

SIXTH THEMATIC CALL OF THE RESEARCH, DEVELOPMENT AND INNOVATION PROGRAMME ICT 2023: Autonomous systems and the augmented human

Research, development and innovation programme ICT 2023

The research, development and innovation programme ICT 2023 is jointly coordinated and funded by the Academy of Finland and Tekes, the Finnish Funding Agency for Innovation. The aim of the programme is to further improve Finland's scientific expertise in computer science and to promote the extensive application of ICT. The programme is based on the report *21 Paths to a Frictionless Finland* by the ICT 2015 Working Group. At least 10 million euros of the Academy's budget authority for 2016 will be used to implement the ICT 2023 programme.

Autonomous systems and the augmented human

Humans and information technology possess different sets of strength. Humans excel in understanding the big picture, seeing the world from an overall perspective, and in making decisions based on incomplete information. Machines, on the other hand, are fast and accurate in laborious routine tasks and may work quite autonomously even in changing conditions. The growth of artificial intelligence has created more and more opportunities to utilise information technology in the development of machine vision, machine learning and robotics to support innovations.

The reconciliation of the key strengths of humans and machines makes it possible to introduce more effective and versatile ways of working and to experience the world in a completely new way each day. Technology can also enable us to augment human capacity, senses and cognition in new, unknown ways. The solutions to be developed and explored under this thematic call are to be based both on new equipment and on computational innovations. It has been predicted that autonomous systems and robotics will hold significant potential to support economic growth, improve the quality of goods and services and promote industrial renewal.

There are numerous fields of application for this technology in various branches and in our daily lives. It can provide much support to knowledge and manufacturing workers as well as to the activities of people with limited functional capacity. The technology can also help create different kinds of autonomous devices. The potential fields of application range from logistics to manufacturing and e-commerce, from healthcare and medical applications to environmental and natural resources management, and from education and learning to overall security.

In principle, research into this area will require a multidisciplinary approach from the perspective of computer science, cognitive science, psychology, social research, human-technology interaction, and social sciences. The results of this thematic call have potential to significantly influence future information technology, societal functions and people's daily lives.

The introduction of autonomous, intelligent and interactive systems will not, however, be a straightforward process. In addition to posing a wide range of interdisciplinary technological challenges, autonomous systems will also present challenges to both individuals and society at large. The impending changes will target, for instance, the workload, working methods and the

redistribution of work. This is why there are key research questions unanswered in several scientific disciplines, from engineering to the social sciences.

Thematic areas

The call includes the following key thematic areas:

- The function of autonomous systems in changing and challenging conditions (e.g. on the ground, in the air, in water, in space or inside the human body)
- Observation and interpretation of information in the surroundings
- Development and application of artificial intelligence for autonomous systems and to augment human capabilities
- Robot-human cooperation and interaction, including safety and security perspectives
- User interfaces and user experience in new ways of working and in systems that promote wellbeing
- Using technology to augment human functional capacity, senses and cognition
- Ethical, judicial and societal perspectives in relation to the above themes.

Development of individual components and implementation technology (e.g. sensors) is not included in the themes of this call.

Review of applications

The applications will be reviewed and the decisions will be made following [the Academy of Finland's general review criteria](#). In addition, special attention will be paid to the following issues:

- international engagement
 - attracting young, talented researchers from abroad to Finland or hiring researchers who have recently come to Finland to work in the project
 - research visits by Finnish researchers to leading-edge foreign universities and research institutes
- business collaboration
 - cooperation between universities, research institutes and business companies
 - problem-setting in research
 - application potential of results
- intersectoral mobility of leading-edge researchers
 - mobility from universities to business companies
 - mobility from business companies to universities
- use of universities' and research institutes' own resources to carry out research
 - use of resources of the site of research and the partners
 - level of commitment and funding contribution by the site of research.

The applications will be reviewed by an international expert panel. The reviewers will use the Academy's review form for Academy Programmes.

The threshold rating for Item 1.1 (Project's relevance to the programme) is 4 on a scale from 1 to 6. If an application fails to meet this requirement, the review will be discontinued and the applicant will only receive feedback on Item 1.1.

If an application does not receive at least rating 4 for Item 1.2 (Scientific quality and innovativeness of research plan), the review will be discontinued and the applicant will only receive feedback on Items 1.1 and 1.2.

This call is a single-stage call. The non-negotiable deadline is 27 April 2016 at 16.15. Applicants may be invited for interviews during the review process.

The funding is granted for two years. Applicants may choose the start date of the two-year project to be either 1 September 2016 or 1 January 2017. In choosing the start date, applicants should take into account that the funding decisions will be made in summer 2016.

Consortium applications

If the applicant is a consortium, see detailed guidelines on our website under [Guidelines for consortium application](#). Please note that consortium PIs can submit the consortium application only after all consortium subprojects have completed their applications. The non-negotiable call deadline also applies to consortia. Consortium compositions cannot be changed after the deadline has expired. The Academy of Finland only funds research organisations. If the consortium includes business companies, see the specific guidelines below.

Intersectoral consortia

Applicants must clearly indicate in their research plan if the consortium involves parties applying for funding from both the Academy of Finland and Tekes. In addition, the application must include a collaboration plan as a separate appendix.

Collaboration plan (no more than three pages):

- List all parties and specify which parties are applying for Academy funding and which for Tekes funding.
- Describe the collaboration and management included in the project.
- Describe the management and research duties within the project.
- Describe the mechanisms by which the project will integrate all participating organisations and individual researchers.
- Describe, if relevant, the implementation of intersectoral researcher exchange.
- Define each PI's required input to the project, and justify why each research team's expertise is necessary in order to achieve the project's objectives.
- Describe the complementary roles of the companies in the consortium, and explain which research results can be jointly utilised by the companies.
- Describe the application potential of the results.
- Make sure that the collaboration plan's length and details are proportional to the size of the project. The plan should be extensive enough to ensure that the project parties will work together as one whole.

In the Academy's online services, enter only the consortium parties that are applying for funding from the Academy. Within this call, Tekes is prepared to fund only such projects by companies that are parallel with the proposed research projects.

Funding from Tekes is applied for in line with Tekes' guidelines. The deadline for applications addressed to Tekes is 27 April 2016 at 16.15. The applications are submitted via Tekes' service at www.tekes.fi/en/online. Identify the application with the theme "**ICT 2023 Autonomous systems 2016**".