SARRACEN

Andrew Harris

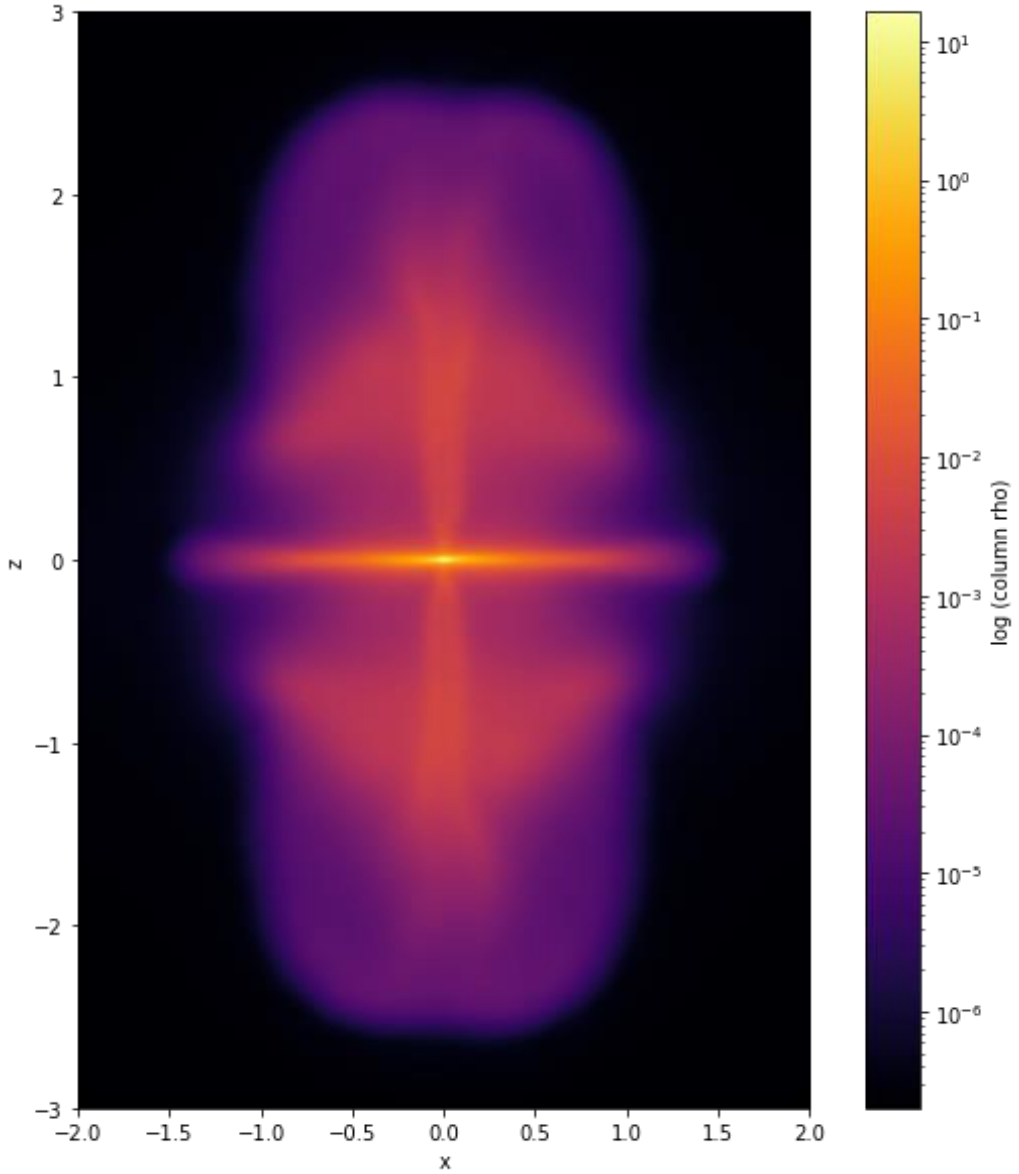
4th Year Computer Science Undergraduate

Memorial University, Canada

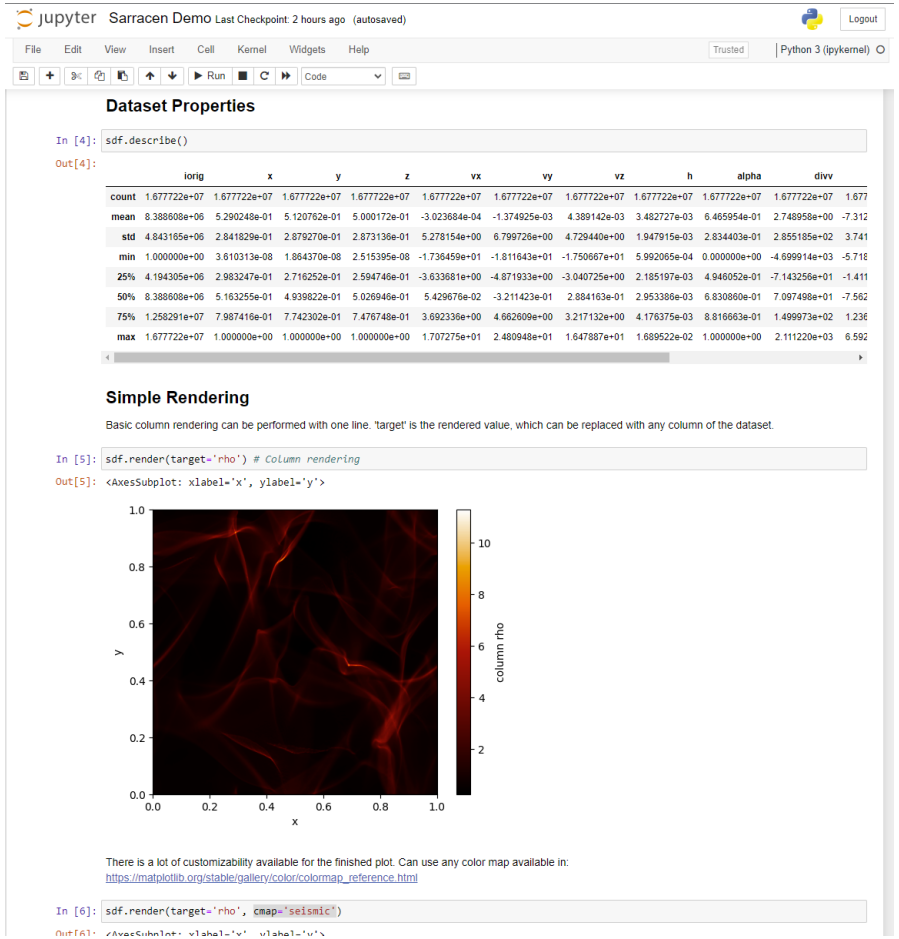
February 12, 2023

SARRACEN

- Sarracen is a Python-based tool for analysis and visualization of SPH data dumps.
  - It can seamlessly read binary data dumps produced by Phantom.
  - Rendering 2D images / line plots of SPH datasets
  - Scriptable filtering and analysis of SPH data
  - Highly customizable figure creation



PYTHON & JUPYTER NOTEBOOKS



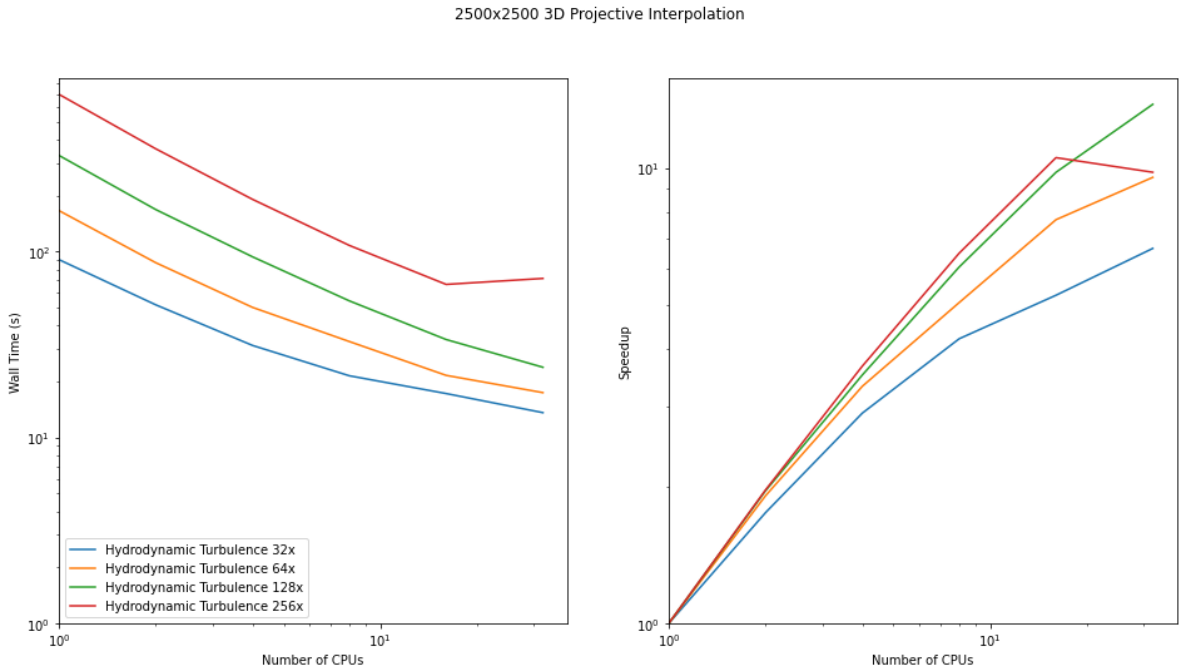
- Using Python allows for easy modification of output
- SPH analysis can be easily augmented with available statistical and mathematical tools.
  - For example, powerful functions that are available in NumPy and SciPy
  - Integrated very well with matplotlib and pandas
- Jupyter Notebooks can be utilized with Sarracen, providing a great platform for exploring and sharing SPH data.
  - Can be used remotely, or on a local machine.

INSTALLATION INSTRUCTIONS

- We are hosted on PyPI!
  - `pip install sarracen`
- To import:
  - `import sarracen as sar`
- Source code is available at:
  - https://github.com/ttricco/sarracen
- We have full documentation:
  - https://sarracen.readthedocs.io/en/latest/index.html
- Documentation includes:
  - Installation Guide
  - Quick Start Guide
  - Usage examples, from basic to advanced examples
  - Full API

MULTITHREADING AND GPU (CUDA)

- SPH Interpolation is expensive; we were concerned that high-level Python would not yield acceptable performance.
- To minimize this issue, we have taken several steps:
  - All performance-intensive interpolation functions are compiled into parallelized machine code with numba. (This compilation is JIT, so the first call of any function will have some overhead)
  - All interpolation functions can also be executed on a CUDA-enabled GPU.



RELATIONSHIP TO SPLASH

- Sarracen complements Splash, they both fill different roles.
- Splash:
  - Splash generally has faster performance than Sarracen.
  - Splash is excellent for initial explorations of datasets.

- Sarracen
  - Sarracen excels at deeper analysis of SPH datasets
  - Sarracen allows for production of highly customizable plots.

USAGE DEMO

- Here, I will demonstrate some useful features of Sarracen in a Jupyter Notebook.