Interactive Exploration of Large-Scale Datasets with Jupyter-Scatter

Fritz Lekschas

@flekschas
lekschas.de

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SciPy '23

WORK

Head of Visualization Research at Ozette

EDUCATION

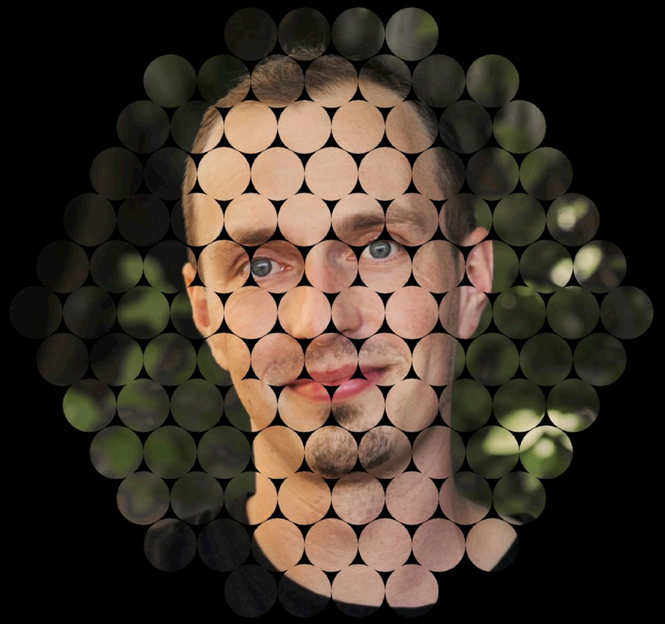
PhD '21 in CS from Harvard University

RESEARCH

Visualization | Human-Centered ML | Design

PASSION

Embeddings & Scatter plots!



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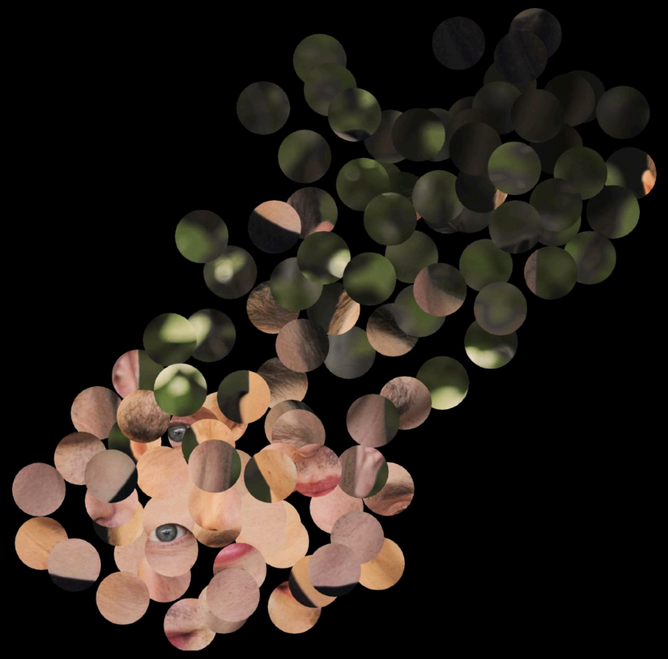

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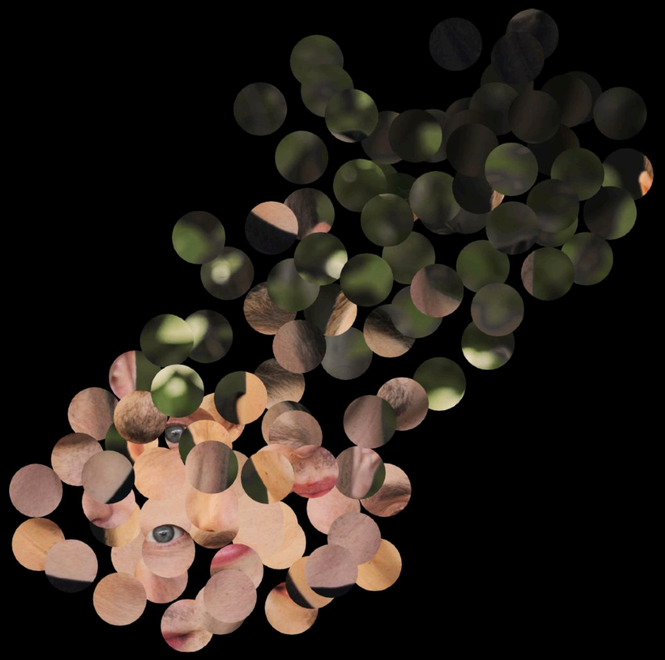
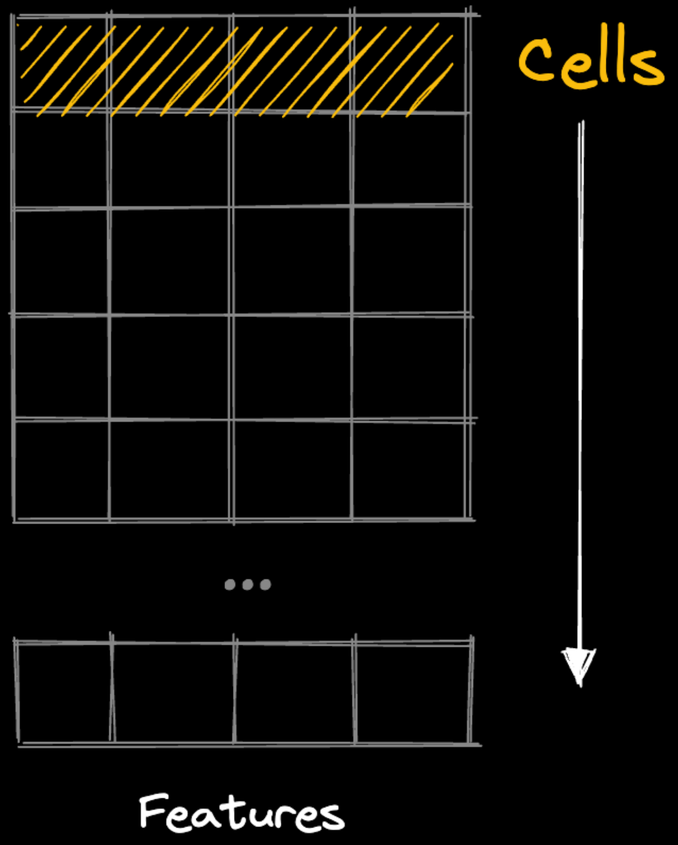
Single-Cell





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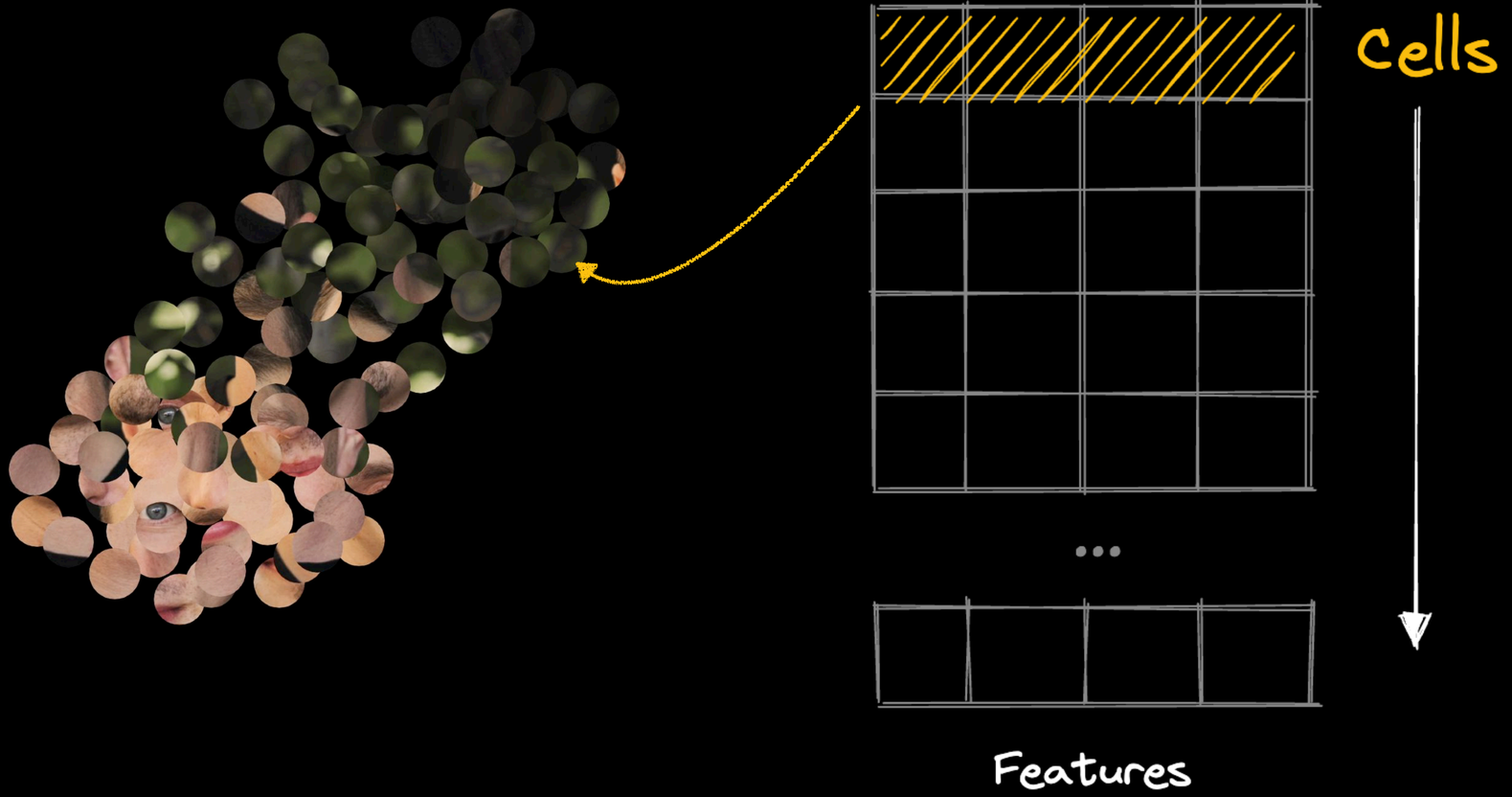

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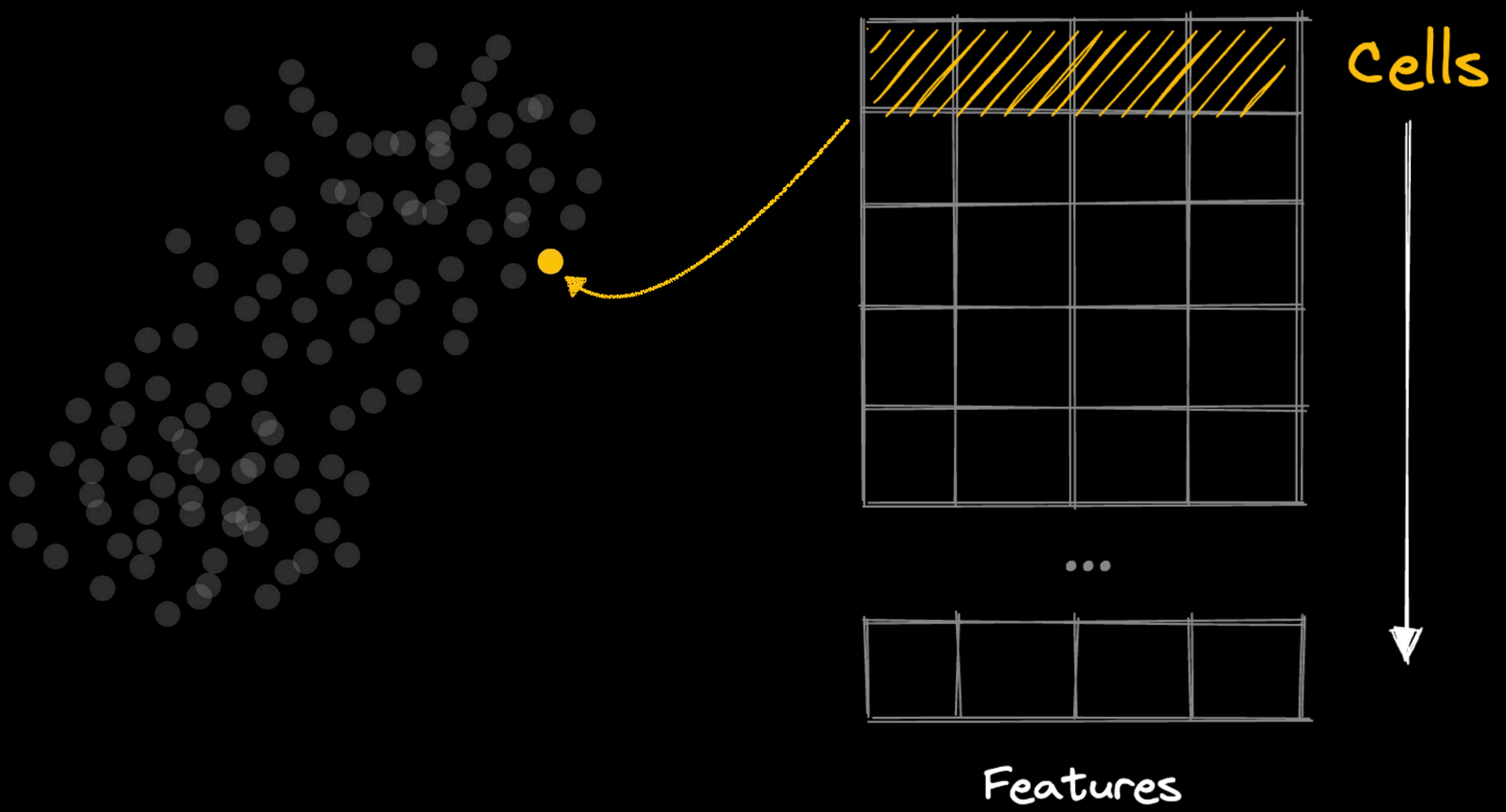
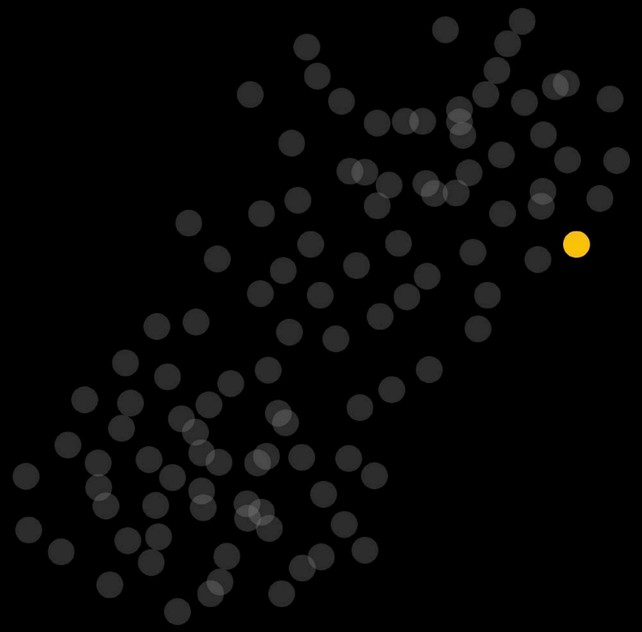
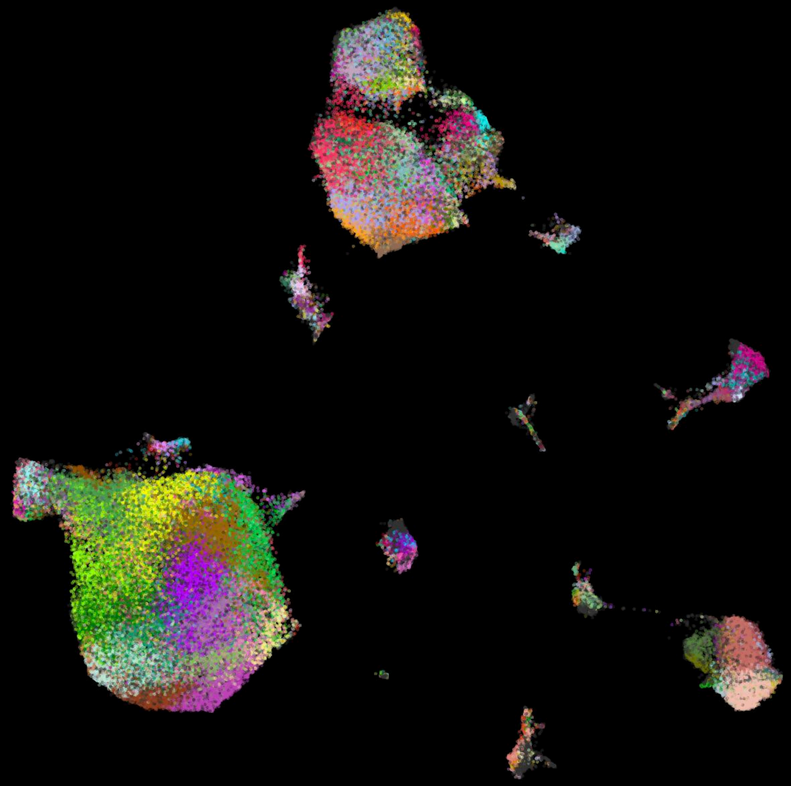




USEFUL FOR

Overview of Data
Explore & Compare Clusters



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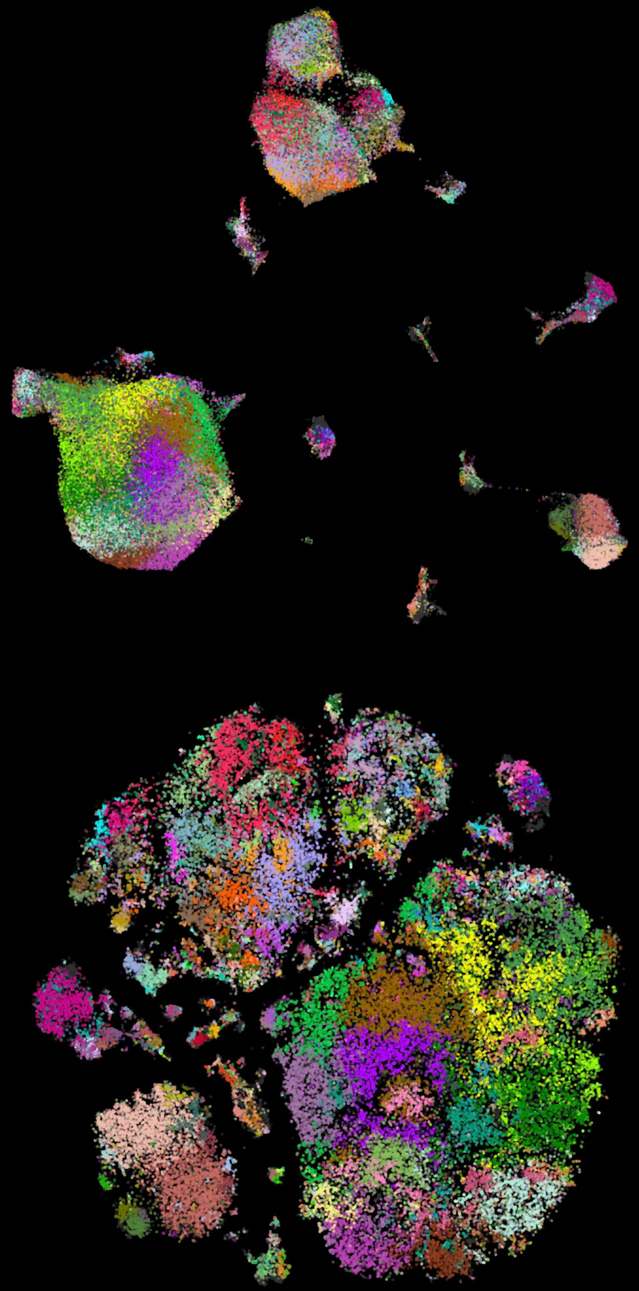

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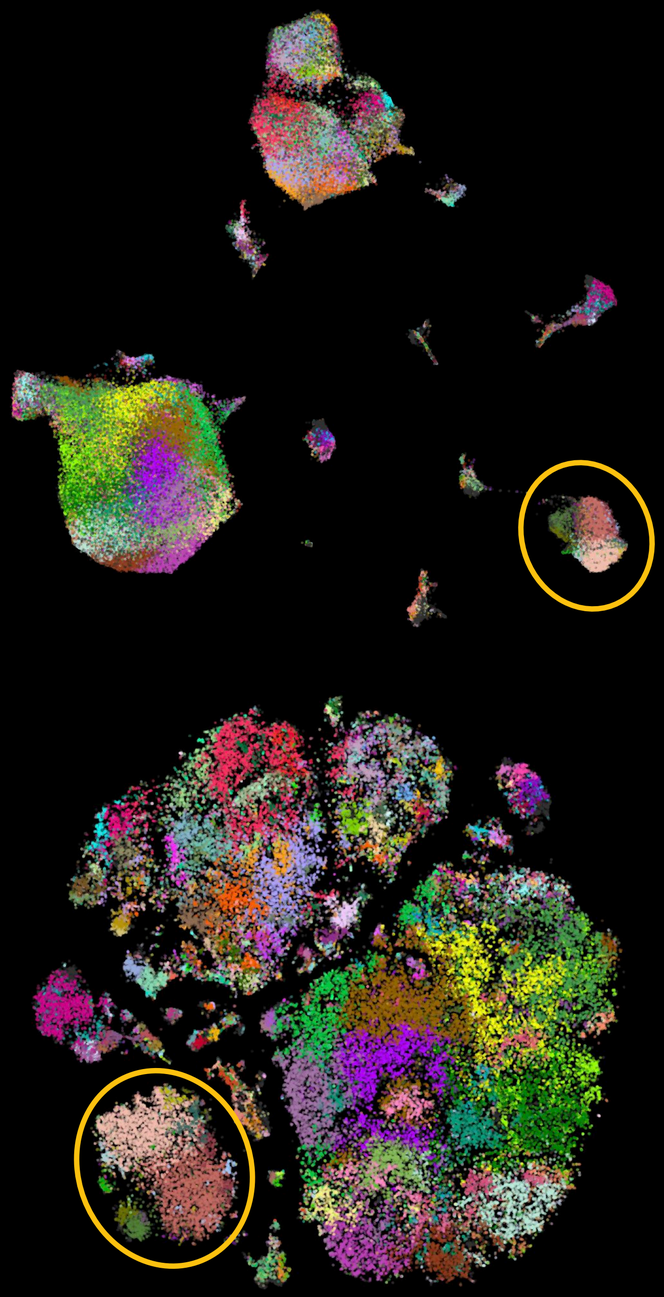

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Jupyter Scatter

A widget for interactive exploration of large-scale scatter plots.

pip install jupyter-scatter

github.com/flekschas/jupyter-scatter

GOALS

1. Scale to millions of points
2. Support interactive pan+zoom and selections
3. Offer perceptually-effective defaults
4. Allow linking multiple scatter plots
5. Expose via an easy-to-use API

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Biology

- Single-Cell
- Genomics

Natural Language Processing

- Word Embeddings
- Document Embeddings

Computer Vision

- Image Embeddings
- Generative AI

Geospatial Data

...

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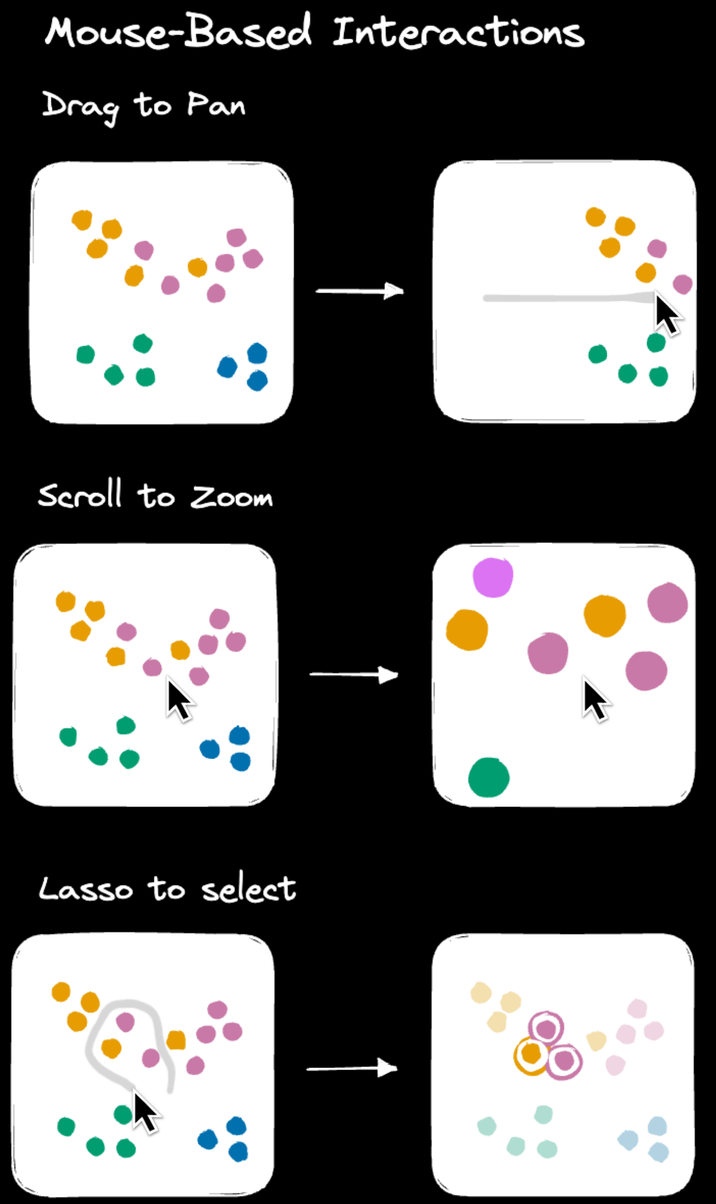

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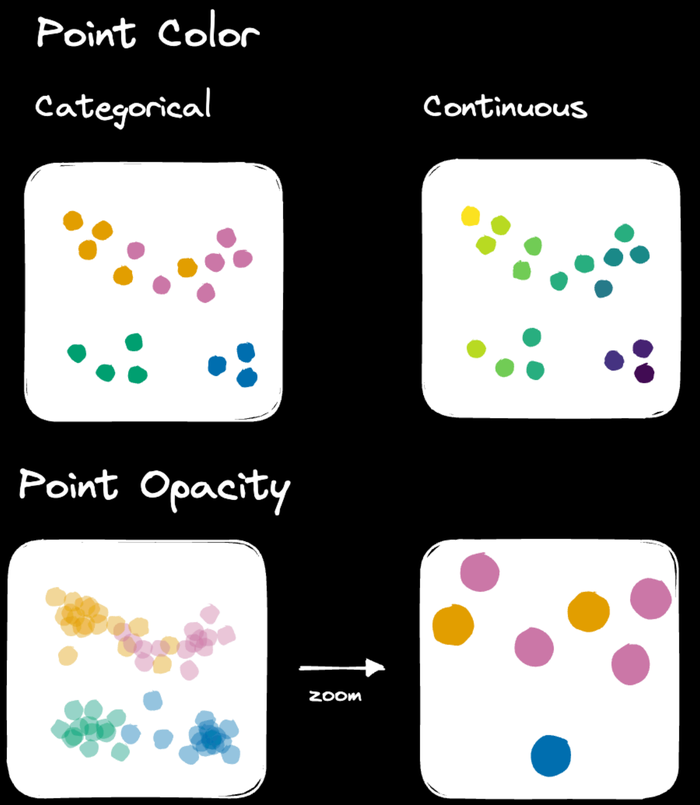

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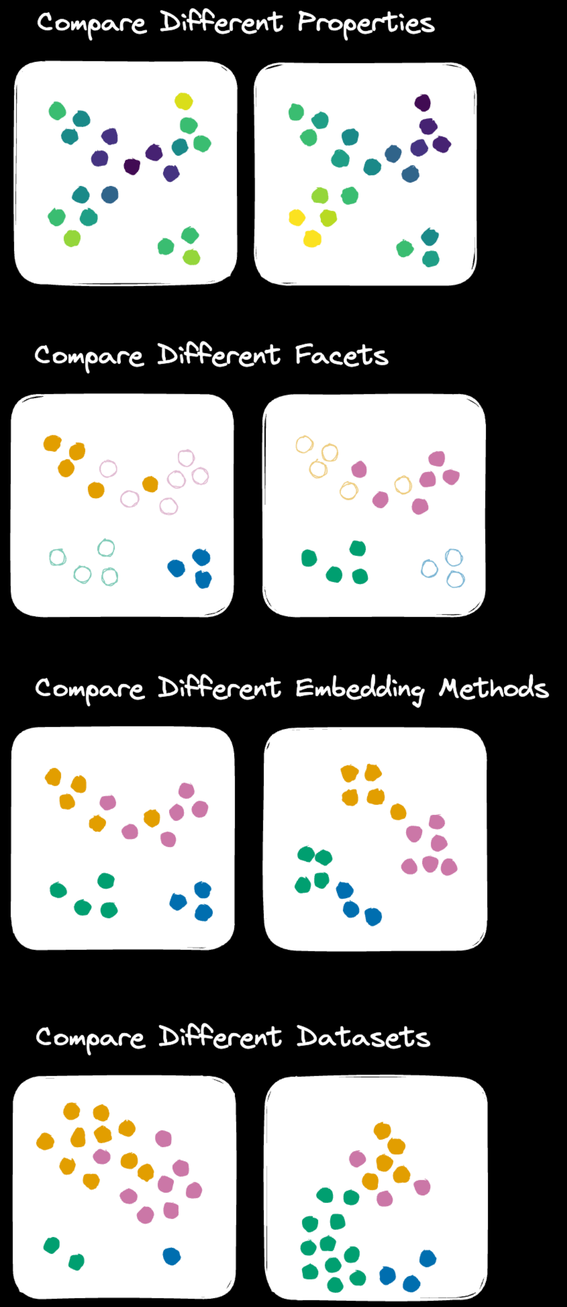

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Integrate with Pandas DataFrame

```
Scatter(
    data=df,
    x="column_a"
    y="column_b"
)
```

Readable API

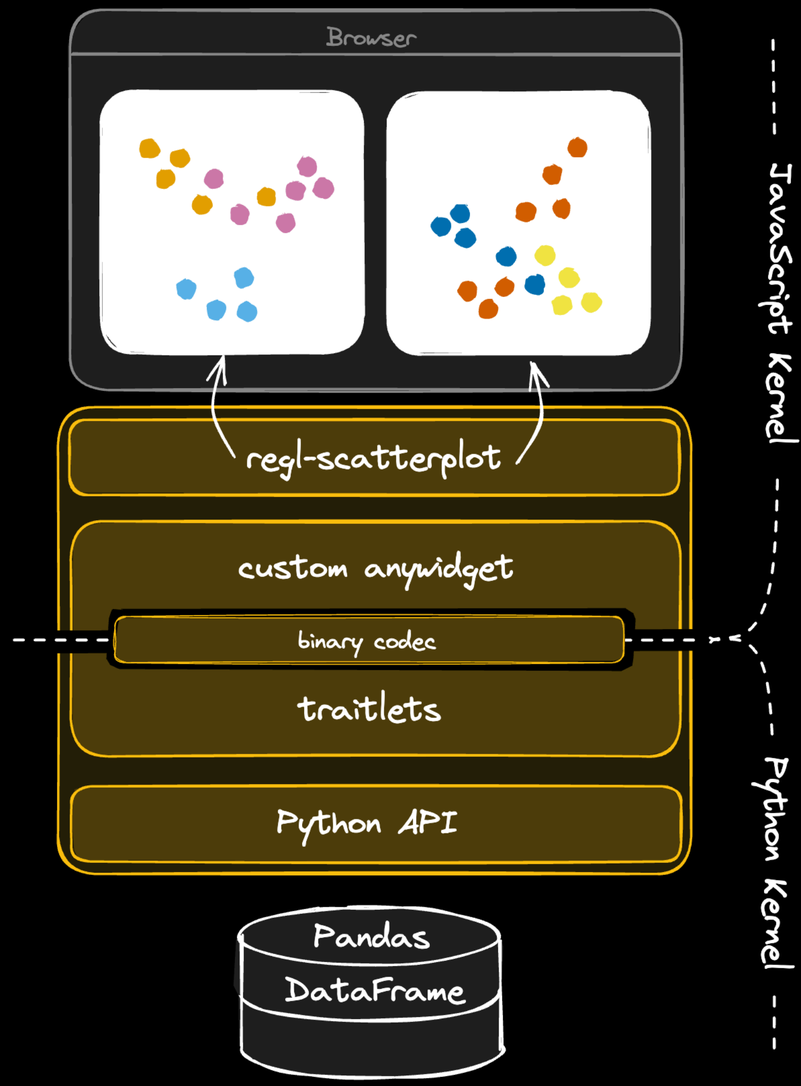
```
scatter.color(by="column_c")
scatter.opacity(0.5)
scatter.size(12)
scatter.height(320)
scatter.selection([1, 2, 3])
```

Live Demos!

https://github.com/flekschas/jupyter-scatter-tutorial

ARCHITECTURE

1. WebGL Rendering via `regl-scatterplot`[1] for fast plotting
2. Python API layer for integrating with Pandas and configuring `regl-scatterplot`[1]
3. Ipywidgets for communication with Jupyter via `anywidget`[2]



1) https://github.com/flekschas/regl-scatterplot/
2) https://github.com/manzt/anywidget/

🚨 MASSIVE SHOUT OUTS!

Trevor Manz for the codec design, anywidget integration, & tutorial setup

Nezar Abdennur for feedback on the API design

Ricky Reusser for his inspirational work on selecting the right point opacity

Rye Terrell for his beautiful multi-instance WebGL rendering approach

Thanks!

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- github.com/flekschas/jupyter-scatter-tutorial

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