Request for Applications: Collaborative Computational Tools for the Human Cell Atlas

The Chan Zuckerberg Initiative invites applications for one year projects to develop computational tools, algorithms, visualizations, and benchmark datasets in support of the Human Cell Atlas. Participants in this project will collaborate with each other and with Chan Zuckerberg Initiative scientists and engineers to accelerate progress, facilitate communication, and maximize open dissemination of the resulting tools.

OPPORTUNITY

Overview

The goal of the International Human Cell Atlas project is to create a shared, open reference atlas of all cells in the healthy human body as a resource for studies of health and disease. This endeavor will generate molecular and imaging data across a range of modalities and spatial scales, requiring new probabilistic and integrative approaches for analysis and interpretation, systematic comparison of methods on benchmark datasets, and mechanisms for disseminating these methods to a wide community. The Chan Zuckerberg Initiative seeks applications for the development of computational tools, algorithms, visualizations, and benchmark datasets in support of this endeavor. This program welcomes applicants who are new to the Human Cell Atlas — no prior work in this area is required. In a new approach to open, collaborative development, researchers on projects funded by these grants shall work together and share progress with each other to evaluate the strengths of different approaches. To maximize the impact and visibility of this work, members of the Chan Zuckerberg Initiative science and engineering teams will work with successful grant recipients to help enhance and package their tools, and link them to the Human Cell Atlas Data Coordination Platform (DCP), if appropriate and desired.

Project Specifications

Many computational efforts in support of the Human Cell Atlas are underway in the research community, and new methods are needed. This RFA aims to support further development and systematic comparison of methods across existing and new benchmark datasets derived from single-cell RNA sequencing, bulk RNA sequencing, proteomics, image-based transcriptomics, and other tissue imaging approaches. The RFA will also support new analysis and visualization methods, and new approaches to integrating data across modalities. The goal is to support a diverse set of well-validated tools to analyze, consume, integrate, and explore Human Cell Atlas data.

To help the resulting tools reach the widest possible audience, scientists and engineers from the Chan Zuckerberg Initiative will collaborate with researchers on projects funded by this RFA to help bring tools to the scientific community; for example, by helping to enhance or package software with an emphasis on scale, robustness, speed, interoperability, web-based dissemination, and user experience. There will also be opportunities for new tools to connect to and leverage the Human Cell Atlas Data Coordination Platform (https://www.humancellatlas.org/data-sharing), which provides infrastructure for data sharing and cloud computing.

This effort is also a pilot project for new models of collaborative computational research. With the assistance of the Chan Zuckerberg Initiative, project participants will be expected to share their proposals within the collaborating framework, attend regular meetings, workshops, and hackathons, and communicate their ongoing progress through GitHub and Slack. We welcome submissions that represent pre-existing collaborative efforts, but as part of the broader collaborative goals of this RFA, we require each principal investigator to submit a separate application, rather than serving as a co-principal investigator on a shared application.

The goals of this RFA include, but are not limited to:

- Developing standard formats and analysis pipelines for genomic, proteomic, and imaging data, in forms that enable consistent use of these pipelines by numerous experimental labs
- Identifying and solving common challenges for web-based interactive visualization of cellular and imaging data
- Developing user tools that allow scientists and physicians to extract and analyze data organized by genes, cells, or tissues of interest
- Supporting analytical methods and machine learning approaches to solving problems such as multimodal integration, inference of state transitions and developmental trajectories, and representation of spatial relationships at the cellular or molecular level
- Generating curated benchmark datasets from new or existing data for evaluating computational methods and designing future analysis competitions
- Developing new computational approaches to comparing and normalizing genomic and imaging data across assays, subjects, and species
- Generating experimental datasets that directly address computationally-guided questions in quality control, reproducibility, or multimodal integration

Although the focus of the project is analysis of human data, we are interested in new ideas and will consider proposals that focus on data from human tissues, non-human animals, organoids, and cell lines. We encourage proposals from areas of machine learning entirely outside of computational biology, e.g. deep learning. Proposals will be evaluated based on the computational novelty and viability of the method, a commitment to collaboration, the intention to interoperate with existing efforts such as the Human Cell Atlas Data Coordination Platform, and a plan to ensure that software is sharable, portable, and reproducible.

Project Requirements

To accelerate scientific discovery and collaboration and help build an open ecosystem around the Human Cell Atlas, the Chan Zuckerberg Initiative supports a consent, sharing, and publication policy for open and rapid dissemination of research results, and a policy for software development that maximizes accessibility, reuse, and shared development.

If awarded, complete forms of accepted proposals will be shared, first among grantees, and then publicly (e.g. as public Google documents, in a GitHub repository, or similar), to help identify opportunities for collaboration and build community among grantees.

Any code developed must be made publicly available on GitHub as it is developed — as soon as a functional prototype exists in minimal form — to encourage outside contribution and collaboration. All code must be released under a permissive open-source license (MIT, Simplified BSD, ISC, or Apache v2.0). All analysis packages must be released through the appropriate language-specific package manager (e.g. PyPi for Python, CRAN for R) with documentation, example data, and interactive demos (e.g. Jupyter notebooks), and the use of Docker or similar container technologies to ensure portability and reproducibility.

Any datasets either curated or generated for this project, such as new benchmark datasets, must be made publicly available and easily accessible online. This requirement includes metadata, documentation, and intended computational use cases. Wherever appropriate, datasets must be deposited into the Human Cell Atlas Data Coordination Platform.

To encourage rapid dissemination, any publications related to this work must be submitted to a preprint server such as bioRxiv before the first submission to a journal.

For any experimental work, all human tissue must be fully consented upon collection to enable open sharing of the resulting data in accordance with laws and regulatory requirements. Appropriate documentation of consents will be required prior to an award for this project RFA, but is not required for the initial stage of the application process.

Indirect costs are limited to 15% of direct costs. Indirect costs may not be assessed on capital equipment or subcontracts, but subcontractors may include up to 15% indirect costs of their direct costs. Applications selected through this process will be recommended for funding through the Chan Zuckerberg Donor-Advised Fund (DAF) at the Silicon Valley Community Foundation.

ELIGIBILITY

Applications may be submitted by scientists, researchers, staff scientists, or software engineers in independent investigator positions, i.e. with principal investigator status, of qualified sponsoring institutions. Graduate students and postdoctoral fellows are not eligible. We expect most successful applicants to come from academic and non-profit institutions and organizations, but will consider other applicants as well. Projects including any activities in Office of Foreign Asset Control (OFAC) sanctioned countries (https://www.treasury.gov/resource-center/sanctions/Programs/Pages/Programs.aspx) are not eligible to apply. Facebook employees, including employees of any subsidiary Facebook entities, are not permitted to apply for this grant. We encourage applications from women, underrepresented minorities, and early career scientists.

APPLICATION PROCESS

Key Dates

7/25/17:	Application portal is open for registrations and applications
8/28/17:	Applications due by 5:00 PM PT
1/15/18:	Earliest notification of decisions (subject to change)
2/1/18:	Earliest start date of project (subject to change)

Award period and start date: Proposed projects should be one year in duration with a projected start date no earlier than February 1, 2018. Actual start date may vary.

Registration

Prospective applicants must first register through the Chan Zuckerberg Initiative's online grants management portal (Fluxx) at https://chanzuckerberg.fluxx.io/. If your registration is approved, you will receive login credentials to the portal within two business days. This notification will be sent to you as an automated email from the Fluxx system. Please consider that these emails may end up in your spam filter. All applications must be submitted through Fluxx, so timely registration is a must. For more information, please see the detailed application instructions (https://chanzuckerberg.com/initiatives/rfa/instructions).

Application Requirements

All applications must be completed and submitted through the Chan Zuckerberg Initiative's online grants management portal at (https://chanzuckerberg.fluxx.io/). It is recommended that you familiarize yourself with this portal well in advance of any deadlines.

The application must include the following components:

- Proposed title
- Primary focus area of proposed project (drop-down list)
- Project summary (approximately 250 words; 1,750 characters maximum including punctuation and spaces)
- Keywords
- Full citations (with PubMed links), GitHub repository links, data repositories, and/or similar for up to five of your most significant contributions relevant to the proposal
- Collaborative network (approximately 500 words; 3,500 characters maximum including punctuation and spaces): description of any collaborating groups who are, or are not, applying to this RFA highlighting their expected contributions and how you will work together. We welcome submissions that represent pre-existing collaborative efforts, but as part of the broader collaborative goals of this RFA, we require each principal investigator to submit a separate application, rather than serving as a co-principal investigator on a shared application.
- List of key personnel including name, organization, role on project
- Proposal (1,600 words maximum for text and one page maximum for figures), organized as follows:
    1. Summary
    2. Project aims, and how they address program goals
    3. Prior contributions in this area and preliminary results (not required)
    4. Proposed work and deliverables
    5. Proposal for evaluation and dissemination of methods, resources, or results: e.g., how will benchmark datasets be shared; what testing of computational methods has already been conducted and what new tests are proposed; what engineering support from CZI would advance dissemination of this resource or method
    6. Statement of commitment to share proposals, methods, data, and code with other researchers funded by this RFA and with CZI
- References cited (no page limit)
- Biosketch or CV for applicant (five pages maximum; NIH format or similar) and description of other key personnel in your group (one page maximum). If you are applying from a non-academic institution, please briefly describe your current position in this section.
- Brief preliminary budget (one page maximum): Application budgets must reflect the actual needs of the proposed project within your group; you do not need to estimate the costs of

support from CZI engineering or the HCA Data Coordination Platform. The Chan Zuckerberg Initiative will work closely with successful applicants to arrive at a suitable budget after review.

The proposal, references cited, biosketch, and brief preliminary budget must be uploaded in PDF format. All text in these documents must be in Arial 11 point font and no less than single spaced.

The formatting and component requirements, including word and page limits indicated above, will be enforced by the review team. Any submitted materials that exceed the word and page limits or do not follow the requirements will not be considered during the application review process.

Please note that this application is considered a pre-proposal. For successful applications, we will request additional materials, co-signed by your institutional officials, to determine final budget and administrative details of the award. The Chan Zuckerberg Initiative does not require institutional sign-off at this stage of the application process, but we strongly suggest that you consult your home institution to determine your eligibility to apply for this grant and your institutional policy on indirect costs.

Detailed application instructions are available on the Chan Zuckerberg Initiative website (https://chanzuckerberg.com/initiatives/rfa/instructions), as well as in the grants management portal following registration.

REVIEW

The Chan Zuckerberg Initiative will evaluate all applications for scientific and technical merit and will seek independent expert review of applications. Proposals will be evaluated based on the computational novelty and viability of the method, a commitment to collaboration, the intention to interoperate with existing efforts such as the Human Cell Atlas Data Coordination Platform, and a plan to ensure that software is sharable, portable, and reproducible.

There is no expectation of any specific number of awards, and the Chan Zuckerberg Initiative reserves the right to not recommend the funding of any applications.

CONFIDENTIALITY

All submitted applications will be kept confidential to the greatest extent possible, except as necessary for processing and evaluation. After the grant award, all funded proposals will be shared among the collaborating groups, but unfunded proposals will remain confidential. Application materials will not be returned to applicants.

REPORTING

For awarded projects, financial statements and progress reports will be due at the conclusion of the grant year. Specific deliverable requirements will be outlined in the award notification. Investigators of funded projects will be required to attend two one-day in-person convenings in the Bay Area during the one-year period of the grant and funds to support this travel should be requested in the budget. Requests for no-cost extensions will be considered.

RFA CONTACT

For administrative and programmatic inquiries, technical assistance, or other questions pertaining to this RFA, please contact sciencegrants@chanzuckerberg.com.