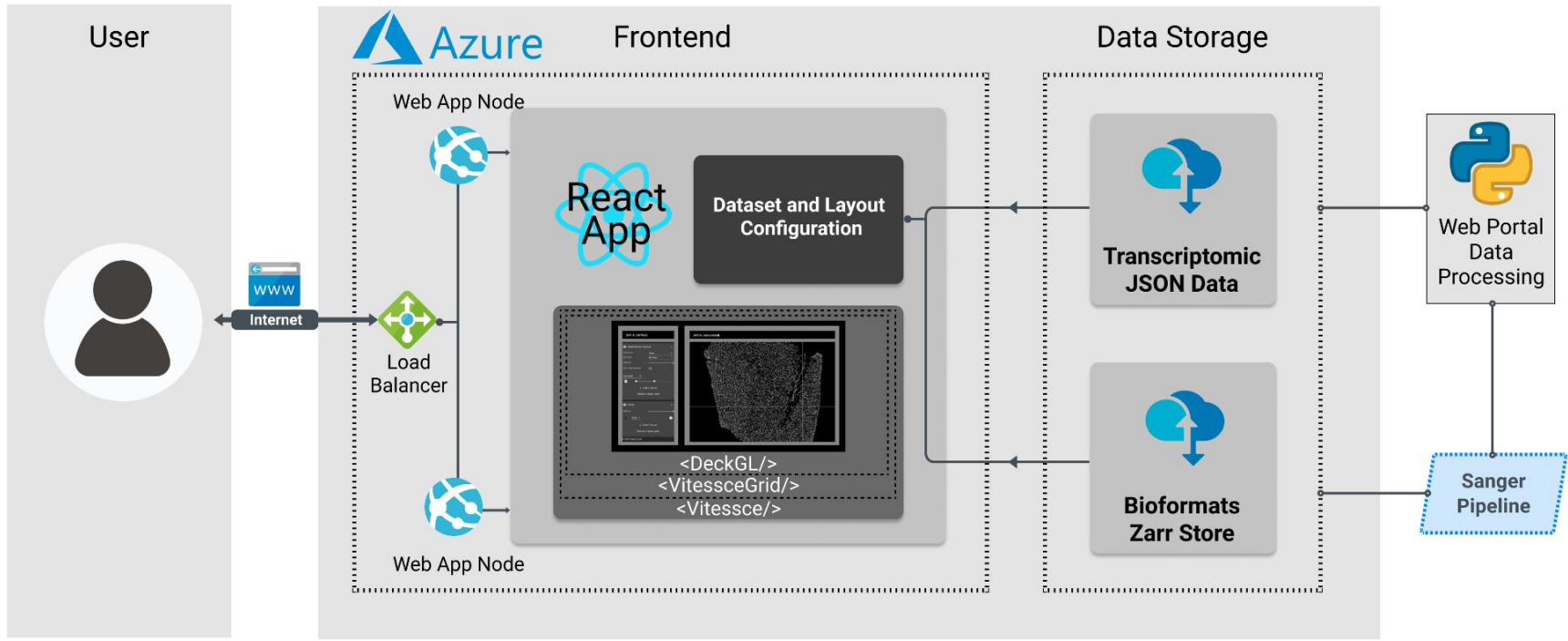


City of Melbourne 3D Point Cloud 2018, visualised in experimental Tile3DLayer of DeckGL



CELL BOUNDARIES AS RASTER BITMASKS





04

FILE FORMAT SPECS

Requirements for next generation Spatial-Omics file format specification that maps multiscale images and metadata into a single container

A background network diagram consisting of a complex web of thin grey lines connecting various grey circular nodes of different sizes. The nodes are scattered across the page, with a higher density on the left and right sides. The overall aesthetic is clean and modern.

THANKS

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