

# Data Visualisation In A Galaxy-style Virtual Environment

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## BACKGROUND

- Virtual reality (VR) can provide excellent affordances for visual data mining but workflows for this are not well-defined
- Dimensionality reduction can yield complicated, uninformative 2D outputs and new tools for interactive analyses are required for hypothesis generation from graph media
- To date, there are no available VR tools for data presentation that can be easily tailored to specific use-cases.

## AIMS

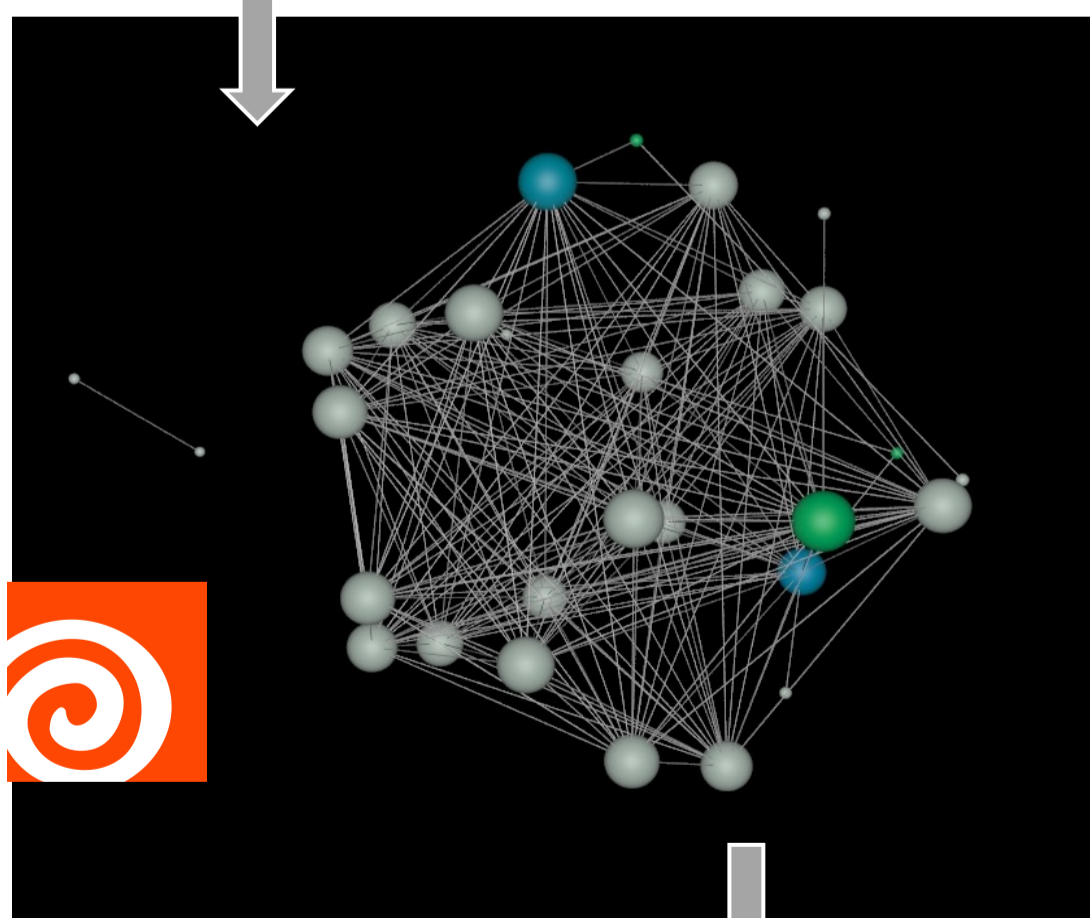
- To develop a workflow and solution for engaging and informative presentation of large biomedical datasets in VR with a focus on affordability and accessibility
- To assess value of VR affordances such as haptic feedback and stereoscopic sound (ongoing)
- To subsequently evaluate the objective usefulness of developed data simulation (ongoing)

## METHODS (EXAMPLE FOR NETWORK DIAGRAM)

The methodology for data processing will vary based on the intended output type



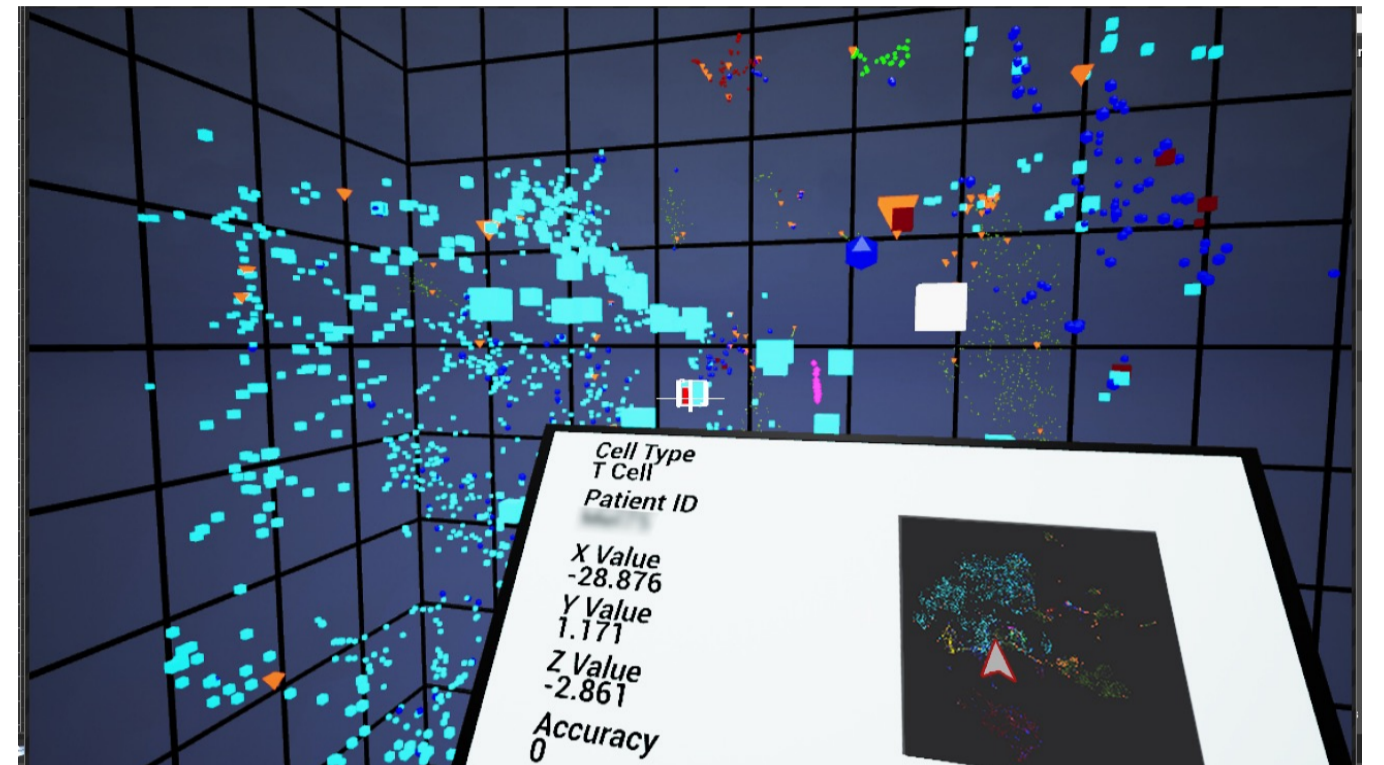
Nodes and edges data hard-coded into Houdini 3D modelling software



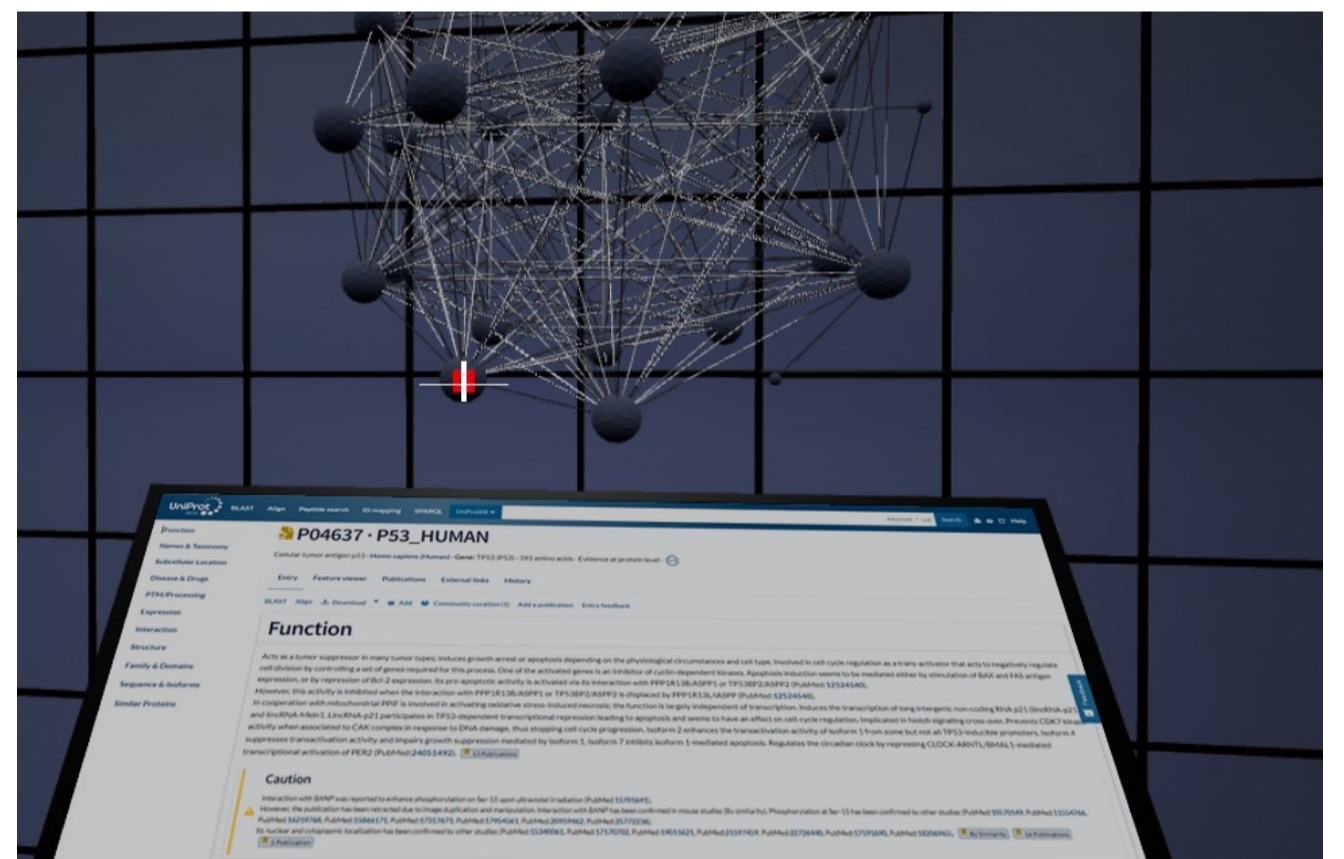
Resulting geometry used in Unreal Engine 4 and viewed in VR on Oculus Rift or flatscreen monitor



## RESULTS



- In presentation of 3D UMAP-reduced datasets, the tool displays all original data on a virtual computer screen
- Each data point is interactive and can be clicked on to reveal information otherwise lost in the reduction process
- Each cluster emits ambient noise assisting with user orientation and haptic feedback assists with point selection. A mini-map also assists user orientation



- The tool can augment visual analysis by including additional information from external databases
  - In this ubiquitous visualisation, clicking the data point "TP53" will display its *Uniprot* entry on the virtual monitor

## CONCLUSION & FUTURE DIRECTIONS

- VR provides new affordances for hypothesis generation from interrogation of outputs from dimensionality reduction
- We will develop workflows for additional visualisations such as 3D dendrograms from hierarchical clustering of principal components (HCPC)
- Conducting VR research during the pandemic has been difficult however we will formally evaluate the tool in 2022 with additional biomedical datasets