

Visualization and exploration of a billion stars in the Jupyter notebook.

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vaex

Challenge

With large astronomical catalogues (>1 billion) such as the Gaia catalogue, and Pan-STARRS we need new methods to visualize and explore these large datasets. Scatter plots lead to overplotting, making these often useless and too slow ($\gg 1$ minute).

Solution

We solve the performance and visualization issue using binned statistics, e.g. histograms, density maps, and volume rendering in 3d. The Python package **vaex** can process a billion rows per second, and visualize it.

Websites

<http://vaex.astro.rug.nl>

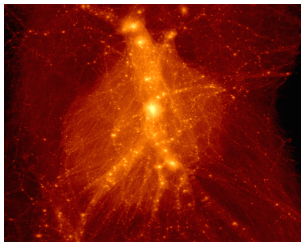
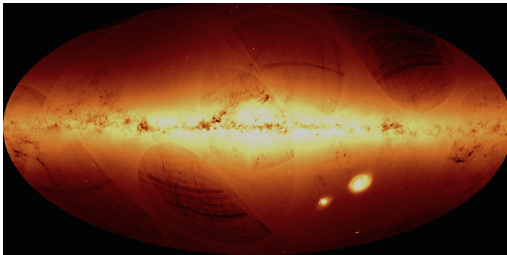
<https://github.com/maartenbreddels/vaex>

Summary

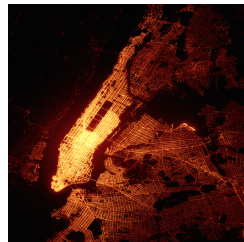
Yes, you can visualise 1 billion stars (e.g. the whole Gaia catalogue) in ~ 1 second.

Examples:

Whole Gaia DR1 catalogue (1e9 stars)



Aquarius-A2 dark matter simulation (6e8 particles)



New York Taxi dataset (1e9 rows)

ipyvolume

The missing 3d plotting library

The Python Jupyter notebook is often the default environment for (data) scientist. However, it is (or was!) lacking a 3d visualisation library that integrates in the notebook.

Solution

ipyvolume:

- easy matplotlib like API
- volume rendering
- scatter + quiver plot
- animations

Upcoming

- Lines and mesh plotting
- 100x faster binary data transfer

Websites:

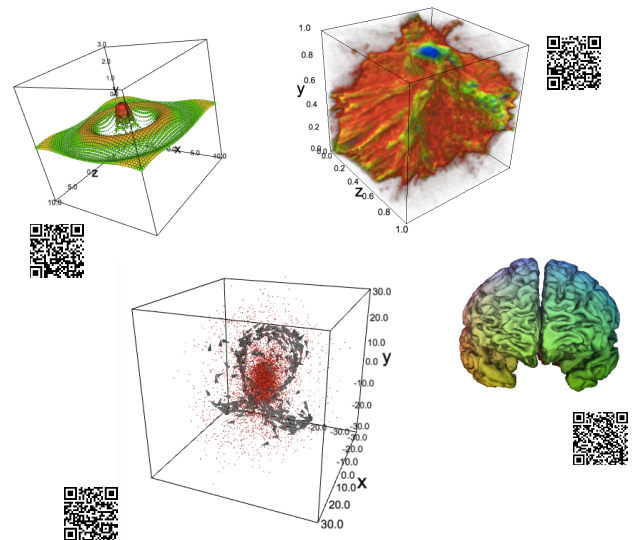
<https://ipyvolume.readthedocs.io/>

<https://github.com/maartenbreddels/ipyvolume>

Summary

Interactive 3d plotting in the Jupyter notebook

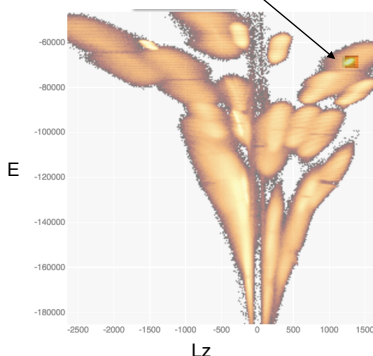
Examples (scan the QR code for a live demo):



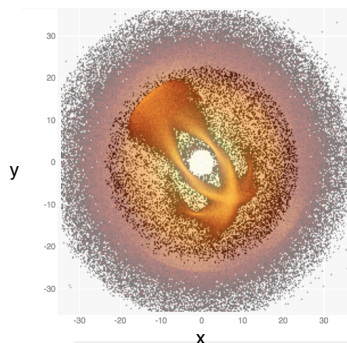
Psst, it also does virtual reality rendering (Google cardboard)

Combing vaex, bqplot and ipyvolume in the Jupyter notebook

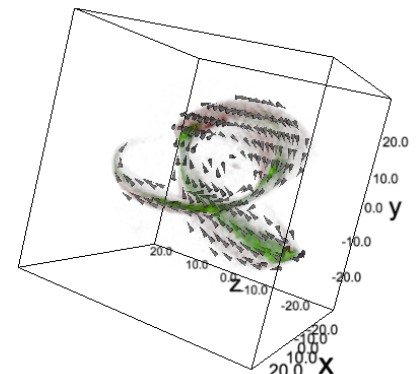
Selecting a clump in energy-angular momentum space



This selection corresponds to a stream, but projected in 2d



Using ipyvolume we can visualize this in 3d



TL;DR, but show my how to generate some of these plots! Check out <https://goo.gl/vk6ccX>

