SSF Call for Proposals

SSF Multidisciplinary Research Center

Cyber-Resilience for AI-systems (MRC CRAI)

The Swedish Foundation for Strategic Research (SSF) announces 60 million SEK in a national call for proposals for a Multidisciplinary Research Centre (MRC) that meets the highest international scientific standards. The call aims to stimulate truly multidisciplinary research collaboration between academia, research institutes, industry, and society.

SSF seeks to fund one (1) MRC in the field of making future AI-systems Cyber-Resilient (MRC CRAI).

The MRC will be granted up to 40+20 million SEK in total including overhead costs for a period of six years. Full funding will be contingent upon a successful midterm evaluation.

SSF Multidisciplinary Research Centers (MRC)

Multidisciplinary research is defined here as coordinated research efforts in which several scientific competences, presumably not all from the same department or faculty, each outstanding in their field, work together to solve a major societal problem.

A Multidisciplinary Research Center (MRC) is characterized by the added scientific value that arises from multidisciplinary research. The potential for an MRC to find new solutions through multidisciplinary and synergistic approaches is a key evaluation criterion.

The research by the MRC should be based on a clear scientific question centered on gaps in knowledge related to important problems and opportunities. Moreover, the MRC should have explicit plans for the implementation and/or knowledge transfer of research results into industry and society in a long-term perspective, including for sustainable development aspects.

Another MRC characteristic is its strong presence in international research initiatives (*e.g.*, *EU Horizon Europe*), leveraging the SSF-funding with international funding for increased thrust. The potential for an MRC to constitute an internationally leading research center is a key evaluation criterion.

Aims and Scope

Complex technical systems relying on Artificial Intelligence (**AI-systems**) are increasingly important for our digital society. These AI-systems might be purely cyber or cyber-physical in composition, operating independently or in groups or swarms (systems-of-AI-systems). While the AI-systems reliance on data, computing and energy are often discussed, as well as their ethical issues and impact on the labor market, the new security risks these AI-systems introduce or are vulnerable to are less discussed. As an example, even slight alteration of the datasets AI-systems are trained on, either by explicit cyber-attacks or by technical mistakes, can seriously alter the functionality of the final AI-systems, potentially making these perform as the attackers wish. Also, AI as a tool for adversaries poses a threat to our digital society and technical systems, for which we must be better equipped. The Swedish AI Commission presented in 2024 its report *Färdplan för Sverige*. The message is that the whole society must adopt to deal with AI. While the report contains 75 different items for action, one of the six main proposals is the need for investments in world-class research in cyber-resilience and AI-security.

Contemporary cyber security approaches assume the occurrence of cyber-breaches and aim to make our society's digital systems intrinsically more robust and resistant, *i.e.*, to make our digital systems **cyber-resilient**. Future cyber threats will most likely be strongly AI-empowered, thus posing new challenges. The new EU regulation, *The European Cyber Resilience Act* (CRA, 2024), is evidence of this condition.

As measures of countries' level of digitalization, the *IMD World Digital Competitiveness Ranking 2024* ranks Sweden as number four globally, while the *EU Digital Economy and Society Index 2022 (DESI)* ranks Sweden as number four in the EU. The *Oxford Insights Government AI Readiness Index 2024* ranks Sweden as number 14 globally, while the *ITU Global Cybersecurity Index 2024*, not using ranks, places Sweden in the top Tier 1 Role-modeling category together with 45 other countries. The previous 2020-edition, then using ranks, placed Sweden at rank 26 globally in cybersecurity. Clearly, Sweden is a global leader in overall digital readiness, but less ready when it comes to AI and cyber security. Sweden thus risks not being able to fully reap future benefits of AI, and of having a threatened digital sovereignty.

Motivated by this situation, SSF finds great strategic relevance in supporting MRC CRAI. With a sharp focus on **internationally excellent research on making future AI-empowered systems cyber-resilient in the presence of various threats and technical errors.** CRAI will be strategically positioned and well-timed. Multidisciplinary research between experienced AI researchers, experienced cyber-security researchers and selected industrial and/or societal partners further increases CRAI's potential impact.

The successful SSF MRC CRAI has the following characteristics:

- The research focus is clearly on internationally excellent research on making future AI-systems cyber-resilient, these being purely cyber or cyber-physical in composition, operating independently or in groups or swarms (systems-of-AI-systems). Starting with deep knowledge of AI-systems and technical system vulnerabilities, CRAI will advance knowledge on cyber-resilience also in view of the disruptive developments in AI – in the operations of technical systems and as an instrument in attacks. Proposals with a general "cyber-security with AI-approach" will therefore not be funded.
- Separate groups of excellent AI-researchers and excellent cyber-resilience researchers join forces during the project period for the above common multidisciplinary research task. Demonstrated long-term excellence in, at least, both these research fields are required for transformative research at the highest international level. Proposals without a balanced demonstrated research excellence in both AI-systems and cyber-resilience will not be funded.

- To be strategically relevant for Sweden, CRAI has a holistic perspective, with quantifiable efforts towards relevant AI-systems. This is achieved through partnerships with selected research, industrial, and/or societal partners offering CRAI their needs, knowledge, experience, tools and results. While SSF by its statues can fund research only in natural science, engineering and medicine, proposers are encouraged to include partners within the human, behavioral and social sciences. As AI is expected to transform society, knowledge of human and societal needs is required to make the AI-systems that are relevant, desirable and usable for society. This requires knowledge outside traditional technical research. Proposals without a trustworthy strategic relevance for Sweden, technically, economically and socially, will not be funded.
- CRAI presents validation of proposed resilience techniques in use case(s) in collaboration with enterprises for, *e.g.*, energy systems, communication systems or governance/management.
- Scalability and positive spillover-effects are quantifiably addressed by CRAI.
- CRAI is very active in international research programs, such as EU *Horizon Europe* and *Digital Europe*.
- CRAI is fully compliant with, and supportive of, key relevant Swedish and EU strategies and regulations such as The Swedish AI Commission's *Färdplan för Sverige,* the EU's *AI Act* and *European Cyber Resilience Act.*
- CRAI quantifiable engages a comprehensive cyber-resilient AI community in Sweden, with a significant number of senior researchers, PhD students, engineers, MSc students and active industrial and/or societal partners.

Examples of potential research questions in this Call are:
- Threat and Risk Analyses and Implications for various AI-systems and use cases.
- Explainable AI (XAI) for transparency, traceability, trustworthiness in AI-systems.
- Secure-by-Design AI-Systems and Zero Trust Architectures for cyber-resilience.
- Systems-of-AI-Systems using swarm behavior features for cyber-resilience.
- Safe Training Infrastructures prevent data manipulation during AI learning phase.
- Data-Extraction Prevention shields AI training data from compromised model.
- AI Cyber Threat Intelligence for automated threat prevention, prediction, detection, and response.

The above research questions are examples for stimulating research and innovation. They are not to be considered as mandatory SSF research directions. SSF encourages innovative, multidisciplinary collaborations to propose novel research, with positive impact on a range of applications.

Eligibility

An MRC consists of applicants from one hosting Higher Educational Institution (HEI) and applicants from one to three other HEIs or Research Institutes (RI), supported by at least two industrial and/or societal partners. The partners should complement each other.

Each HEI may be represented by its employees in maximum of one (1) application as main applicant in this call. There is no limit to the number of applications in which the given HEI or RI is represented by an employee as co-applicant. The HEIs and RIs are expected to be selective and make strategic framing of their centers.

The main applicant (Center Director) must have international standing as a research leader in her/his field, must be actively employed by the hosting Swedish HEI to at least fifty percent of full time and must be prepared to assume operative responsibility for the MRC during the entire grant period.

The co-applicants are the researchers employed to at least fifty percent of full time by the collaborating HEI/RIs, including the hosting HEI. The total number of co-applicants should not exceed seven (7) persons, and gender equality must be considered in the team.

Each industrial and/or societal partner may be represented in maximum of two (2) applications in this call. Applications with industrial and/or societal partners registered in Sweden are prioritized.

International research organizations may participate only by their own means, apart from international researchers that becomes employed by the MRC through the participating Swedish HEIs/RIs.

The MRC must have a Governing Board, approved by SSF, having a majority of industrial/societal representatives. The Board, with a chair from industry/society, shall have the mandate to recommend SSF to terminate the funding, in whole or in parts, or to change the management of the MRC. A tentative Board should be stated in the application.

The MRC must assign an international Scientific Advisory Committee (SAC), proposed in the application.

A provisional Center Agreement, signed by all partners, will be required from the consortium behind the application, if and when it is selected for a hearing. The period for this contract is recommended to be at least three years, *i.e.,* until the mid-term evaluation.

Successful applicants should be well-connected internationally, for example to European Commission initiatives. For a strong impact, the proposed MRC should also be well-connected to research branches that are complementary to natural science, medicine and/or engineering sciences through collaborations.

Applications not conforming to the above eligibility criteria will not be considered by SSF. It is the responsibility of the main applicant to inform all co-applicants and industrial/ societal partners, and to check the proposal for compliance before submission.

Grant

SSF-funding is available only to Swedish universities or research institutes, where one HEI is the administrative organization for the grant. The industrial/societal partners and international partners must support the MRC by their own means.

The proposed budget from SSF shall be up to 60 million SEK in total during six years.

The budget allocation from SSF will be a decision of 40 million SEK in conjunction with the MRC's start. Up to 20 million SEK will be decided and distributed by SSF after a mid-term evaluation. Three percent (3%) of the overall grant will be reserved by SSF for supporting utilization/exploitation efforts of the research results proposed by the Center Director.

The universities/research institutes can use the grant for salaries (senior researchers, postdocs, PhD students, *etc*.), research tools/infrastructure, and running costs according to the needs of the MRC. The application must demonstrate how the SSF grant will be adequately distributed among the HEIs/RIs*, i.e.,* with adequate budget for each organization. It must also clearly display any co-funding (in-kind, cash, lab usage, research infrastructure, *etc.*) from the industrial/societal partners.

A maximum of twenty-five percent (25%) of the overall grant may be used for salaries for the Main applicant (Center Director) and/or for the Co-applicants (*i.e.,* these individuals)

taken together. However, no more than twenty-five percent (25%) of the salary of each applicant (*i.e.,* the same individuals) may be covered by the SSF grant. A maximum overhead cost of twenty-five percent (25%) is allowed.

Proposal and submission

A complete application must contain, among other data specified in SSF's online application portal, a full description of the MRC research plan and details of the relevant and complementary expertise of each of the participants. The multidisciplinary approach to the research problem and the use case(s) should be clearly described.

Each proposal must clearly describe the international state of the art within the research area(s) addressed, and present how the MRC will be scientifically competitive and relevant to sustainable development. In addition, the proposal should clearly state the resources available and demonstrate how the proposed participating organizations will be effective to reach the MRC goals. The plan and potential for international cooperation and leverage should be clearly described.

The application should contain a clear account of the strategic significance of the research, including an IPR plan and a plan for utilization/exploitation of the results in Sweden during the MRC's research operations, as well as after completion of the MRC.

The MRC participants must themselves propose a concise set of long/short term Key Performance Indicators (KPI), upon which the MRC can be evaluated in the mid-term evaluation. These indicators must cover scientific, managerial, and business qualities and substance as well as strategic relevance impact. Each of the KPIs should be elaborated in the research plan and tightly connected to the MRC goals.

The following KPIs are mandatory for all MRCs:

- the volume of co-authored papers by the collaborating research groups and partners
- mobility in person-years between the collaborating research groups and partners
- international presence, *e.g.,* grants from the EU and/or other international initiatives (state also the starting values of these for base line)

Include a sustainability assessment and also a risk analysis of the devised technology, innovation or other output.

The application should contain a clear account of how the applicants currently and onward use Artificial Intelligence (AI) as a tool in their research.

The application should be elaborated jointly by all the MRC participating organizations and must be submitted by the Centre Director (main applicant). All participating organizations must attach Letters of Intent (LoI) signed by the highest management level in the organizations (head of research, or equivalent). The vice-chancellor of the hosting HEI must also sign the application.

The proposal must be written in English and submitted via the SSF online application portal at: http://apply.strategiska.se. Note that in order to get a complete view of all data required for submission it is necessary to consult the portal. Please log on to the portal well in advance of the deadline. Please also submit the application in due time before the deadline. When the application is submitted, the system will reject it if some data fields are missing. It is possible to submit and re-submit as needed before deadline.

Applications must be submitted by September 2, 2025, 14:00 hours CET. No additional material will be considered after this deadline, unless explicitly asked for by SSF.

Evaluation

Applications will be assessed by an evaluation committee and a hearing committee consisting of national and international experts from industry, academia, and research institutes as well as by international peer reviews.

The applications will be evaluated using the following criteria:

- Conformity to scope and eligibility as outlined above.
- Constituting an internationally leading research constellation.
- Scientific quality; originality, strengths, weaknesses, and feasibility of research plan.
- Added value of multidisciplinary and synergistic approaches.
- Degree of internationalization.
- Strategic relevance to Swedish industry and/or society as well as explicit long-term impact of the proposed research.
- Qualifications of the applicants and composition of the research team, including previous achievements (science, innovation, and entrepreneurship), international experience and networks, gender balance and leadership/management.
- Level of engagement from all participating organizations, including evidence of anchoring of the application to top management (including Letter of Intent, LoI).

Timetable

Call announced: February 20, 2025

Last date for applications: September 2, 2025, 14:00 hours CET

The applications will be evaluated in stages:

- Selection of maximum three applications for hearings **September, 2025**
- Hearings **November, 2025**
- Selection of one application for funding.
- Decision by the SSF Board **December, 2025**
- Center start: From **January 1, 2026** and no later than **July 1, 2026**

Please note that the Foundation is subject to the Principle of Public Access to Official Records (*Offentlighetsprincipen*). Thus, applicants should avoid submitting material that they do not wish to be made public, *e.g.,* information that could prevent patenting.

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