Research7+ Engagement Group

Joint Statement 2024

TABLE OF CONTENTS

R7+ JOINT STATEMENT, 2024

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EXCERPT OF THE JOINT STATEMENT

Research7+ members[1] recommend promoting scientific collaboration within and across disciplinary and national borders. To create an impact on science, technology and society, R7+ members recommend investments in the full spectrum of scientific research from fundamental research to application. In this scenario, one of the most important resources is the competence and creativity of talent across the breadth of research teams. This is especially true for early career talents, therefore it is fundamental to attract and retain early career talents in science and innovation while promoting mobility, and international training programs in research organizations. Academic freedom is crucial to ensuring a thriving scientific ecosystem. Building the capacity for evidence-informed policymaking and investing in scientific and technology foresight will benefit societies. Scientific diplomacy is acknowledged as a fundamental instrument to promote peace and dialogue between different cultures and countries and should be promoted at all levels also through international research infrastructures, mobility of researchers, scientific cooperation and open science.

The transformative impact of Artificial Intelligence (AI) in reshaping the future of industry and society suggests needing a call for action by governments, private sector, and academic institutions. AI is accelerating scientific discovery and has the potential to address global societal challenges. Strengthening collaborations among research institutions, including industrial partners and private initiatives, is crucial for advancing research focused on human-centered, trustworthy, responsible, and sustainable development of AI.

Coordinated international efforts are essential to facilitate progress at the necessary scale and speed. Investing in AI infrastructures, talent attraction and training within the framework of international cooperation is critical for nurturing the next generation of AI researchers and practitioners.

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[1] NSERC - Natural Sciences and Engineering Research Council (Canada), JRC - Joint Research Centre of the European Commission (European Union), CNRS - Centre National de la Recherche Scientifique (France), Fraunhofer-Gesellschaft (Germany), CNR - Consiglio Nazionale delle Ricerche (Italy), RIKEN (Japan), CSIC - Consejo Superior de Investigaciones Científicas (Spain), UKRI - UK Research and Innovation (United Kingdom), National Science Foundation (United States of America)

R7+ JOINT STATEMENT, 2024

NSERC, Canada | JRC European Commission, European Union | CNRS, France | Fraunhofer-Gesellschaft, Germany | CNR, Italy | RIKEN, Japan | CSIC, Spain | UKRI, UK | NSF, USA

Joint Statement

The R7+ members, fully aware of their responsibilities and those of their researchers, towards society, particularly in terms of scientific integrity, ethics and transparency, have made the following joint statements to the G7 Science and Technology Ministers.

1. GENERAL STATEMENTS ON RESEARCH AND TECHNOLOGY

The Research 7+ Engagement Group (R7+) is a platform made of Research Performing Organizations (RPOs) and research Funding Agencies (FAs) operating both in the field of fundamental and translational research; the R7+ aims to provide recommendations to the G7 Science and Technology Ministerial meeting in order to help identify the knowledge and innovation paths which can help in facing global challenges and promote societal values of peace, wellbeing and democracy.

The R7+ was held in Bologna, Italy on 6-7 May 2024, during the Italian Presidency of the G7, with the free initiative of the National Research Council of Italy. The inaugural meeting was attended by some of the leading research organizations of the G7 members, as well as Spain, as listed at the bottom of this joint declaration.

1.1 Science as an Instrument of Peace, Dialogue and Knowledge

Science is a universal tool for the advancement of knowledge and an irreplaceable source of progress and innovation; fundamental research is its driving force.

Science is also a key instrument for promoting dialogue and peace between different countries, cultures and also with local communities including underrepresented ones such as Indigenous groups. It should be considered for the good of all, with collaboration among scientists guided by principles of fairness, reliability, transparency, objectivity, reciprocity and trust. International scientific cooperation is even more essential in the changing geopolitical environment.

The R7+ members recommend promoting impact and long-term investments on full spectrum of scientific research, supporting cooperation among those institutions that have a key function in promoting research and enabling innovation ecosystems

1.2 Pivotal Role of International Collaboration in Research including Infrastructures and Large Scale Facilities

International collaboration lies at the heart of scientific success. Flagship joint international scientific initiatives have demonstrated their effectiveness for the advancement of knowledge.

Scientific research is called to face complex global challenges, such as pandemics, climate change, and the risks of artificial intelligence. Research benefits from international collaboration as well as the development of research infrastructures with interoperable and secure data sharing mechanisms and competence frameworks. In this perspective it is also important to join forces for promoting appropriate access to scientific results through open science initiatives. Research security and integrity underpin international collaboration and we express strong support for the efforts undertaken by the G7 Working Group on the Security and Integrity of the Global Research Ecosystem (SIGRE). In this context, research infrastructures, including Large Scale Facilities where international agreements for joint research programs have been implemented, play a pivotal role in leveraging scientific results fostering collaboration between various disciplines and diverse scientific communities. The joint support and participation of G7 members in research infrastructures, for the development of new solutions and innovative ideas for the future, are encouraged. G7 Science & Technology Ministers are therefore recommended to prioritize the development and maintenance of large-scale research infrastructures especially in areas where international collaboration is pivotal for advancing fundamental research in future technologies.

R7+ JOINT STATEMENT, 2024

NSERC, Canada | JRC European Commission, European Union | CNRS, France | Fraunhofer-Gesellschaft, Germany | CNR, Italy | RIKEN, Japan | CSIC, Spain | UKRI, UK | NSF, USA

1.3 Innovation to face common challenges and build a secure and resilient world

G7 technological cooperation spanning the whole innovation value chain holds immense potential to expedite the development, production and widespread adoption of crucial future technologies across G7 members and beyond. Research ecosystems should catalyse voluntary technology transfer on mutually agreed terms throughout the G7 innovation spectrum even in response to societal demands. G7 members are encouraged to foster bi- and multilateral research programmes to bolster technological cooperation.

Innovation, scientific discoveries, and technological developments constitute fundamental aspects of the answer that humanity should master in the immediate future to address global sustainability and achieve a resilient planet. The strengthening of scientific research is considered an indispensable factor for developing "key technologies" to enable economic prosperity and the technological sovereignty of democratic countries.

1.4 Role of science in supporting policy-making

Systematic dialogue and cooperation among R7+ members could be an important contribution to support resilient and strengthened systems. Evidence-based and inclusive decision-making processes are successful in addressing the challenges and threats lying ahead of our society now and in the future. Academic freedom is crucial to ensuring a thriving scientific ecosystem. Building the capacity for evidence-informed policymaking and investing in scientific and technology foresight will benefit societies. Implementing participatory and deliberative practices is key to advance innovation at the citizen-science-policy interface.

A major effort should be made to disseminate the positive impacts research brings to society. To aid this it is important to strengthen the scientific culture and engagement of citizens and decision makers in science. This is valuable for ambitious international scientific research projects, for the benefit of as many people as possible in aid of humanity and social wellbeing.

1.5 Giving value to the interdisciplinarity and to the relationship between science and humanities

Science is evolving from interdisciplinarity to a closer cross-fertilization between different fields, with fields such as generative AI, which is substantially based on computational language, bridging the gap between the humanities and sciences. As we navigate this shift, it's important to discuss and address the balance between cognitive automation and creativity. Embracing diversity is important to adopt and use the new value brought by digital transformation. This increasing complexity of the social setting could benefit from a comprehensive approach that includes the humanities and social sciences. A higher level of dialogue between different disciplines which uses the high quality data from various research fields to facilitate future prediction and to solve social problems.

It is recommended that research collaborations fostering teamwork and community-engaged research be prioritized, considering collaboration within and across disciplinary and national borders a necessary approach in addressing growing global challenges aligned with Sustainable Development Goals SDGs such as loss of biodiversity.

1.6 Democracy, diverse talent and mobility

Researcher mobility provides benefits on multiple levels to individual researchers, research organisations, nationally and globally. Training of early career researchers carried out in research organizations flows into companies, which absorb a large percentage of the personnel trained in public structures. The cultivation of the potential of early career talent and the promotion of an effective talent mobility are important for safer and more resilient societies.

Mobility of researchers continues to be a central dimension for the identification of priority themes, exchange of ideas, mutual learning, access to research infrastructures and databases, data sharing, , dissemination of results, and many other key dimensions of scientific work. In this regard, it is important to give priority to the design, implementation, and evaluation of their international mobility programs to promote the development of frontier research. In todays' research security risk landscape, cooperation is essential for effectively monitoring and responding to the evolving risks around global talent mobility.

It is crucial to promote a longer-term perspective mobility schemes, pay particular attention to the inclusion of women and girls, and place a stronger focus on early-career researchers and the promotion of mobility initiatives. This support is crucial for the results of R&I to be adopted and implemented within society and for continued funding.

2. STATEMENTS ON AI RESEARCH

AI is a transformative technology, paving the way for a new research and innovation renaissance and shaping the future of industry, government, and society. AI is expediting scientific discovery and has the potential for addressing research and innovation challenges. This capacity of AI has been greatly accelerated by the emergence of generative AI and foundation models that have increased, at an unexpected rate, the power and potential of AI to tackle grand challenges by empowering our ability to make more informed choices.

We are not at the start of this revolution; we are already within the transition. Already models exist which can provide step changes in the way science is done, alter the way people work and change the way people interact with the world. New capabilities continue to emerge and should be encouraged, but we need to investigate how we can deploy and best utilise the tools already available but are not yet fully understood or embedded in user communities.

At the same time, generative AI and foundation models have increased the concerns of researchers and decision makers on the risks connected with this technology. It is, therefore, crucial and timely to develop a research agenda on foundational AI for exploiting its potentialities, but at the same time mitigating AI risks in the spirit of the outcomes of the Hiroshima AI Process[2].

2.1 AI as for Societal Benefit

Investments in public research are crucial for scientific, economic, and societal benefits for all. AI use should be prioritised in areas where it can benefit mankind and address global challenges facing all humanity. Inclusion and a user first approach would help enable this. The development of AI for the societal benefits would benefit from making computing, data and software available as appropriate to the research community while preserving accessibility and inclusivity. Providing fair access to AI research infrastructures and continuing to invest in cutting-edge hardware and software, can enable that future AI research is not a privilege for the few but accessible to all who wish to contribute to developing AI.

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[2] G7 Leaders' Statement on the Hiroshima AI Process, October 30, 2023, Hiroshima, Japan

2.2 AI for Science

There is a clear need for global collaboration and investments not only in science on AI but also in science by AI. AI enables us to do research differently, radically accelerating the discovery process and enabling new breakthroughs. AI has vast potential to alter the way R&I are performed, through automation and new ways processing, accessing, analysing, generating data, recognizing novel features, as well as automating the laborious and time-consuming scientific processes, thereby significantly speeding up the cycle of societal innovations supported by science and enabling us to do science differently and address new questions. AI can open new avenues of discovery and interpretation within the research base and amongst innovators, creating novel opportunities to address global and user-driven challenges enabling greater efficiency and effectiveness.

2.3 Human-centered AI

One of the main goals of developing AI systems is to complement and augment human capabilities both at individual and collective level. To address global challenges, AI systems are needed that complement the human-decision capacity instead of replacing it. Research is there needed to investigate the foundations of AI systems which co-evolve with humans "in-the-loop". Promoting effective human-machine interactions and collaborations can be an effective way to apply AI in safety critical applications ensuring human oversight. Social sciences and humanities should be embedded in the development of human-centred AI. Social sciences offer insights into societal impacts, ensuring cultural sensitivity and inclusivity. This also extends to ensuring AI is shaped by human-centered values, across a range and diversity of voices and publics. Humanities enrich AI with diverse human values through historical and philosophical contexts, and stress inclusion across all parts of society. Ethical principles and values should drive, by design, the development of AI and its applications.

2.4 Trustworthy AI

Safe, secure, and trustworthy AI for global benefit, would be enabled by the development of responsible AI systems, standards, and frameworks. Major research challenges include: to design robust AI algorithms addressing cybersecurity, data quality and uncertainty; to develop AI systems meeting high-quality standards for critical applications; to advance the ability to test, validate, and verify the functionality, safety and accuracy of AI systems; to develop the theoretical foundations to better understand the operation and limitations of AI techniques (especially generative AI) and their emerging properties. Fundamental research is needed to develop responsible AI models that by design incorporate properties such as explainability, transparency, and the alignment with specific ethical values, as well as standards and metrics that allow for comprehensive evaluations of such models and potential products that can be built on them.

2.5 AI and Sustainability

AI can contribute to scientific research in environmental sustainability. There is the need to minimize the environmental impacts of AI while at the same time exploiting its capabilities. Sustainability should be a first-order metric and on equal standing with other metrics like performance, reliability, usability, cost, acceptance and safety, in line with the international agreements on climate change. Research should focus on the models of tomorrow to lay the foundations for the construction of AI models that allow a healthy evolution of society, that can be ecologically and socially sustainable. Relevant research topics, to mention a few, are edge-based AI, neuromorphic AI and model-optimized architectures.

R7+ JOINT STATEMENT, 2024

NSERC, Canada | JRC European Commission, European Union | CNRS, France | Fraunhofer-Gesellschaft, Germany | CNR, Italy | RIKEN, Japan | CSIC, Spain | UKRI, UK | NSF, USA

2.6 Generative AI

Recent Generative AI approaches represent a paradigm shift in AI due to the general-purpose capabilities that these types of trained models exhibit, which allow their use in a very wide range of domains and scenarios. The transformer-based architecture of Large Language Models is prominent in current AI research and development related to generative AI. These data-intensive architectures should undergo deeper investigation and expansion. Areas for research include multimodal approaches, knowledge-driven AI, alternative networks architecture, explainable techniques, and generation and usage of synthetic data for AI modelling.

The scientific community needs to develop the theoretical foundations to better understand how AI techniques (especially generative AI) work and their emerging properties. Such understanding is also critical for establishing trust in AI and the results that the application of AI generates. While generative AI is clearly a powerful tool, it should be considered within the broader AI and digital environment, and progress in this technology would need similar progress in broader AI systems, techniques, hardware and software to enable its diffusion and use at scale.

2.7 International cooperation on AI

Considering the aforementioned, G7 members' strengthened scientific collaborations on AI would be extremely beneficial. Strengthening collaborations among research institutions, including industrial partners, is also essential to identify major societal and scientific challenges that could be addressed by AI, and to address any problems which may be caused by AI. Joint efforts are desirable to internationally progress solutions to the aforementioned challenges at scale and speed. Investing in open infrastructures, talent attraction and training in the context of international cooperation initiatives and promoting mobility of researchers is also vital for cultivating the next generation of AI researchers and practitioners. Establishing training programs is crucial for facilitating the transfer of AI skills between academia and industry.
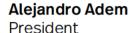
It is therefore of paramount importance to encourage the international collaboration among the multiple AI research networks. Possible initiatives could include the coordinated organization of AI events, the definition of AI "Moonshot" challenges and exploration.

R7+ JOINT STATEMENT, 2024

NSERC, Canada | JRC European Commission, European Union | CNRS, France | Fraunhofer-Gesellschaft, Germany | CNR, Italy | RIKEN, Japan | CSIC, Spain | UKRI, UK | NSF, USA

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