

netherlands

eScience center

Call for Collaboration in Innovative Technologies 2021

Pioneering applied technologies

E

1 Introduction

1.1 Purpose of this call

This call for proposals seeks to transform highly innovative, fundamental knowledge from computer science into applied technologies designed to have a substantial impact on research across the disciplines. The specific technology areas covered by this call are

- (1) FAIR-enabling technologies and
- (2) data-efficient AI.

The call is intended for

- researchers coming from a technical discipline (computer science, data science, AI, etc.), or from a research discipline with a focus on technology development, who have a pronounced interest in making their research applicable to other disciplines

These researchers will collaborate with

- experts in applied technologies (i.e. research software engineers) at the Netherlands eScience Center; they will be assigned to the project to develop the technology as a reusable, sustainable and fully engineered product, provide documentation, set up training events and help identify and connect to stakeholders

A competitive proposal aims to deliver open technologies in the form of e.g., software libraries, algorithms, or methods, that potentially foster breakthroughs in research across the disciplines.

A case needs to be made for innovative and impactful deployment of the software beyond the research project. Commitment of project partners to sustain the software developed in the project is central to this call, as well as explicit support from researchers outside the project team to support, validate or use the software.

1.2 About the eScience Center

The Netherlands eScience Center is the national centre for innovative software solutions in academic research. It was established in 2011 as an independent foundation and receives its funding from NWO and SURF. The eScience Center aims to bridge the gap between digital technologies on the one hand and scientific and scholarly inquiry on the other. Its vision is to establish a robust research community, in which all investigators in all domains are able to exploit advanced digital technologies and research software to answer research questions, keeping the Netherlands at the forefront of cutting-edge international research.

The eScience Center employs about fifty Research Software Engineers or RSEs. As experts in digital technologies and methodologies, they may be seen as the equivalents of postdocs, assistant and associate professors and top-level technicians at universities. In addition to their specific focus on the development of advanced research software, RSEs at the eScience Center will help applicants interpret the results of their research and make the tools and methods that emerge from the project (re-)useable for the wider research community. They will co-author research and methodological publications together with members of the research team. Based at the Netherlands eScience Center in Amsterdam, RSEs perform their project activities both remotely and at project locations.

In operational and administrative terms, projects are overseen by eScience Center's programme managers, who share responsibility with the applicant for monitoring progress and facilitating the delivery of project results.

1.3 eScience Center Expertise

Awarded projects are offered an in-kind investment in expertise in the form of RSEs employed by the eScience Center. In close collaboration with applicants, RSEs will develop and improve the research software best suited to solving the research questions described in the project proposal.

To maximize the added value and impact for applicants, the technological needs and requirements of the project should match with the expertise of the eScience Center. Broadly defined, the Center's current areas of expertise include:

- AI: machine learning, image processing
- Analytics: big data analytics, text analysis, visualization
- Data processing: databases, real-time data analysis, interoperability and linked data
- Computing: exploitation of hardware accelerators, high performance computing, cloud computing, combining simulations
- Software quality: developing workflow technologies, improving software practices, advancing software sustainability

For an overview of the eScience Center's expertise areas, see Appendix B (eScience Center Expertise). For an overview of the research software that has been developed and contributed over the past few years, see software.esciencecenter.nl.

1.4 Available person years

The call makes available in-kind support by allocating the time of Research Software Engineers (RSEs) employed by the eScience Center to the project. The eScience Center's in-kind contribution is calculated in 'person years' or PYR, where 1.0 PYR represents 1,620 hours of RSE time available for the duration of the project.

The total available budget for 2021 is approx. 6 PYRs. Applicants may request 3.0 PYR, so that a maximum of 2 projects are expected to be awarded through this call: one project for each technology area covered by this call.

The maximum duration of a project is 3 years. Each project will be allocated sufficient engineers to carry out the research proposal. Of the total requested PYR, 15% covers project management, organizational and professional development activities of RSEs (courses, work meetings, conferences, etc).

1.5 Validity of this call

This call for proposals is valid for proposals submitted before the deadline of **Thursday 6 May 2021, 14:00:00 CET**, until the board of the eScience Center has taken the final decision, as specified in the assessment procedure.

2 Guidelines for applicants

2.1 Who can apply?

Proposals can be submitted by researchers from a Dutch research performing organisation. All eligible organisations are included in Appendix A (Eligible organisations).

Each proposal is to be formally submitted by a single named researcher (henceforth the 'lead applicant' or LA). The LA will act as primary contact for the eScience Center.

The LA must

- should come from a technical discipline (computer science, data science, AI, etc.), or from a research discipline with a focus on technology development
- be in possession of a PhD
- hold a permanent contract at a Dutch research performing organisation as specified above; in case the LA holds a contract based on tenure track, the eScience Center should be consulted

In-kind matching for the duration of the project of a researcher on postdoc level with an in-depth understanding of fundamental research is mandatory. The matching depends on the contents of the proposal but a minimum of 0.2 fte is required.

Proposals supported by large research infrastructures and/or research consortia will be positively valued. Researchers employed by research organisations not mentioned in Appendix A may also participate in the consortium.¹

The LA may submit only one proposal in that capacity in this call.

2.2 What can be applied for?

This call is open for proposals in the following two technology areas.

1. FAIR-enabling technologies

The FAIR data principles are well-known and widely supported. However, the concrete tools that broadly enable the implementation of FAIR principles across the research disciplines are still lacking. Improvements are needed to ensure that FAIR repositories and interfaces are usable and useful for researchers, who increasingly require the interlinking of multiple data sets. Just technically linking data together is insufficient: to meaningfully combine data sets, the relevant semantics must also be considered.

The technologies we seek include, but are not limited to, semantic web and RDF; tools that support ontology creation; advanced FAIR data endpoints; semantic data portals.

2. Data-efficient AI

In the application of machine learning (especially with deep learning), significant time and effort must currently be invested in gathering, cleaning, and pre-processing the data. If supervised machine learning is used, sufficient data must be labelled by domain experts as well. Together, the steps needed to prepare the data for the actual learning phase are labour-

¹ Employees of institutes for higher education (see vereniginghogescholen.nl/hogescholen) may also participate in a research team.

intensive and error-prone. Technologies that enable researchers to apply AI to their problems include the development of algorithms that are more data efficient: they can train machine learning systems with much less (labelled) data.

The technologies we seek include, but are not limited to, tools for data pre-processing, cleaning, regriding, resampling, anomaly and outlier detection; tools for visual data inspection and smart data labelling; semi-supervised and active learning; data-efficient learning algorithms.

A project may be requested for an in kind budget of 3.0 PYR. The project duration should typically be between 24 and 36 months.

The organisation of at least two substantial workshops is mandatory. The goal of these workshops can include technology development, as well as user community engagement. The format and costs of the workshops should be negotiated with the eScience Center, which will cover all costs.

2.3 When can applications be submitted?

Project proposition

Applicants are required to submit a project proposition before they can submit a full proposal. The closing date for the submission of project propositions is **6 May 2021, 14:00:00 CET**.

Full proposal

The closing date for the submission of full proposals is **2 September 2021, 14:00:00 CET**.

2.4 Specific conditions

Proposals must be submitted with the following additional documents:

- a letter of commitment (project proposition)
- a software sustainability plan (full proposal)

Details are provided below.

Letter of commitment (project proposition phase)

An institutional-level guarantee (letter of commitment) is required to cover the in-kind matching of the researcher who will collaborate in the project with the eScience Center. The letter should be uploaded as a pdf file on submission of the project proposition.

Software sustainability plan (full proposal phase)

The lead applicant needs to present a clear software sustainability plan, based on the institutional commitment agreement and using the template provided. The plan may be adjusted on submission of a signed commitment superseding the previous one, and on explicit prior approval of the eScience Center.

Furthermore, the following conditions are applicable:

Software and data accessibility and quality

The eScience Center expects a basic level of accessibility and quality for the data and software used in its projects. In all cases where existing data and software serve as starting points of the research,

applicants must provide convincing arguments that they are usable. See the proposal template for more information.

Open science

Open science is central to the eScience Center. Open science enables verification, reproducibility and transparency in all phases in the research process, and maximizes the chance for adoption, reuse and impact of outputs resulting from the projects.² When writing the project proposal, the LA should be aware that:

- All source code will use permissive open-source licenses; research software developed by the eScience Center during the project will be licensed under the Apache 2.0 license. Software will be published in publicly accessible repositories such as GitHub from the start of the project, allowing community contributions. Software will also be made available in the research software directory (software.esciencecenter.nl), so as to make the software findable for search engines, provide citation options and add relevant metadata (such as documentation and related projects, tools and publications).
- Substantial effort is put into making software sustainable. Preference should be given to extending, improving and strengthening existing research software supported by existing research communities. Developing new software should only be proposed when no other viable alternatives exist.
- Research data and publications are freely available under open licences at the earliest possible stage.
- Reproducible research is supported (e.g. by using workflow technologies, computational notebooks, virtual environments, container solutions), so that researchers with access to the data and software are able to reproduce the research results.
- All academic publications resulting from research awarded under this call for proposals are to be publicly accessible (in open access) at the time of publication.

General conditions

- An identical project proposal may not have been awarded elsewhere.
- Awarded projects must commence within six months after the award date.
- The proposal must match with eScience Center expertise (See Section 1.3).
- Components (such as software, data sets or specialized hardware) necessary for starting or continuing the proposed research must be available at the date specified in the project workplan.

2.5 Submitting the application

- Applications must be completed in English.
- Use the application form (project proposition or full proposal) from the eScience Center website. The link will be available after the information event.
- Project propositions and full proposals can be submitted only via NWO's electronic application system ISAAC: www.isaac.nwo.nl. For technical questions, contact the ISAAC helpdesk (see Section 4.1).
- Project proposition and full proposals must be submitted no later than the deadlines set in Section 2.3.
- In the submission process in ISAAC, you may be requested to provide additional information. Please take this into account with regard to the set deadline.

² nwo.nl/en/open-science

- Please take into account that the proposal summary provided in ISAAC, and the summary for non-experts, may be used for publication purposes, should your application be awarded.
- Please note that applicants should inform their employing institute of the submission by sending a copy of the project proposition and the full proposal to the research director or dean of the institute or department. It is therefore assumed that the employing institute or university is informed of, and accepts, this call's conditions.
- Possible letters of intent from e.g. private partners should be added to the ISAAC fact sheet in a separate PDF-file in ISAAC as an attachment to the application form.

3 Assessment procedure

3.1 Procedure

The evaluation and selection procedure consists of three main steps. NWO will be involved to guarantee proper procedure. The procedure as a whole is intended to be as light-weight as possible.

Information event

To inform interested applicants of the specific aims of this call for proposals, as well as the role and expertise of the eScience Center RSEs, an information event will be organized on **30 March 2021 (13.00-17.00)**. In cases of force majeure the event will take place online. More information can be found on esciencecenter.nl/collaborate.

Step 1: Project proposition

The project proposition stage is intended to facilitate a consultancy with experts from the eScience Center, before proceeding to step 2 (the full proposal stage).

If the number of project propositions is higher than five times the number of projects that can be awarded, the eScience Center reserves the right to make a random selection out of a pool of all eligible proposals.

The LA must submit a project proposition outlining the project ambitions. The project proposition should outline the technological innovations that will be transformed into applied technologies, describe what is needed for this transformation, and explain what the expected impact will be.

The project proposition should be submitted via ISAAC in through the appropriate template (esciencecenter.nl/collaborate). The closing date for the submission is **6 May 2021, 14:00:00 CET**. It is important that the lead applicant should already make certain at this stage that the specific conditions mentioned in Section 2 can be realistically met.

The project proposition will be checked for eligibility at the eScience Center based on the criteria listed in Section 3.2 (letter of commitment and match in expertise). Only eligible project propositions will be included in the random selection, should it take place. The outcome is binding.

Step 2: Full proposal and assessment

Full proposals must be submitted before **2 September 2021, 14:00:00 CET**. The following procedure will then be adhered to:

Eligibility check

A formal eligibility check will be performed by NWO regarding the eligibility of the LA, the correct completion of the template, the inclusion of letters of commitment, and the extent to which the special conditions (Section 2.5) have been met.

Panel assessment

An assessment panel will assess the proposals. The panel will consist of acknowledged experts in applied computer science and experts from the eScience Center. The assessment will be based on the criteria mentioned in Section 3.2. The assessment panel will rank the proposals on the basis of their scores; proposals in different technical themes (FAIR-enabling technologies and data-efficient AI) do not

compete with each other. The ranking will then be submitted, together with a recommendation, to the Board of the Netherlands eScience Center.

Step 3: Awarding decision

The Board of the Netherlands eScience Center formally decides on awarding the projects, based on the recommendations of the assessment panel. The findings of the assessment panel will be sent to the applicants.

Timetable

30 March 2021	information event
6 May 2021, 14:00:00 CET	deadline project proposition
May 2021	eligibility check and selection
2 September 2021, 14:00:00 CET	deadline full proposal
September 2021	eligibility check
October-November 2021	panel assessment
December 2021	applicants informed of final decision

3.2 Assessment criteria

Criteria (project proposition)

To proceed to the random selection, proposals should

- propose a match with eScience Center expertise
- include a letter of commitment guaranteeing the in-kind matching for the duration of the project of a researcher on postdoc level with an in-depth understanding of fundamental research. A minimum of 0.2 fte per year is required

Criteria (full proposal)

Proposals will be assessed by the assessment panel based on the criteria below:

Academic quality and state-of-the-art (34%)

- the proposed work should aim to solve a specific, urgent challenge
- the proposal must indicate the technological and/or methodological challenges that need to be overcome
- the proposal should discuss relevant existing technologies and methodologies and indicate why these do not suffice
- the proposal must indicate how the proposed research is connected with efforts within the broader research community to address the methodological issue at hand
- the LA should have demonstrable knowledge and experience in developing digital methodologies
- the research team including the LA should make clear its availability for, and track record concerning, a collaborative effort, and argue why this is sufficient on the basis of a realistic project plan

Impact (33%)

- the proposal must indicate which outcomes the projected software solution(s) are expected to lead to
- the proposed research should potentially change the modus operandi in research disciplines, in terms of broadness, scale, speed of result delivery, or otherwise;

- the proposal must indicate which efforts are made to promote the results of the project, in terms both of academic publication and of research community (demonstrations, training, etc)

Re-use and sustainability (33%)

- the proposal must indicate how the technology and software will find use beyond the proposed work itself, preferably across institutional, national or disciplinary borders, both during and after finalization of the project
- the technological and software deliverables must be open source/open access and permit use and/or interpretation by other researchers
- the proposal must indicate how the project will build further collaborations, in academic research, industry, or both

4 Contact details

Specific questions about this call

If you have specific questions about this call for proposals and the assessment procedure, please contact:

For questions about the Netherlands eScience Center, or the eScience requirements for this call, please contact:

Programme Director Netherlands eScience Center

Tel.: +31 (0)20 460 4770

Email: calls@esciencecenter.nl

Questions about ISAAC

For technical questions about the electronic application system ISAAC, please contact the ISAAC helpdesk. Applicants are requested to read the ISAAC manual before consulting the helpdesk.

The ISAAC helpdesk is available from Monday to Friday from 10.00 to 17.00 hours on +31 (0)20 346 7179. You can also send your questions to isaac.helpdesk@nwo.nl. You will receive a reply within two working days.

The eScience Center adheres to NWO's Code for Dealing with Personal Interests (see nwo.nl/en/code-dealing-personal-interests).

Appendix A - Eligible organisations

1. Universities

Erasmus Universiteit Rotterdam
Open Universiteit Nederland
Protestantse Theologische Universiteit
Radboud Universiteit Nijmegen
Rijksuniversiteit Groningen Technische
Universiteit Delft
Technische Universiteit Eindhoven
Theologische Universiteit Apeldoorn
Theologische Universiteit Kampen
Universiteit Leiden
Universiteit Maastricht
Universiteit Twente
Universiteit Utrecht
Universiteit van Amsterdam
Universiteit van Tilburg
Universiteit voor Humanistiek
Vrije Universiteit Amsterdam
Wageningen Universiteit en Researchcentrum

2. KNAW-instituten

Hubrecht Instituut voor Ontwikkelingsbiologie en Stamcelonderzoek
Huygens ING
Internationaal Instituut voor Sociale Geschiedenis
Koninklijk Instituut voor Taal-, Land- en Volkenkunde
Meertens Instituut
Nederlands Herseninstituut
Nederlands Instituut voor Ecologie
NIOD Instituut voor Oorlogs-, Holocaust- en Genocidestudies
Nederlands Interdisciplinair Demografisch Instituut
Westerdijk Fungal Biodiversity Institute

3. NWO-instituten (NWO-I)

Physics of functional complex matter
Advanced Research Center for Nanolithography
Netherlands Institute for Radio Astronomy
Centrum Wiskunde & Informatica
Dutch Institute for Fundamental Energy Research
Nikhef - Nationaal instituut voor subatomaire fysica
Koninklijk Nederlands Instituut voor Onderzoek der Zee
Nederlands Studiecentrum Criminaliteit en Rechtshandhaving
Netherlands Institute for Space Research

Appendix B - eScience Center Expertise

The eScience Center has invested in the following expertise areas:

software quality

- developing workflow technologies: setting up an optimal and reproducible workflow
- improving software practices: robust programming to enable reuse
- advancing software sustainability: embedding software in the open science community

AI

- machine learning: using data to train computer models
- image processing: understanding patterns in images and video

analytics

- big data analytics: exploring large volumes of complex data
- text analysis: understanding patterns in texts
- visualization: creating images to drive interpretation

data processing

- databases: making data accessible and searchable
- real-time data analysis: processing sensor data ultra-fast
- interoperability and linked data: interconnecting data sets

computing

- exploiting hardware accelerators : increasing speed at lower cost
- high performance computing: increasing computational scale
- cloud computing: easily accessing computing power
- combining simulations: replicating complex systems