DARPA-EA-23-01-03
Collaborative Knowledge Curation (CKC)

I.   ARC Opportunity

The Defense Advanced Research Projects Agency (DARPA) Defense Sciences Office (DSO) is issuing an Advanced Research Concepts (ARC) Opportunity, inviting submissions of Abstracts for innovative exploratory research concepts in the technical domain of knowledge curation. This ARC Opportunity, otherwise known as Collaborative Knowledge Curation (CKC), is issued under the master ARC Exploration Announcement (EA), DARPA-EA-23-01.

ARC Opportunities are designed to allow an individual researcher the opportunity and time to focus on nascent, paradigm-shifting ideas for national security applications. While multiple researchers from the same organization may be proposed, the aggregate level of effort for a proposed research concept must be equivalent to one full-time equivalent (FTE) and 12 months. DARPA expects that the individual(s) working on the proposed idea primarily focus on the effort for the entire period of performance to the maximum extent practical. Only minimal variation to this requirement will be accepted. The maximum period of performance is 12 months. Each ARC award's maximum total value is $300,000, including direct and indirect costs. Proposed costs are limited to $10,000 or less for materials, equipment, and Other Direct Costs (ODC). Under no circumstances will profit be authorized. While resource sharing is not expected, it may be offered in the proposal. Any proposed resource share must be directly applicable to the effort. Any costs proposed beyond the $300,000 in Government funding will be the performer's responsibility. Travel and publication costs may not be proposed. No subawardees are permitted.

To view the original DARPA Exploration Announcement and the latest amendment issued against Advanced Research Concepts, visit SAM.gov under solicitation number DARPA-EA-23-01: https://sam.gov/opp/879d2ce6478d47139041ed6078d1bec2/view. It is incumbent upon the proposer to review DARPA-EA-23-01, any resulting amendments to DARPA-EA-23-01, and Frequently Asked Questions before preparing and submitting an Abstract and/or an Oral Proposal Package (OPP) (if invited). All Abstract submissions to this announcement must adhere to the instructions contained in the underlying master solicitation.

All technical, contractual, and administrative questions regarding this notice must be emailed to CKC@darpa.mil. This ARC Opportunity is soliciting Abstracts only. DARPA will evaluate Abstracts submitted in response to this ARC Opportunity, as detailed in Section 4 of the latest amendment issued against DARPA-EA-23-01. If the Government selects an Abstract for an Oral Presentation, the Government will issue an invitation to submit an OPP. The invitation will include the submission instructions and deadline.

All awards made as a result of the ARC Opportunity will be Research Other Transactions (OTs) awarded under the authority of 10 U.S.C. § 4021.

Abstracts submitted to this ARC Opportunity will be evaluated on a rolling basis in accordance with the latest amendment issued against DARPA-EA-23-01. The end of the submission period will be 4:00 p.m. Eastern Time on November 30, 2023. No Abstracts will be accepted after the end of the submission period.

II.   ARC Opportunity Description

In a world of increasingly complicated and interdependent systems, analysts and decision-makers spend more and more time curating the knowledge that informs their models and decisions.

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Knowledge curation involves acquiring information from many sources; triaging it as unimportant, contextual, or actionable; identifying factors and causal links; finding associated datasets; and developing metrics with which to measure objectives. This process is integral to successful economic statecraft, where knowledge curation is used to convert natural language objectives, such as "building soft power," into measurable, causal hypotheses, such as "Increasing D will increase X, as measured by I." Despite being a vital step in the decision-making process, knowledge curation is usually done by hand, which means analysts and decision-makers often miss important factors in complicated socioeconomic systems. For example, restrictions on the purchase of Russian oil did not include bans on the sale of ships to Russia, allowing the growth of a "shadow fleet" ferrying oil in defiance of price caps.

This ARC Opportunity will explore how machines can help analysts and decision-makers curate information faster and more thoroughly. How can we partially automate knowledge curation to help analysts and decision-makers gain and maintain awareness in complicated, interdependent systems?

A.   ARC Opportunity Technical Objective

This ARC Opportunity solicits methodologies and technologies that treat humans and machines as partners in the partial automation of knowledge curation. Human collaborators should act as experts who can guide the technology both in terms of curation goals ("What are ways of increasing X?") as well as common sense ("Sanctions and aid are very different."). Collaborative knowledge curation comes with several technical challenges:

- *Data:* Knowledge must often be curated in challenging data environments. Data are often scarce across contexts of interest, especially in evolving or unstable situations, and existing datasets may not tell a clear story without human interpretation. Knowledge curation must continue even in the absence of high-quality quantitative data.
- *Dynamics:* Knowledge must often be curated in volatile environments. Human-machine collaborations must be able to detect when information can safely be ignored, when it represents important context, and when it becomes actionable.
- *Representation:* Humans and machines must share knowledge representations. Static representations provide limited information, even as the amount of knowledge they contain increases, e.g., the infamous "spaghetti bowl slide[1]" containing a knowledge graph of stability in Afghanistan. This graph accurately describes a system that should not be simplified; it does not encourage viewers to expand on and absorb its contents.

ARC performers will develop methodologies and technologies to curate knowledge in one or more of the following scenarios of economic statecraft:

- What does the U.S. need to know to evaluate the effects of economic sanctions?
- What does the U.S. need to know to plan and evaluate the success of climate statecraft?
- How can we anticipate other countries' responses to tensions between world powers?

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[1] Bumiller, E. (2010, April 26). We have met the enemy and he is PowerPoint. The New York Times. Retrieved from https://www.nytimes.com/2010/04/27/world/27powerpoint.html

Performers may represent curated knowledge in a variety of ways, including natural language briefs, interactive visualizations, mutually exclusive and testable hypotheses, causal models, uncertainty analyses, shopping lists for data and metrics, etc.

The efficacy of performers' collaborative methodologies and technologies will be evaluated in support of a new scenario designed by DARPA. To this end, proposers should describe how their proposed methodology and/or technology will be validated against their chosen scenario. Evaluations may include quantitative and qualitative measures. For example, a pipeline that produces summaries might be evaluated on how much information it gets factually correct, but it might also be evaluated on how often it asks the human for help, whether it requires the human to do the same thing more than once, and whether a domain expert judges it to be useful.

This ARC Opportunity does not require that performers build executable models. This ARC Opportunity seeks reusable knowledge curation methodologies and technologies; building scenario-specific models at the expense of a generalizable approach is not within scope. Extracting causal factors by applying machine learning to quantitative data is not sufficient without significant human-machine collaboration. Expert-driven approaches such as knowledge engineering are of particular interest.

B. ARC Abstracts

Abstracts should clearly articulate an approach to one or more of the technical challenges above and describe how the approach is expected to help analysts and decision-makers "know what they need to know" in their selected scenario(s). The scenarios are purposefully broad; submitters may propose their own specifics given their area of expertise and existing information sources, provided that the scenarios remain in the realm of economic statecraft.

This ARC Opportunity is intended to be as inclusive as possible; however, proposed ideas should address the appropriate scope, have a clear deliverable at the end of the effort, and include specific practical applications of the research.

Abstracts should describe a research plan, including (a) detailed intermediate technical objectives with evaluation measures and (b) a schedule segmented monthly or quarterly outlining corresponding deliverables. Abstracts should specify information sources and acquisition methods, as well as propose an acceptable data de-identification strategy if necessary.

DARPA will evaluate Abstracts submitted in response to this ARC Opportunity, as detailed in Section 4 of the latest amendment issued against the DARPA-EA-23-01. If the Government selects an Abstract for an Oral Presentation, the Government will issue an invitation to submit an OPP. The invitation will include the submission instructions and deadline.

C. Schedule of Milestones

The following specific milestones and due dates are common to all Abstracts and OPPs (see above for technical details and Section III.A below for additional information on milestones):

- Kick-off meeting: Should define technical approach and steps forward.
- Quarterly technical report and status meeting: Each report should detail progress towards all research objectives, including a master document that refers to associated explanatory presentation slides, design documents, publications, and associated code with full documentation, as needed.
- Final report: The final report should summarize all work completed on the project.

D.   Reporting Requirements

Performers will be expected to provide, at a minimum, the following reports:

- Monthly technical updates and financial reports. These reports should include progress to plan.
- Quarterly summary reports. Reports should summarize the required quarterly technical report (see Section II.C above) and include a financial summary that spans the prior three (3) months.

III.   ARC Opportunity Submission Format, Instructions, and Selection

A. Abstract Content and Format

All Abstracts submitted in response to this notice must comply with the content and format instructions in Section 3.1 of the latest amendment issued against DARPA-EA-23-01. The submission must use the templates provided as Attachments to DARPA-EA-23-01. Abstracts submitted in response to this ARC Opportunity must be UNCLASSIFIED.

B. Abstract and OPP Submission Instructions

Abstracts submitted in response to this ARC Opportunity and OPPs submitted in response to an invitation shall be submitted electronically via the DARPA Submission website at https://baa.darpa.mil. See Section 3.3 of the latest amendment issued against DARPA-EA-23-01 for Abstract and OPP submission instructions.

Technical support for the DARPA Submission website is available during regular business hours, Monday – Friday, 9:00 a.m. – 5:00 p.m. Eastern Time. Requests for technical support must be emailed to BAAT_Support@darpa.mil with a copy to CKC@darpa.mil. Questions regarding submission contents, format, deadlines, etc., should be emailed to CKC@darpa.mil. Questions/requests for support sent to any other email address may result in delayed/no response.

DARPA will acknowledge receipt of complete submissions via email and assign identifying numbers that should be used in all further correspondence regarding those submissions. If no confirmation is received within two (2) business days, please contact CKC@darpa.mil to verify receipt.

No Abstracts will be accepted after the end of the overall submission period listed in Section I above. Abstracts must be submitted per the instructions outlined in this ARC Opportunity *and received by DARPA* no later than this time and date. Proposers are advised that the Abstract submission deadline outlined herein is in Eastern Time.

Abstracts will be evaluated and selected in accordance with Section 4 of the latest amendment issued against DARPA-EA-23-01.

IV.   Award Information

Selected OPPs will result in a potential award of a Research OT agreement subject to the proposer's acceptance of the terms and conditions. Proposers must review the model Research OT agreement provided as Attachment I to DARPA-EA-23-01.

The completed Task Description Document, Schedule of Milestones and Payments (templates included in Attachment I), and data rights will be included in the Research OT agreement upon award.

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Given the limited funding available for each ARC Opportunity, not all proposals considered selectable may be selected for a potential award.

V. Eligibility

See Section 6 of the latest amendment issued against DARPA-EA-23-01 for information on who may be eligible to respond to this notice.

VI. Human Subject Research

Abstracts to this ARC Opportunity proposing human subjects research will be considered out of scope and may be disregarded.

VII. Administrative Requirements

Section 7.2 of the latest amendment issued against DARPA-EA-23-01 provides information on Administrative Requirements that may be applicable for proposal submission as well as performance under an award.

VIII. Frequently Asked Questions (FAQs)

All technical, contractual, and administrative questions regarding this notice must be emailed to CKC@darpa.mil. Emails sent directly to the Program Manager or any other address may result in delayed or no response.

All questions must be in English and must include the name, email address, and telephone number of a point of contact. DARPA will attempt to answer questions publicly in a timely manner; however, questions submitted within seven (7) calendar days of the proposal due date listed herein may not be answered.

DARPA may post an FAQ list under the ARC Opportunity on the DARPA/DSO Opportunities page at (http://www.darpa.mil/work-with-us/opportunities). The list will be updated on an ongoing basis until one (1) week prior to the proposal due date. DARPA will also maintain https://www.darpa.mil/ARC as a resource page with links to all relevant ARC Opportunities and FAQs.