To a Billion and Beyond

How to Visually Explore, Compare and Share Large Quantitative Datasets with HiGlass

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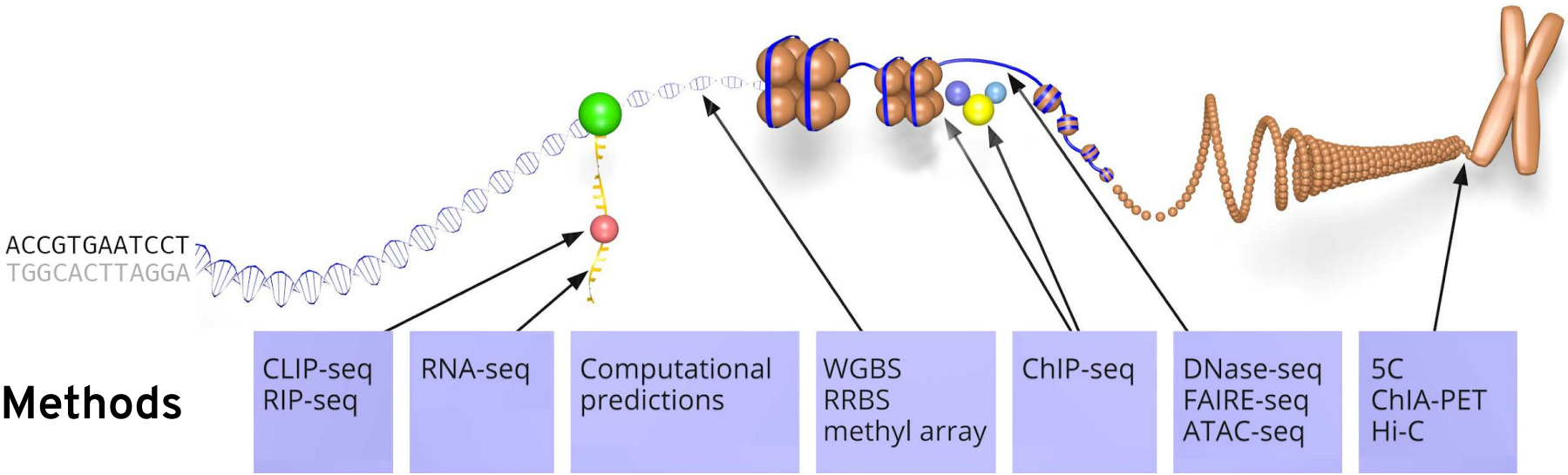
Genomics

where we come from



Methods

Image taken and slightly adapted from encodeproject.org

Principal Challenges

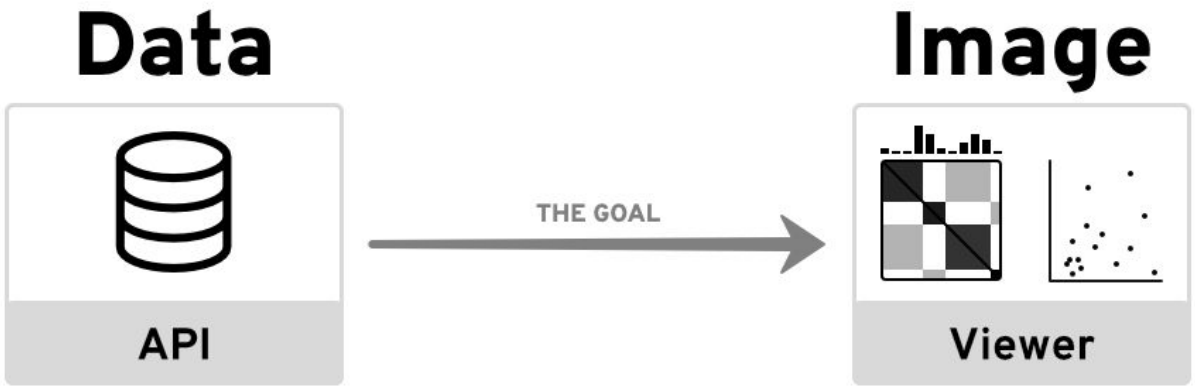
Multiscale
Patterns arise at various resolutions

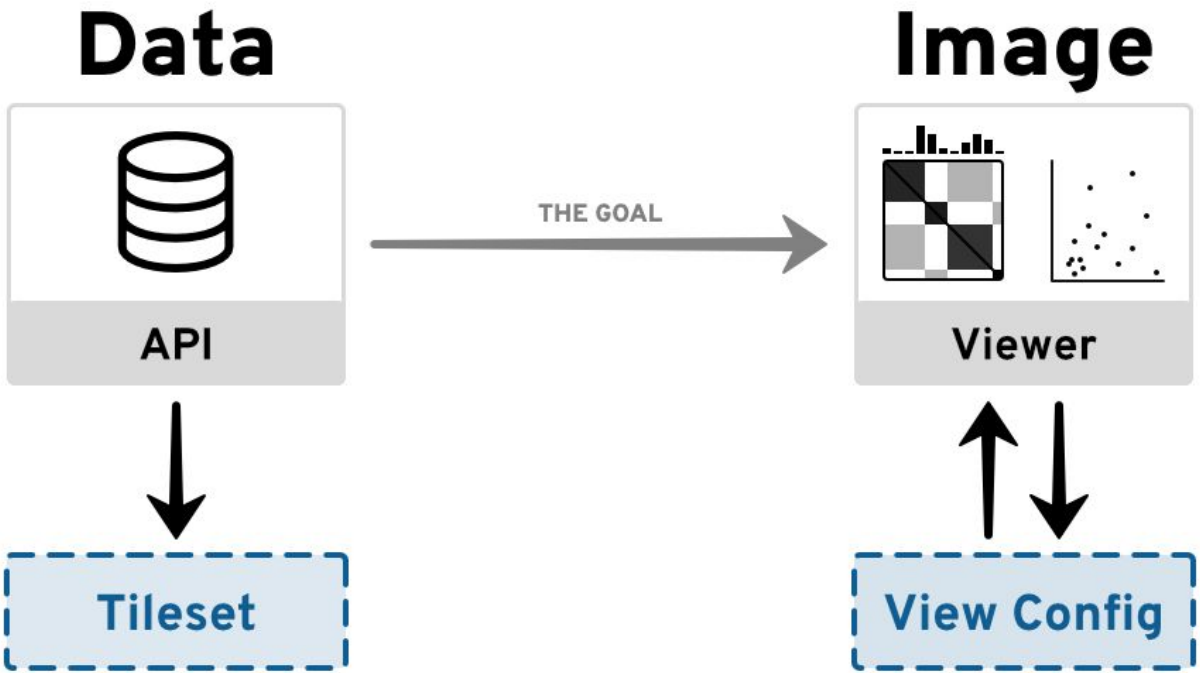
Multimodality
Different data types and synchronized viz

Multiple comparable datasets
Insights arise from differences

Collaborative Exploration
Share exploratory state, not the end result

Architecture


Data
API
THE GOAL
Image
Viewer


Data
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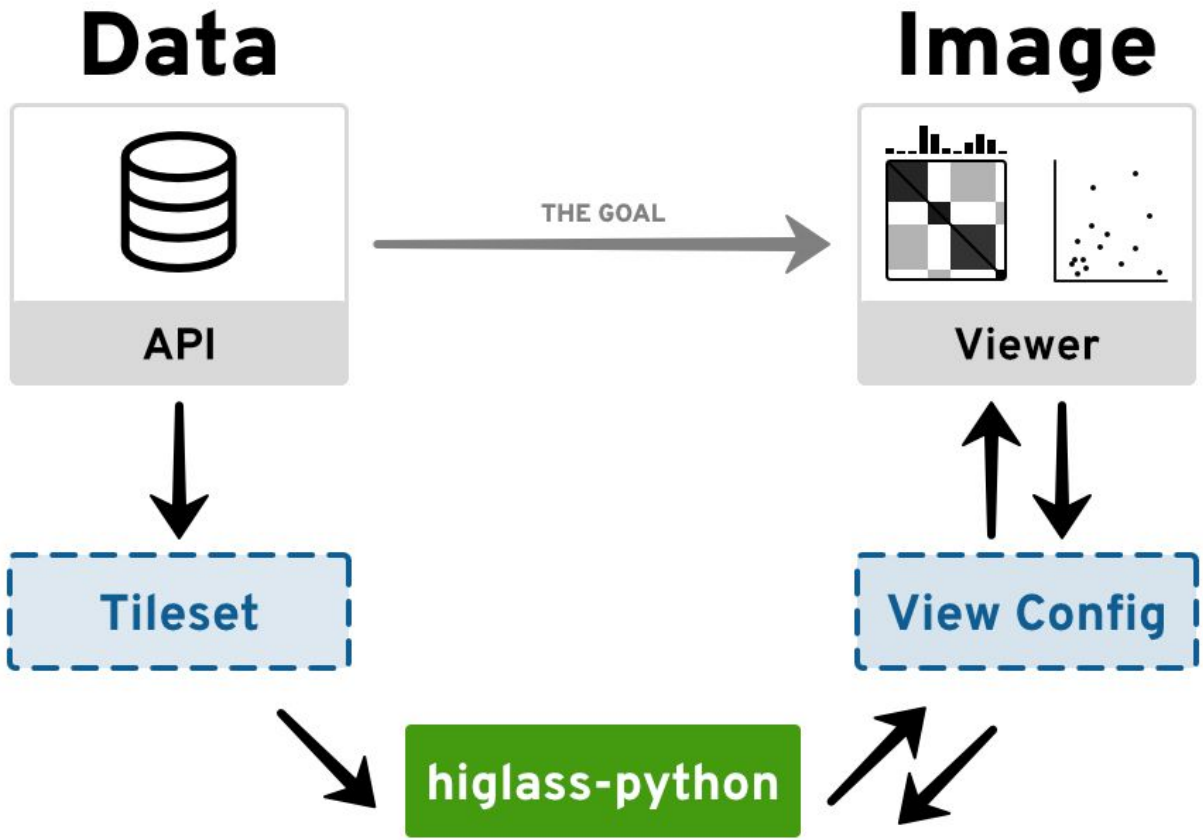
API
Viewer
Tileset
View Config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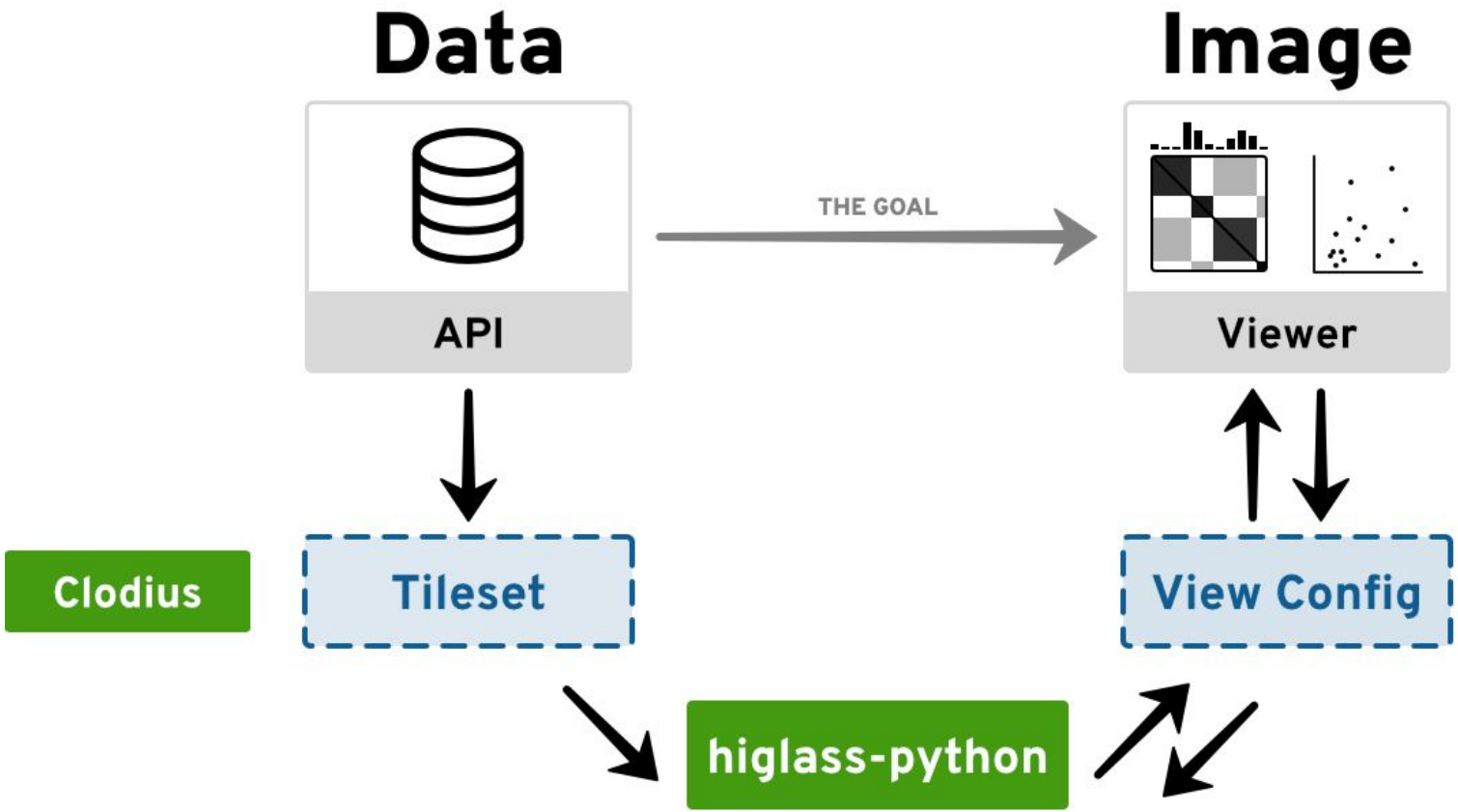
higlass-python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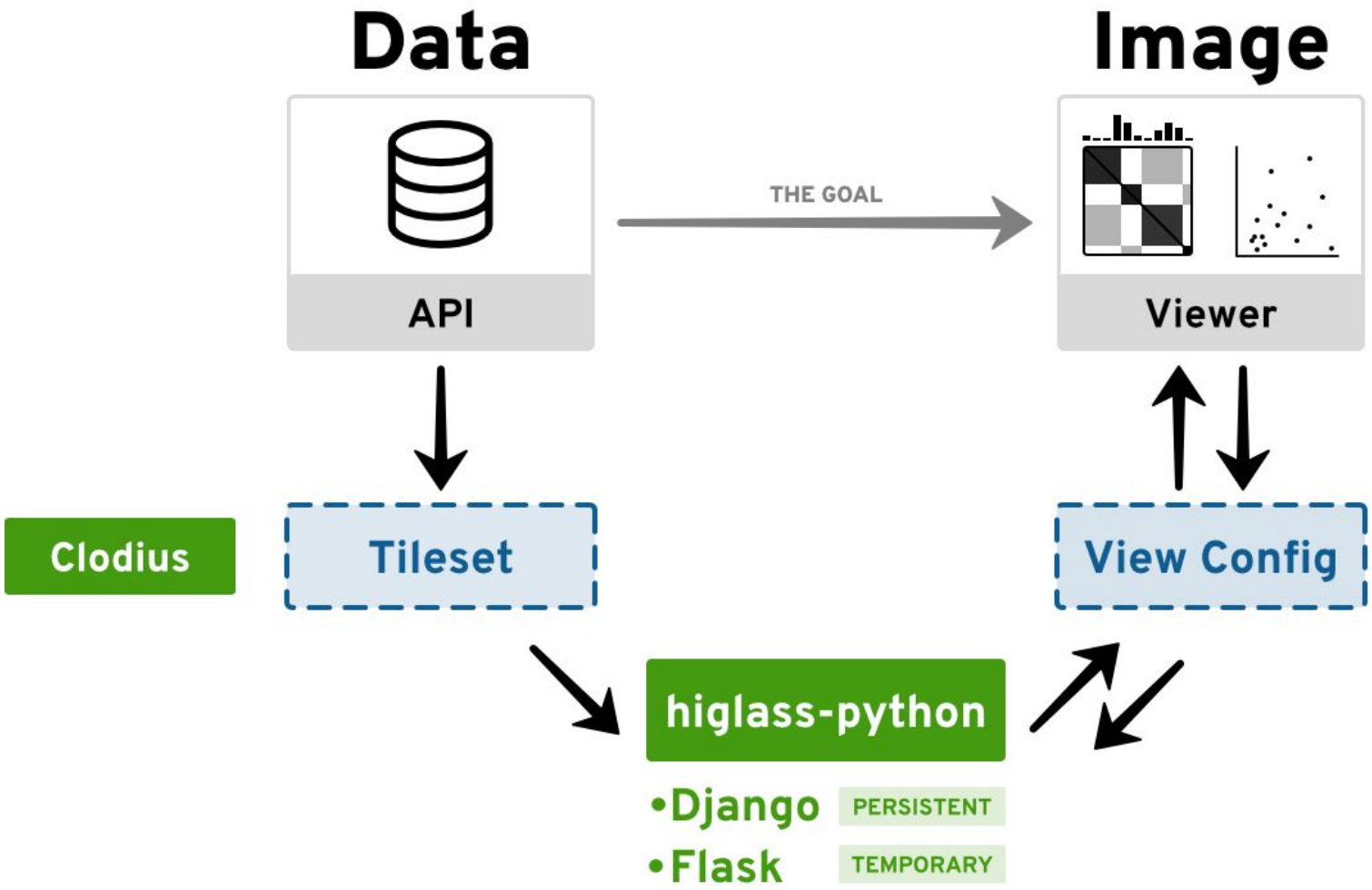
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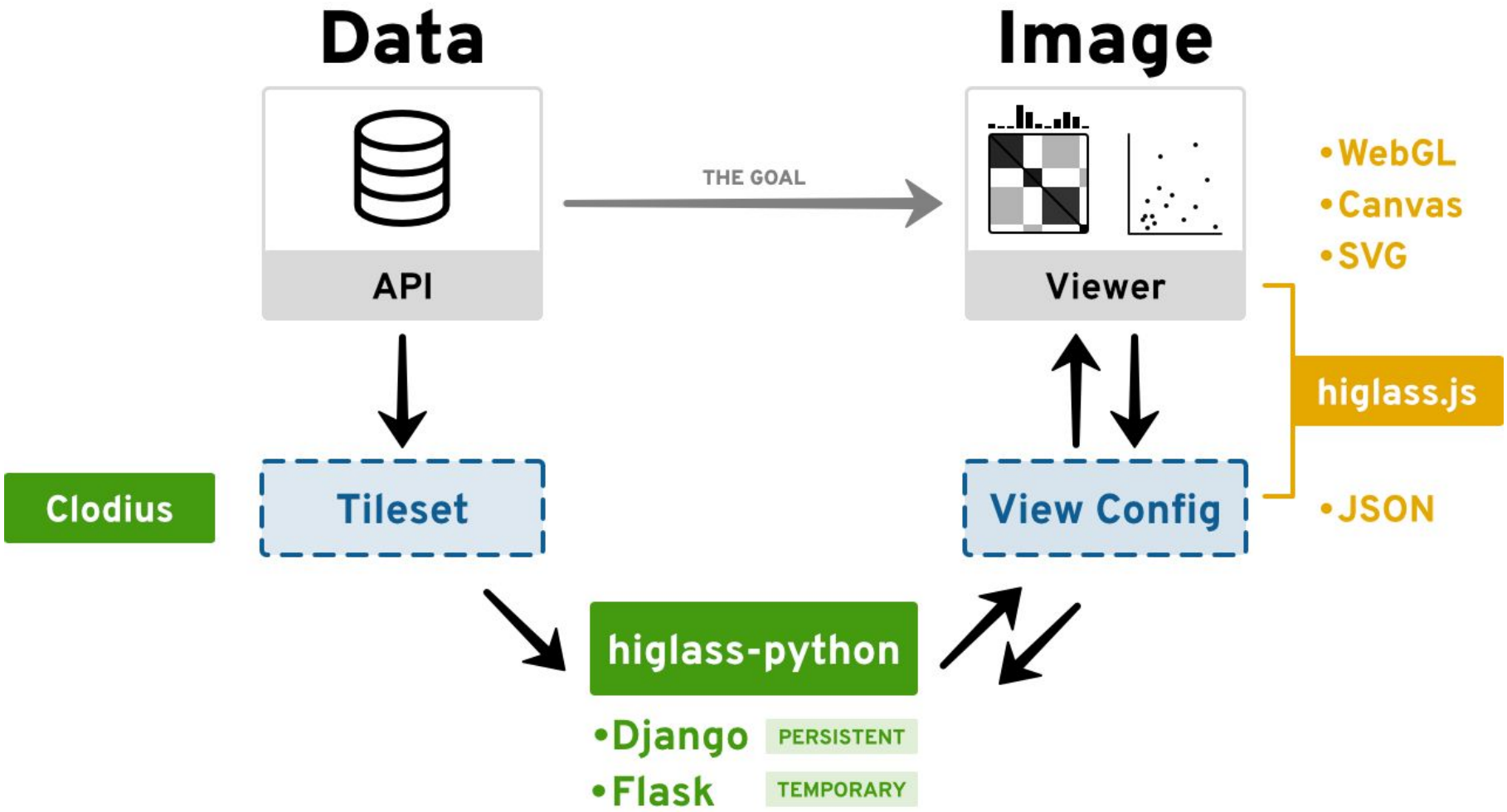
•Django
PERSISTENT
•Flask
TEMPORARY


Data
Image
API
THE GOAL
Viewer
•WebGL
•Canvas
•SVG
higlass.js
Clodius
Tileset
View Config
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higlass-python
•Django
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TEMPORARY

Python API

All demos are available at
github.com/higlass/scipy19

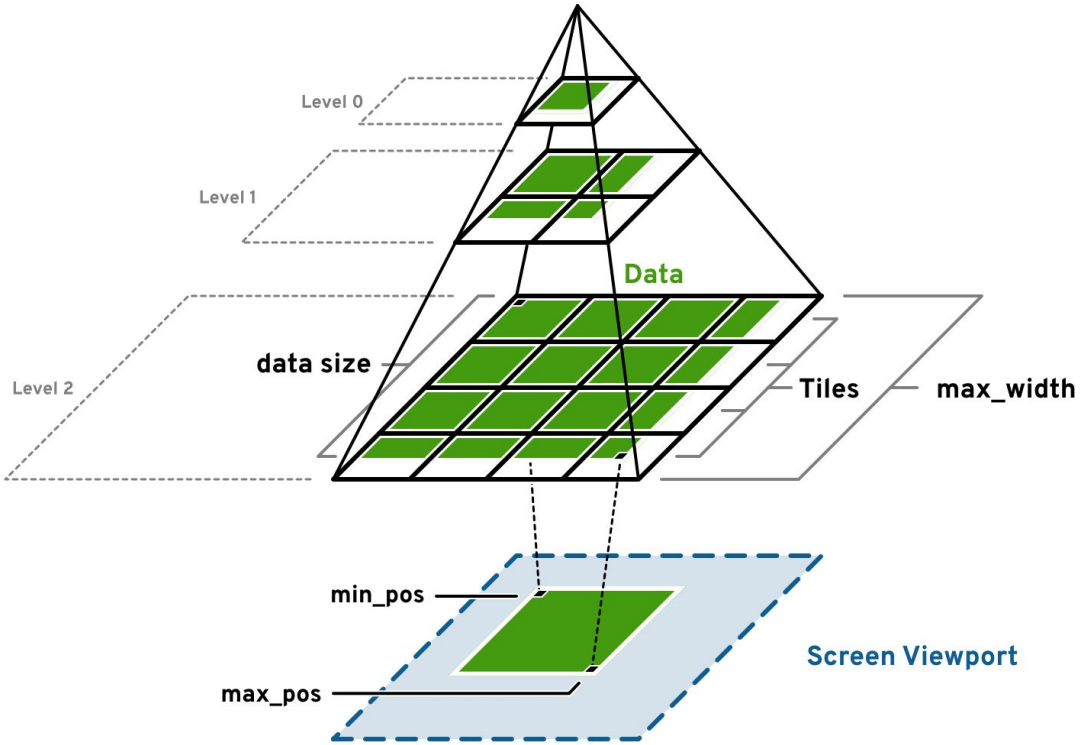
HiGlass in Jupyter

(see temperature.ipynb)

Tileset API

Tileset API

Generates or fetches 1D or 2D data tiles



tileset_info()

→ min_pos & max_pos: relative to the scene

tile_size: size of the tiles (in pixels)

max_zoom: $\lceil \log_2(\text{tile mesh size} / \text{tile size}) \rceil$

max_width: $\lceil \text{tile mesh size} / \text{tile size} \rceil$

tiles(tile_ids)

← [<uuid.z.x.y>, ...]

→ {<uuid.z.x.y>: {

dense, min_value, max_value, dtype

}, ...}

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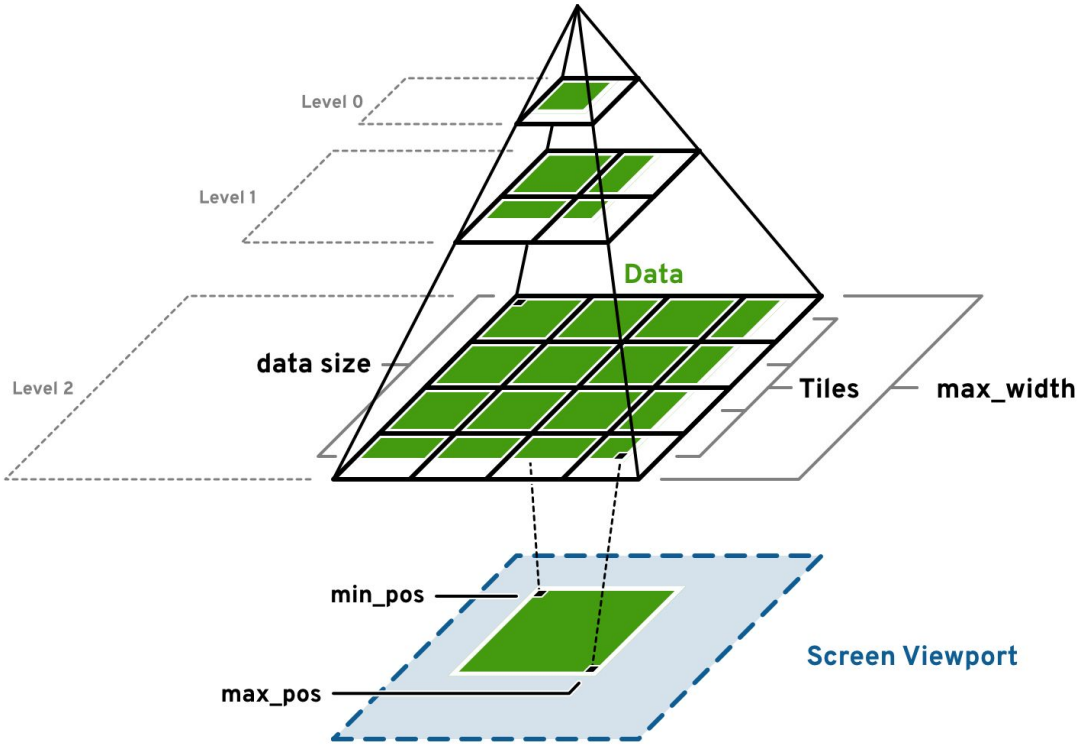

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Base64-encoded raw data

Tileset API Demo

(see point-data.ipynb)

View Configs

View Config

- Views

  Shared location and zoom

  - Layout
  - Tracks

- Locks

  For view synchronization

- Globals

  Server URLs, editability

```
{
  "views": [
    {
      "uid": "aa",
      "initialXDomain": [0, 100],
      "initialYDomain": [0, 100],
      "layout": {
        "x": 0,  "y": 0,
        "w": 12, "h": 6,
      },
      "tracks": {
        "top": [],
        "left": [],
        "center": [],
        "right": [],
        "bottom": []
      }
    }
  ],
  "zoomLocks": { ... },
  "locationLocks": { ... },
  "valueScaleLocks": { ... },
  "editable": true,
  "zoomFixed": false,
  "trackSourceServers": ["/api/v1"],
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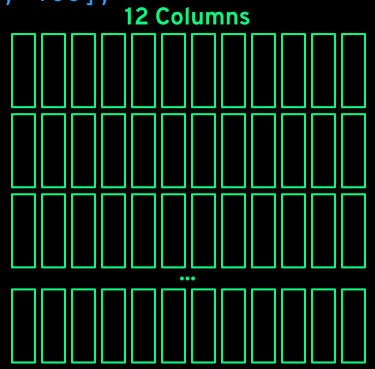

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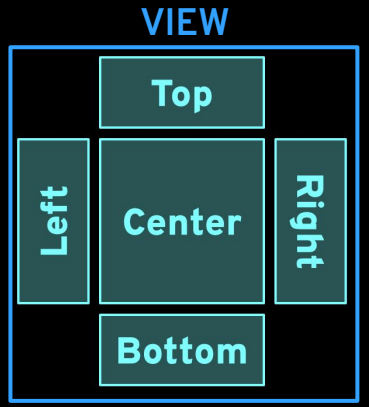


Track Config

- **Type**
  general encoding
- **Server**
  track data source
- **Tileset UID**
  data identifier
- **UID**
  track identifier
- **Options**
  For styling, labeling, etc.

```
{
  "type": "horizontal-line",
  "server": "//higlass.io/api/v1",
  "tilesetUid": "OHJakQICQD6gTD7skx4EWA",
  "uid": "my-very-fancy-line-plot",
  "options": {
    "name": "My Very Fancy Line Plot!",
    ...
  },
}
```

Advanced Features

Advanced Features

(see nyc-taxi.ipynb)

Developer Features

Modular Codebase

Tiling, serving, and rendering are decoupled

E.g., viewer, server, tileset API, docker

Viewer Extensibility

Simple plugin architecture for new track types

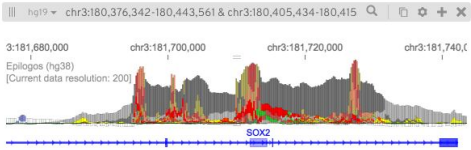
E.g., Epilogos, GeoJSON

JavaScript APIs for Integration

Library version, React component, JsAPI

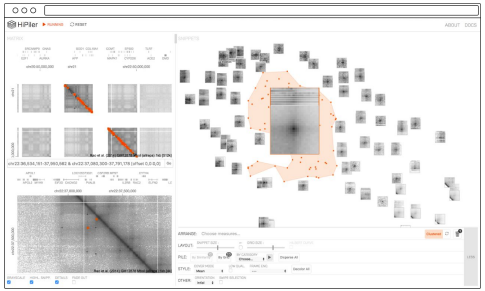
E.g., HiPiler, Peax, cTracks

EPILOGOS



GEOJSON

HIPILER



PEAX

Communication & Collaboration

(see genomics.ipynb)

HiGlass

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TWITTER: @higlass_io

Scipy Slack Channel
#higlass

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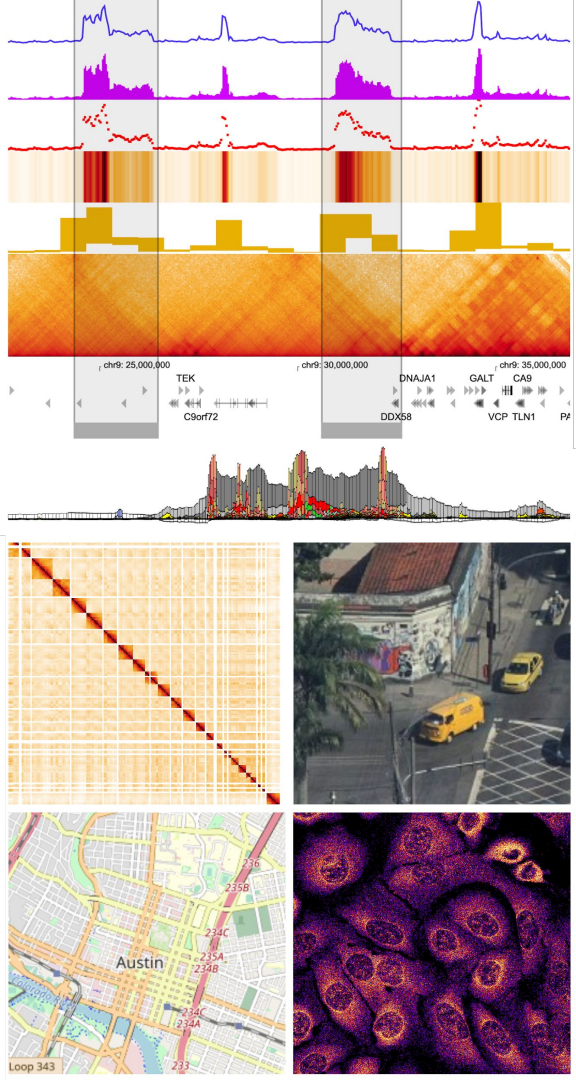
4D Nucleome



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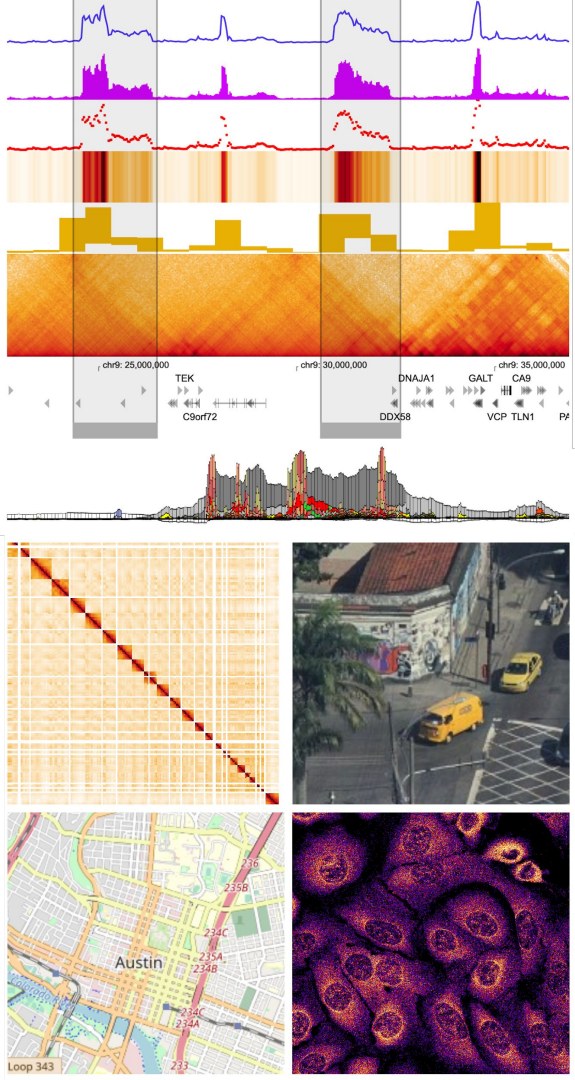
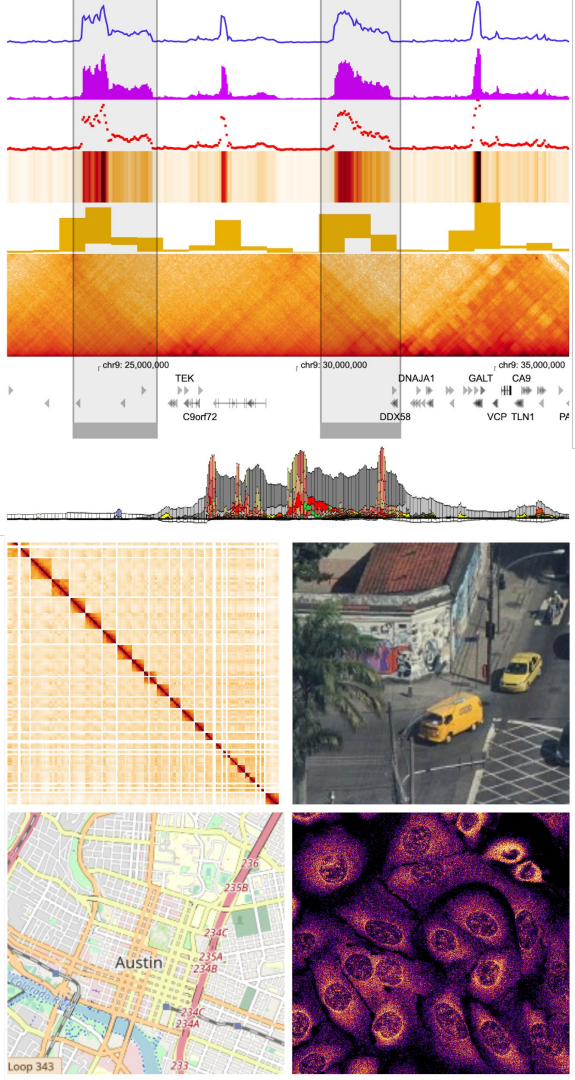
4D Nucleome

cooler



HiGlass

Contributors & Acknowledgements



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