

Building Sustainable Foundations for Open Software and Tools in Biomedical and Behavioral Science

Concept Clearance

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NIH Strategic Plan for Data Science Goals & Objectives



NIH Strategic Plan for Data Science Goal 3 -Tools & Software

Data Management, Analytics, and Tools

Support useful, generalizable, and accessible tools

Broaden utility of, and access to, specialized tools

Improve discovery and cataloging resources

Smart & Connected Health Program

 Accelerate innovations in computer science and engineering to support the transformation of health and medicine in partnership with NSF - <u>NOT-OD-21-011</u>

2

Enhancing Sustainability & Reuse of Research SoftwareEnhancement of Software Tools for Open Science

<u>NOT-OD-20-073</u>, <u>NOT-OD-21-091</u>, <u>NOT-OD-22-068</u>

Foster Software Communities of Practice

 Developed Best Practices for Sharing Software https://bit.ly/3t2SJ71

https://datascience.nih.gov/data-ecosystem

Concept for Building Sustainable Software and Tools

behavioral research

To support the building of sustainable foundations for open software and tools in biomedical and behavioral science, we propose two related funding opportunities announcements (FOAs) to:

Fund projects to foster software foundations that will increase the robustness, reproducibility, and reusability of NIH supported open software tools.

Pilot a new model to support research software engineers in biomedical and

Initiative 1:

Title: NIH Research Software Engineer (RSE) Award (R50 Clinical Trials Not Allowed)

Objective: Support <u>RSE</u> to bring unique skills to building sustainable, open software and tools.

Mechanism: R50

Duration of Award: ≤2 years

Budget: Support RSE salary commensurate with funded effort (\geq 6 months/year) on existing research grants; set aside of **\$6 million**; anticipate **~20 - 24 awards** with exact number contingent on NIH appropriations and sufficient highly meritorious applications.

Due Dates: Two receipt dates per year; September and January over three 3 years.

All applications to be reviewed by CSR Special Emphasis Panel Applicants are encouraged to submit a <u>letter of intent</u> and seek <u>ICO consultation</u> prior to submission.

Initiative 2:

Title: Building Sustainable Software Tools for Open Science (R03 Clinical Trials Not Allowed)

Objective: Fund <u>software projects</u> to support development and enhancement of sustainable software tools for open science.

Mechanism: R03

Duration of Award: ≤2 years

Budget: \$150K DCs per year; set aside of **\$6 million** and anticipate **~20-24 grants** with exact number contingent on NIH appropriation and sufficient highly meritorious applications.

Due Dates: Two receipt dates per year; September and January over 3 years

All applications to be reviewed by CSR Special Emphasis Panel

Applicants are encouraged to submit a letter of intent and seek ICO consultation prior to submission.

Purpose of the Proposed Initiatives

RSE Award (R50)

Support exceptional research software engineers (non-traditional PIs)

Make sustainable impact on NIH research projects

Enhance autonomy and career continuity for highly-skilled software engineers working in research

Pilot solution to software engineering workforce challenges

Sustainable Software Project (R03)

Support projects to develop robust, sharable, sustainable software and tools

Bring software development best-practices & emerging technologies to NIH research projects

Foster collaborations between biomedical and behavioral scientists and software engineers

Extend impact of investment – for reuse; foster communities for open software development

<u>Most importantly</u>: Efforts to support open software and tools are critical to creating a modernized biomedical and behavioral data ecosystem that will catalyze advances in science.

Need for Building Sustainable Software and Tools

Robust software foundations and support for the engineers who can build them are critical gaps in the biomedical & behavioral sciences ecosystem

Enable projects to build sustainable, sharable, reusable software

Enable reproducible interpretation and analysis of research data

Create vibrant partnerships with creators and developers of software and tools to leverage modern computing in the research enterprise

Promotes FAIR4RS principles to maximize research value (FAIR for software)

Application Requirements

RSE Award (R50)

Application must specify research project collaboration, role, and justify RSE need

Demonstrate software engineering experience including in software best practices

Applicant must be in a full-time, non-tenure track position; cover only salary & travel support

Require letter of support & 3 recommendation letters

Sustainable Software Tools (R03)

Application must describe the research project need for sustainable software

Present robust software development plan, milestones, and metrics

Include relevant research and engineering collaborations

Encourage 'open' development practices

Building on ODSS Software Engineering Supplements

- The R03 initiative builds on results, experiences, and uptake by NIHsupported researchers of three cycles of support to enhance software foundations in ODSS administrative supplements.
- In FY 2022 there was ~\$7M funded in 25 supplements across 13 ICs to support enhancement of software tools with best-practices engineering for open science and use in the cloud (NOT-OD-22-068).
- In three years, there have been 94 software supplements funded in FY 2000
 2022 across 19 ICs*, providing a transformational investment to place high-value software for research on solid foundation for sustainability.

https://datascience.nih.gov/tools-and-analytics/administrative-supplements-to-support-enhancement-of-software-tools-for-open-science*

*NCATS, NCCIH, NCI, NHLBI, NHGRI, NIA, NIAID, NIAMS, NIBIB, NICHD, NIDA, NIDCD, NIDCR, NIDDK, NIEHS, NIGMS, NIMH, NINDS, NLM

ODSS Software Engineering Supplements - Examples

Data Standardization

John Buse, CAMP FHIR to map clinical data models to FHIR & harmonize EHRs (NCATS)



Software Engineering for Cloud-Native Toolkits

Gabor Marth, RUFUS genomic structural variation (NHGRI)

Community Outreach

Gerardo Andres Cisneros, multi-scale modeling & dynamic "graphic novel" on Twitter for LatinXChem (NIGMS)

Extracting Data for Sharing on Cloud

Melanie Fried-Oken, Brain-Computer Interface software to collect & share severe speech defect data using cloud (NIDCD)



Scaling FAIR Data Systems on Cloud

Carl Kesselman, FaceBase (NIDCR)



From Desktop to Microservices

Mark Musen, Protégé ontology desktop evolving to cloud microservices (NLM)



Other RSE Programs

- Aligns with complementary efforts at other funding agencies and organizations such as Chan-Zuckerberg Initiative, Schmidt Futures, NSF etc.
- NCI <u>R50 awards</u> initiative launched in 2016 to advance cancer research careers for Research Specialists, including computational experts (<u>PAR-22-187</u>, <u>PAR-22-188</u>).
- To date, 121 have been awarded.

Year	Awards
2016	35
2017	16
2018	14
2019	10
2020	16
2021	16
2022	14

Brian Haas, M.S. Senior Computational Biologist Klarman Cell Observatory Broad Institute

"So much of cancer research is being done by computational scientists who are analyzing vast quantities of data. The R50 Award is one mechanism to support these efforts.

Five years of guaranteed salary support is a stable block of time to accomplish research goals in my lab. It also allows me to focus on developing tools for cancer research and providing technical support to scientists outside the Broad Institute."

Courtesy: NCI Research Specialist Award (R50) originally published by the National Cancer Institute.



New Program with Two FOAs to Advance Open, Sustainable Software Development

Initiative 1: NIH Research Software Engineer (RSE) Award (R50 Clinical Trials Not Allowed)	<u>Initiative 2</u> : Building Sustainable Software Tools for Open Science (R03 Clinical Trials Not Allowed)
Objective : Fund <u>RSEs</u> to bring unique skills to building sustainable, open software and tools.	Objective : Fund <u>software projects</u> to support development and enhancement of sustainable software tools for open science.
Mechanism: R50	Mechanism: R03
Duration of Award: ≤2 years	Duration of Award: ≤2 years
Budget: Salary commensurate with level of funded effort (≥6 months) on research grants; anticipate ~24 awards per year contingent on availability of funds and receipt of highly meritorious applications.	Budget : \$150K DCs per year; anticipate ~20-24 awards per year contingent on availability of funds and receipt of highly meritorious applications.
Due Dates: Two receipt dates per year; September and January	Due Dates: Two receipt dates per year; September and January
Council Action: Vote for approval of concept for the RSF Award (R50) and the Ancillary Project Award (R03) for 3 cycles	

Discussion