Application: Inclusive and Accessible Scientific Computing in the Jupyter Ecosystem II

Tania Allard - [redacted]
EOSS6: Essential Open Source Software for Science (Cycle 6)

Summary

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Last submitted: Oct 16 2023 04:44 PM (BST)

1. Applicant Details

Completed - Oct 16 2023

1. Applicant Details

Complete the following information for the Applicant (required)

The information entered should be for the individual submitting the application who will act as the main person responsible for the application and as its point of contact. **To edit your name or email**, navigate to Account Information by clicking your name in the upper right corner. Please note that this person must remain the same between the LOI and full application (if selected).

Name: Tania Allard

Email: [redacted]

Add your home institution, company, or organization. This does not need to be the organization to which a grant would ultimately be awarded, if selected for funding.

Institution/Affiliation	Quansight Labs

Add the institution, company, or organization that will be receiving the award. This may be the same as listed above, or different.

Award Organization	Quansight LLC

ORCID iD

Enter in format XXXX-XXXX-XXXX-XXXX. ORCID iDs are unique, digital identifiers that distinguish individual scientists and unambiguously connect their contributions to science over time and across changes of name, location, and institutional affiliation. ORCID iDs will be used to streamline reporting in our applications and grant reports to reduce the burden on grantees. For more information, please visit https://orcid.org/register. (Please contact us at sciencegrants@chanzuckerberg.com if you wish to opt out.)

0000-0002-5353-5397

2. Proposal Details

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2. Proposal Details

a. Proposal Title: **Inclusive and Accessible Scientific Computing in the Jupyter Ecosystem II**

Auto-filled; Maximum of 60 characters, including spaces. If you need to edit your proposal title, navigate to your application summary page; click on the three dots to the right of the application title; and select Rename from the dropdown menu. ***Please note that you will not be able to make changes to the title of your application between the LOI and full proposal period.***

b. Amount Requested

Total budget amount requested in USD, including indirect costs; this number should be between $100,000 USD and $400,000 USD total costs over a two-year period. Enter whole numbers only (no dollar signs, commas, or cents).

400000

c. Proposal Summary/Scope of Work

Provide a short summary of the work being proposed (maximum of 500 words)

Jupyter is a vast ecosystem of diverse tools widely used in research, industry, applied science, government, education, non-profits, and more. However, much work must be done to ensure Jupyter is accessible to disabled users, hence living to its principles of inclusion.
This proposal builds on Jupyter-related accessibility work carried out by our team for the past five years. It aims to improve the accessibility and usability of tools for notebook authors and readers and Jupyter maintainers, developers, and contributors, as reflected in the following Work Packages:

Accessibility testing tooling and infrastructure: We will expand the JupyterLab automated testing suite developed by this team (e.g. robust regression testing, better reporting, and extension testing), its documentation, and manual accessibility testing scripts. Additionally, we will formalise JupyterLab and Notebook's accessibility testing policies to ensure these tools support maintainers and contributors to avoid accessibility regressions and bugs throughout their development process without hindering review and contribution processes.

Capacity building: Accessibility-related knowledge is scarce within the open-source community (and tech overall). Thus, knowledge transfer and onboarding new accessibility-focused contributors within Jupyter is paramount to ensure current and future versions of existing and new tools are accessible and usable by disabled users. We will continue to host the fortnightly Jupyter accessibility calls and lead the overall efforts and governance of the Jupyter Accessibility Software Subproject, including supporting Jupyter projects' accessibility needs (reviews, fixes, mentoring, etc.) and continue accessibility remediation in Notebook 7 and JupyterLab 4/3.

Improved authoring and rendering tools: Most of the accessibility efforts within Jupyter have centred on fixing WCAG violations in JupyterLab and Notebook (testing, auditing, user testing). While these contribute to the core tools' accessibility and allow disabled people to create content with such tools, we must also support and enable such authors to produce content that conforms to WCAG.
A common way to interact with notebooks is through static-rendered notebooks through services such as nbviewer and documentation engines (see ExecutableNotebooks). Nbviewer receives an average of 300 thousand views weekly and serves over 1.2 million monthly users. However, the templates (markdown, reveal.js, LaTEX, HTML) provided by nbconvert and the resulting HTML remain highly inaccessible.

We will improve the nbconvert templates based on findings from previous work on user testing with disabled users to ensure WCAG conformance and, where possible, implement the recommendations from the Authoring Tool Accessibility Guidelines (ATAG) to improve rendered notebooks' accessibility along with more user testing work.

A common request from notebook authors has been to provide guidance and tooling to write accessible notebooks; building on previous work, we will create new authoring templates and a notebook accessibility checking tool to generate accessible notebooks and support authors with minimal or no accessibility knowledge.

Finally, we will extend work on syntax highlighting contrast issues and JupyterLab UI contrast and refactor our theming extension so that it is JupyterLab 3/4 and Notebook 7 compatible and add Jupyter-equivalent light and dark themes that meet WCAG contrast requirements and a high contrast theme. As a stretch goal, we will incorporate this JupyterLab core.

d. Value to Biomedical Users

Described the expected value of the proposed work to the biomedical research community (maximum of 250 words)

Jupyter is a critical open-source ecosystem for biomedical science education, research, and manufacturing. It is formed by a vast ecosystem of tools that enables researchers to work with code, prose, data, and visualisations in a single interface. Jupyter's growth in the classroom and laboratory speaks to the value of these technologies in science. However, the current state of these tools makes them usable only by fully abled individuals.

Disability affects between 20% and 25% of the world population, meaning that for every million Jupyter users, we are excluding at least 200,000 prospective scientists from participating in biomedical research. Also, software that lacks accessibility features can have significant ethical and legal implications in various contexts, and there has been increased pressure for tool accessibility conformance in research and educational areas.

Our proposed work aims to make JupyterLab and Jupyter Notebook's computing interface and rendered HTML output templates (nbconvert) accessible to disabled users by ensuring conformance with Web Content Accessibility Guidelines and Authoring Tool Accessibility Guidelines and by incorporating direct feedback from disabled users. Achievement of this work's outcomes will open biomedical computational literacy for scientists with visual, auditory, physical, speech, cognitive, language, learning, and neurological disabilities. This accessibility effort will also help bring traditionally excluded voices and users into the Jupyter and open research ecosystems, diversify them, and contribute to their long-term sustainability.

e. Open Source Software Projects

Number of software projects are involved in your proposal (maximum of five):

5

Complete the table with the following information for each software project. If there is no homepage URL, re-enter the main code repository URL.

	Software project name	Main code repository URL	Homepage URL
1	JupyterLab	https://github.com/jupyterlab/jupyterlab	https://jupyterlab.readthedocs.io/
2	nbconvert	https://github.com/jupyter/nbconvert	https://nbconvert.readthedocs.io/en/latest/index.html
3	Lumino	https://github.com/jupyterlab/lumino	https://lumino.readthedocs.io/
4	Jupyter notebook	https://github.com/jupyter/notebook	https://jupyter-notebook.readthedocs.io/
5	nbviewer	https://github.com/jupyter/nbviewer	https://nbviewer.jupyter.org/

f. Landscape Analysis

Briefly describe the other software tools (either proprietary or open source) that the audience for this proposal primarily uses. How do the software project(s) in this proposal compare to these other tools in terms of user base size, usage, and maturity? How do existing tools and the project(s) in this proposal interact? (maximum of 250 words)

For disabled scientists who use accessibility features and assistive technology, we are unaware of any web-based browser or desktop interactive scientific computing interfaces that they can successfully use with default settings or that provide out-of-the-box robust support for assistive technology. In our experience, they can use unique combinations of tools to express themselves in code; at worst, they cannot access the tools they need and are barred from opportunities in education and industry. As a result, it sometimes prompts them to leave their field altogether.

Even as it neglects the estimated 20-25% of the population that is disabled, Jupyter has a growing user base in the tens of millions, a thriving ecosystem due to compliance with vetted open standards, and was recognised with the ACM Software System Award in 2017. JupyterLab is used mainly as a desktop application, while tools like JupyterHub and Pyodide lower barriers to entry in computing and enable mass adoption of Jupyter interfaces like JupyterLab on mobile and tablet devices.

Jupyter is not only a standard for scientific computing; its components and notebook format also support and influence established projects like VSCode, nteract, and Google Colab. Abiding by Web Content Accessibility Guidelines and Authoring Tool Accessibility guidelines in Jupyter can significantly ripple effect throughout the open-source scientific computing ecosystem and lead towards a more inclusive community. Centring accessibility in Jupyter projects is building on a successful recipe that will expand access to computational literacy to even more prospective scientists.

g. Category

Choose the two categories that best describe the software project(s) audience.

	Category
Category 1	Machine learning and data analysis
Category 2	Visualization

h. Previous Funding

Have you ever received grant funding from CZI, the Wellcome Trust, or the Kavli Foundation? Select Yes or No.

Yes

Please check the box(es) of the organization(s) from which you received funding.

Responses Selected:

Chan Zuckerberg Initiative

Did you previously apply for funding under the CZI EOSS program? Select Yes or No.

Yes

Have you previously received funding under the CZI EOSS program? If yes, please list your application ID in the format EOSS1-0000000001.

Responses Selected:

Yes, application ID:: EOSS4-0000000164

3. Terms and Conditions

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Terms and Conditions

Please carefully read the below terms and conditions regarding grant policies and personal data.

Grant Policies

Funded applications will be subject to various grant conditions and policies. **Submission to this program, as well as checking the box below, will imply that your organization agrees to and will be able to comply with these conditions**. Funder specific policies are linked below:

- CZI Grant Policies
- Wellcome Grant conditions & grant funding policies
- While the Kavli Foundation does not have a specific grant policies document, if you have questions related to Kavli grant conditions, please contact science@kavlifoundation.org.

Responses Selected:

I understand and acknowledge the grant policies and conditions

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Application and Personal Data

By submitting your application, you agree to share all submitted application data (i.e. name(s), contact details, role, professional details, organization, details of your proposal, ORCID iD) and sharing these personal data with the Wellcome Trust and Kavli Foundation (in addition to CZI) for the purpose of administering, managing and evaluating your application, as well as for assessing the effectiveness of our grants program. In addition, if you choose to, you can voluntarily provide demographic data in the following section of the application. If you choose to provide the data, check the box in section b.2. below to consent to CZI's data privacy and sharing policy. The demographic data / diversity data will be aggregated and anonymized and this anonymized data will be shared with the Wellcome Trust and The Kavli Foundation for diversity monitoring purposes. Applications and reviews will be subject to and processed in accordance with the privacy policies for all three organizations:

- Wellcome Grants Privacy and Confidentiality
- Kavli Foundation Privacy Policy
- Chan Zuckerberg Initiative Privacy Policy

Responses Selected:

Check the box to acknowledge that you have read and understand the data privacy and sharing policy and consent to CZI sharing your LOI application data and subsequent full application data (if applicable) with the funders affiliated with this grant program (the Kavli Foundation and the Wellcome Trust).
