

PLUTOPTOY: ENGAGING THE WIDER PLANETARY SCIENCE COMMUNITY WITH OPEN SOURCE.

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Introduction: The recent push for open source planetary science tools and workflows has been isolated to software-oriented groups in the community. Less technical planetary scientists can also benefit from open source workflows to improve their collaborations and publications, but often do not know where to start. Plutopy is a new initiative aimed at engaging the wider planetary science community with open source collaboration to educate and advocate for more open, reproducible planetary science.

Plutopy: Plutopy is an open source GitHub repository: <https://github.com/cjtu/plutopy/>. It includes common components of open source Python packages (e.g. a readme, license, contribution instructions, etc). The repository teaches open source concepts in two primary ways:

Passive: the repository is a **template of a planetary science research package** that members can emulate to publish their own code.

Active: members **contribute to the repository to learn the process of open source collaboration** in a supportive, risk-free environment.

Plutopy assumes **no prior Git experience** and a large focus is currently being placed on making the repository accessible to scientists who are new to version control. New members are tasked with following step-by-step tutorials which guide them through their first contributions to the main repository on GitHub (Fig 2). This allows new members to quickly become acquainted with version control and engaged in the repository. Additional tasks allow members to learn the benefits of version control, the basics of Git and how to write reproducible analyses with Python and Jupyter.

As new members progress in their learning, they will **contribute back to the repository** by updating old tutorials or adding new tutorials based on their interests or domain experience. This will build their Git collaboration skills while improving the repository over time. Advanced members will review the contributions of more junior members to learn the process of code review and how to manage an open-source project. In this way, the repository has potential to become self-sustaining and grow its scope with increased membership over time.

Plutopy is structured as a mock data analysis package that is built exclusively on open source tools. Python was chosen as the primary data analysis language because it is open source and has gained significant

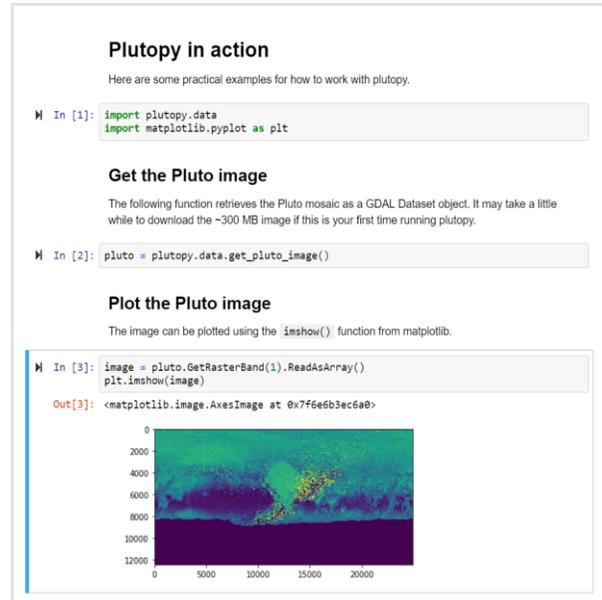


Fig 1: Jupyter notebooks combine descriptive narrative text, code, and inline plots, making them a powerful tool for sharing reproducible research code [6]. This notebook describes how to use the Plutopy package to display an image.

traction in planetary science in recent years [1-2]. The data analysis is done with GDAL on a New Horizons mosaic of Pluto [3]. Worked examples are presented as Jupyter notebooks to show best practices for sharing reproducible analyses and figures (Fig 1) [4-6]. Though the current focus of the repository is to teach the basics of working with and publishing open source code, in future work we aim to offer full tutorials for common image analysis tasks.

Plutopy is distributed under the MIT open license with the intent that all code, tutorials and examples can be freely altered and re-distributed by the community.

Learning outcomes: A typical participation cycle of a new Plutopy member occurs in 5 steps:

- 1) **Git basics:** Follow step-by-step tutorials to start contributing to Plutopy on GitHub. Applied tutorials allow new members to quickly get acquainted with version control and open source collaboration.
- 2) **Plutopy image analysis:** Learn how to install the Plutopy Python package and use it to ana-

lyze an image. Contribute analysis to the repository to get feedback from code reviews.

- 3) **Jupyter reproducible plotting:** Present the analysis done in step 2 in a reproducible way using a Jupyter notebook to describe the processing steps and code involved. Contribute the notebook to grow the collection of worked examples.
- 4) **GitHub collaboration:** Contribute new or updated tutorials to practice open source collaboration. Review the contributions of more junior members to learn the code review process.
- 5) **Open, reproducible research:** Apply the skills learned to a broader application (e.g. open source a personal code package, write a Jupyter notebook to supplement a publication, contribute to another open source repository, etc).

Results: Plutopy is currently live and in its early stages on GitHub. The first plutopy members joined as part of a scientific coding course run at Northern Arizona University in the fall of 2018. All 6 members were able to fork the repository and submit their first basic contributions to Plutopy, thus completing step 1. Most members then began work on the Python image analysis task, but as of writing of this abstract, no member has submitted a contribution for step 2. Ongoing work to develop Git tutorials and add simpler tasks to build new members up to making meaningful contributions is currently under way.

Conclusion: The Plutopy repository leverages the same open source tools that it teaches (e.g. Git, GitHub, Python, Jupyter) in order to allow planetary scientists to get hands-on experience with these tools and learn how to use them to produce more open and reproducible science. By collaborating on Plutopy, members will learn how to open source their own code and collaborate in a Git environment. The format of the learning is entirely open and self-paced, and the offered tutorials and example notebooks will grow organically as more members join and make contributions. With enough time and community interest, Plutopy has the potential to grow into a dynamic resource for teaching planetary scientists how to open source code and conduct reproducible planetary data analyses.

Future Work: Since Plutopy is an open source project in its early stages, we are actively seeking new members who are interested in helping to make open source more accessible to the wider planetary science community. The on-going feedback from Plutopy members and collaborators will inform how the repository evolves to better suit the needs of the planetary science community over time.

References: [1] Laura J. et al. (2013) LPSC XLIV, Abstract #2226. [2] Laura J. et al. (2016) LPSC XLVI,

Abstract #2208. [3] Moore J. M., et al. (2016) Science, 1284-1293. [4] Perez F. and Granger B. (2007) Comput. Sci. Eng., 21-29. [5] Kluver T., et al. (2016) ELPUB, 87-90. [6] Piccolo S. R. and Frampton M. B. (2016) GigaScience, 30.

[Task 1]: Submitting your first pull request #1

Open cjtju opened this issue on Dec 2, 2018 · 0 comments

cjtju commented on Dec 2, 2018 · edited

Your First Pull Request

These steps will walk you through making your first contribution to a public GitHub repo by adding your name to the CONTRIBUTORS.md file. The guidelines here are adapted from an excellent teaching repository, [first-contributions](#).

Contributing guidelines

Many open source repositories will have contributing guidelines in a file called CONTRIBUTING.md. This can provide community guidelines, like a code of conduct, as well as any info you need to get a working development environment set up. The contributing guidelines for this project can be found [here](#). Review them before moving on.

GitHub Issues

Issues are a means of communicating bugs or feature requests to the maintainers of a GitHub repo. Project maintainers can assign a person or people to an issue to indicate that it is being worked and so that work isn't duplicated. Before starting work on an issue, it is good etiquette to comment on the issue and let the maintainers know that you would like to work on it. Comment on this issue to be assigned!

Fork this repository

Fork this repository by clicking on the fork button on the top of this page. This will create a copy of this repository in your account.

Clone the repository

Now clone the forked repository to your machine. Go to your GitHub account, open the forked repository, click on the clone button and then click the [copy to clipboard](#) icon.

Open a terminal, navigate to where you want to clone the repository, and run the following git command:

```
git clone "url you just copied"
```

Fig 2: Basic Git tutorials guide new Plutopy members through the process of contributing to an open source repository. The first task is a step-by-step guide to opening a pull request to Plutopy, giving new members early hands-on experience with the repository.