

The background features a dark blue field with a complex, abstract pattern of thin, light blue lines. These lines form a series of interconnected geometric shapes, including triangles, rectangles, and polygons, creating a sense of depth and structure. Scattered throughout this pattern are small, solid white circles, some of which are positioned at the intersections of the lines, adding to the technical or architectural feel of the design.

NORA

STRATEGY

Vision. Mission. Ambition.



Foreword by the Chair of the Board and CEO

There has possibly never been a more exciting time when it comes to the development of new technology that might change our lives forever. The development of artificial intelligence has been described as the fourth industrial revolution. Like the other industrial revolutions, those who are able to adapt to and embrace the new technology will have great benefits.

In NORA, we believe that we are stronger when we work together. That is why nine of the leading academic and research institutions in Norway have come together under the NORA umbrella to coordinate their efforts within artificial intelligence, machine learning and robotics.



Norway can and should be a leading nation when it comes to education, research, development and use of artificial intelligence, machine learning and robotics within a responsible and ethical framework. We believe that artificial intelligence will be essential for increasing the quality of life for all. It will power wealth and health and it will also be crucial for achieving the United Nations' sustainability goals. The very fundament of this technology is excellence in research, education and innovation.

Together, through excellence in research, education and innovation, NORA's partners will contribute to forming artificial intelligence for the benefit of humanity and the world we live in.



Pinar Heggernes
Chair of the Board
of directors, NORA



Klas H. Pettersen
CEO, NORA

About NORA

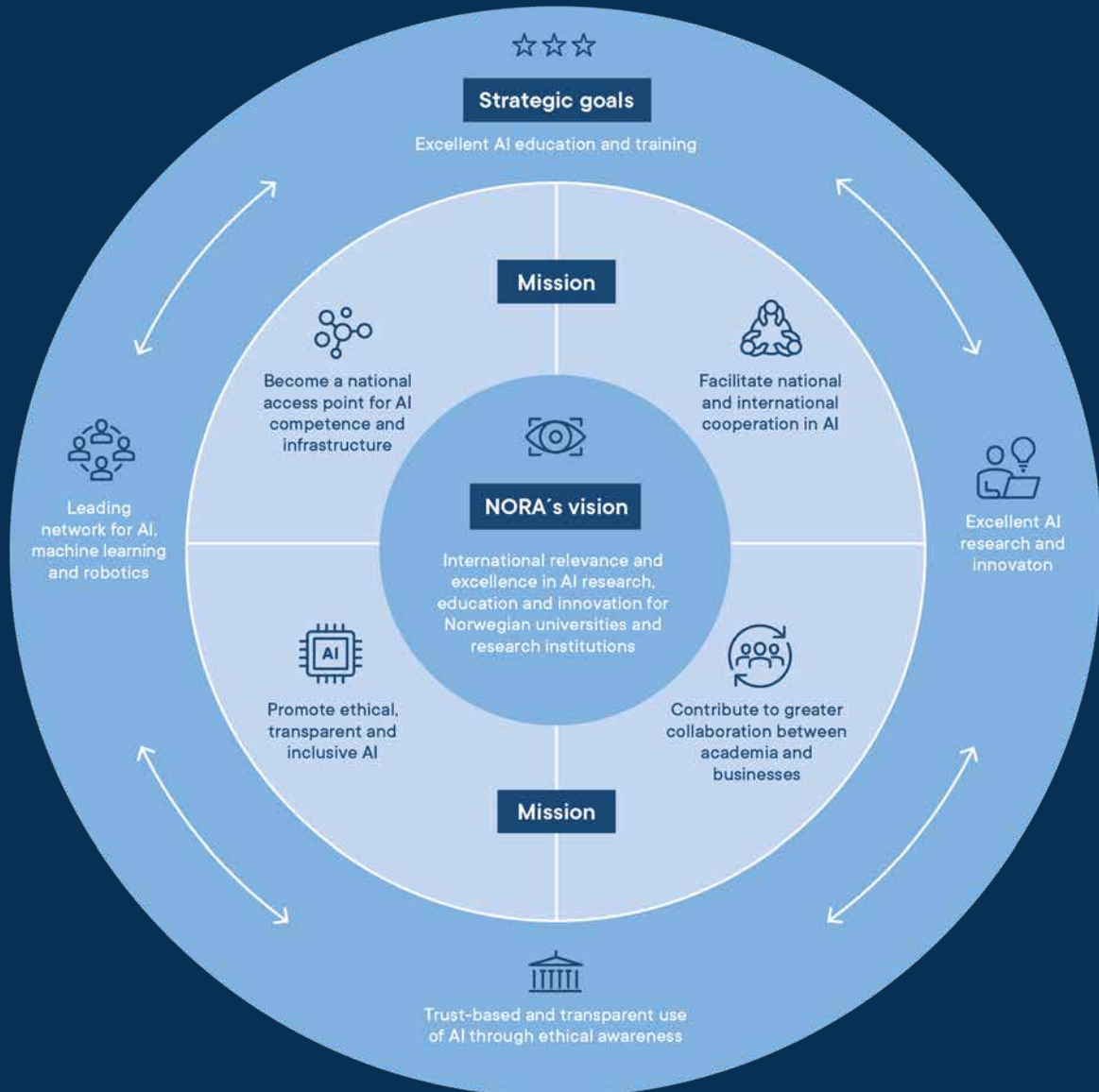
NORA – *Norwegian Artificial Intelligence Research Consortium* – was established to strengthen Norwegian research and education within artificial intelligence, machine learning and robotics, as well as other relevant research that supports the development of artificial intelligence applications. The consortium consists of the following partners: University of Agder, UiT The Arctic University of Norway, Oslo Metropolitan University (OsloMet), University of Bergen, Norwegian University of Life Sciences, Simula Research Laboratory AS, NORCE Norwegian Research Centre AS, University of Oslo and University of Stavanger. NORA's partners have outlined the following tasks for NORA:

- 1 To collect, make available and promote information about the NORA partners' efforts in the field of artificial intelligence, machine learning, and robotics.
- 2 To facilitate an academic process between NORA partners to further define the academic content behind a joint effort in artificial intelligence.
- 3 To facilitate the further development of the national network for artificial intelligence, including organizing meetings and seminars.

Based on the outlined tasks, NORA has developed a strategic plan for 2020–2022. The strategy will help NORA prioritize and structure its work, in order to achieve tasks set by the NORA founders.

NORA's ambition

Become an internationally known AI
research and education network



NORA's ambition, vision and mission

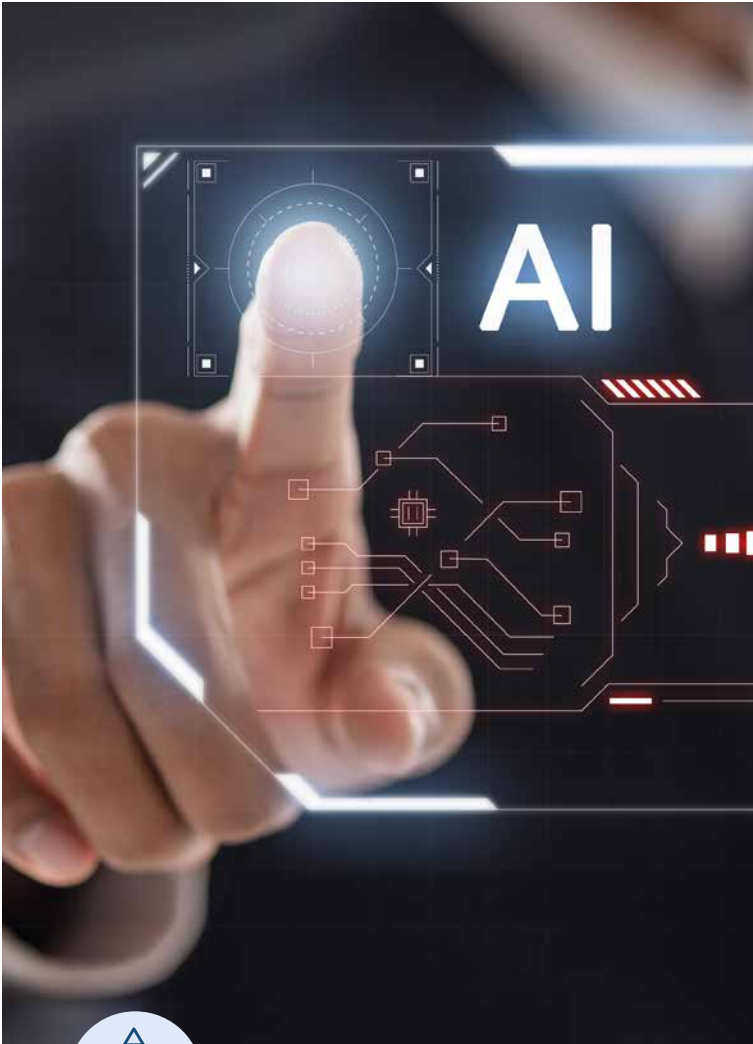
NORA's ambition is to establish the necessary preconditions for successful recognition as an internationally known artificial intelligence (AI) research network. NORA will offer a platform for both fundamental and applied research that reflects the complexity, interdisciplinarity and diversity of the field of AI.

NORA as an AI network will be a research-based environment of partnerships between institutions focusing on AI with strong bases in ethical principles. NORA will be built on the experience available in the consortium and in already connected partnerships.

International cooperation will be fundamental for bringing Norwegian AI research to the forefront and to make NORA partners' research internationally visible. NORA will play a key role in European AI networks in order to achieve international relevance and excellence in AI research, education and innovation.

Increased research activity within the fields of AI, machine learning and robotics will be paramount for NORA's vision of international relevance and excellence of our partner institutions. The funds available at the national level are not yet sufficient to support the needs and requirements for the development of AI research in Norway. NORA will take a strategic role in discussing these challenges with the national institutions responsible for research funding in order to influence the future goals and formulations of calls for funding within AI.

Currently, the Norwegian higher education system has AI covered as a research topic at most universities and university colleges. Currently, the courses are fragmented and not easily available to a larger number of





NORA's ambition

Become an internationally known
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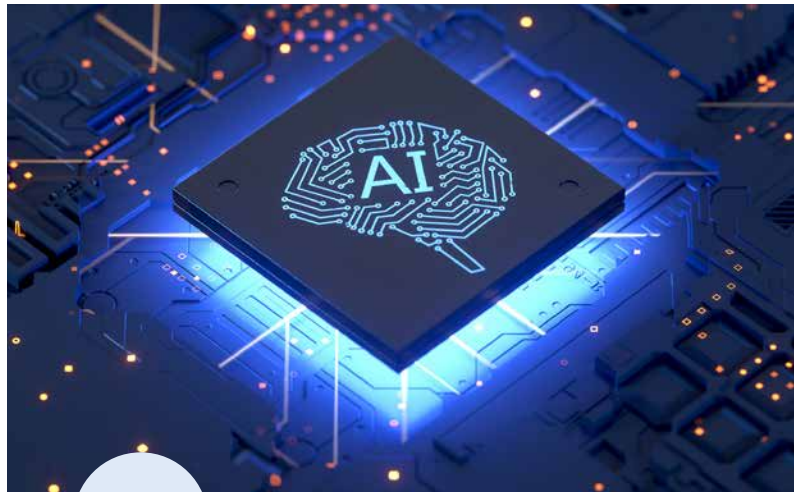


NORA's mission

- Facilitate national and international research cooperation in AI
- Contribute to greater collaboration between academia and businesses
- Promote ethical, transparent and inclusive AI
- Become a national access point for AI competence and infrastructure

students or early stage researchers, and some subtopics of AI are not covered at all within Norway's higher educational system. NORA will address the opportunities that are available within the consortium, building a better and more comprehensive national research and education profile in AI. By establishing a research school, access to the specialized education in AI and AI related topics will become more available, and more topics within AI could be covered. A research school within AI, machine learning and robotics will increase the level of education in AI.

NORA will also work on supporting innovation-driven research by stimulating both the partner institutions and financiers to support innovation in AI. NORA will establish a network for innovation across the partner institutions and will link this network to experienced incubators and start-up companies. Further, NORA will seek collaboration with businesses, especially small and medium-sized businesses, and play an active part in connecting businesses and research groups within the NORA network.

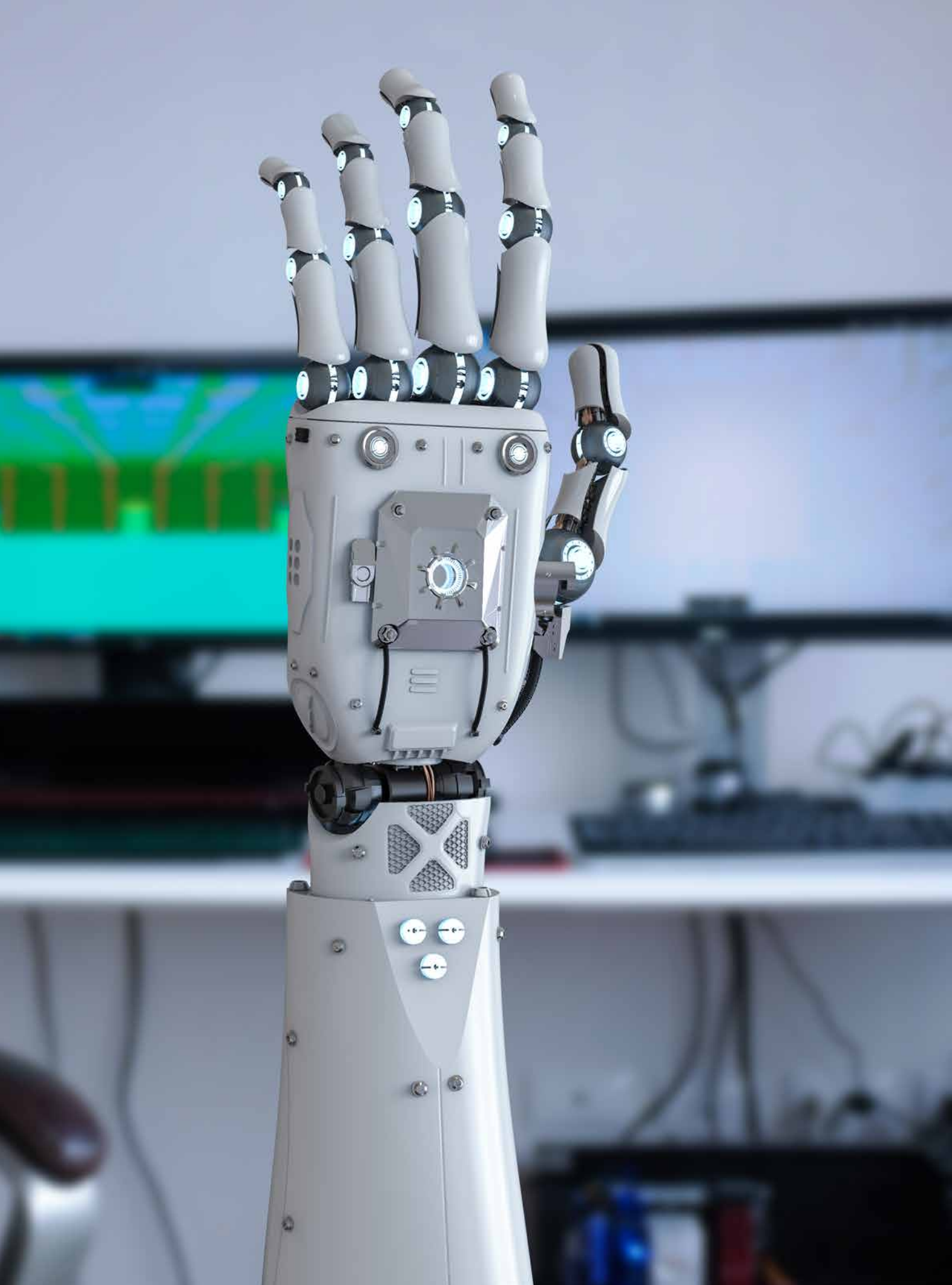


NORA's vision

International relevance and excellence in AI research, education and innovation for Norwegian universities and research institutions







NORA's strategic goals

NORA has outlined four strategic goals that will help us move closer to our vision, ambition and mission



To achieve excellent AI research and innovation, NORA will:

- Provide support for and coordinate research applications
- Create arenas for interaction and cooperation
- Take an active part in establishing start-up companies in the AI field

Excellent AI research and innovation

Norway has a great potential to succeed in the forefront of AI research. It is important to strengthen AI-related research, while at the same time thinking long-term in order to fully utilize the potential that AI has for society.

There are three main challenges:

1. Available funding for the research and innovation projects within AI
2. Fragmentation between the research communities that actively participate in AI research
3. Differences between the commercial and scientific approach to applied AI

Available funding

If we are able to increase the research funding for AI, the field can strengthen both its current research communities and attract new researchers from other academic areas. AI research is based on key areas of information and communications technology (ICT) and cannot be achieved without further investments in ICT research. Funding for fundamental and applied ICT research must therefore be strengthened in order to support a growing need for AI research. Research funding in other academic fields that include a use of AI, either theoretical or applied, must also be strengthened.

The use of AI and machine learning methods has increased dramatically during the last decade due to a dramatic increase in available data sets, computing power and new methods. For Norway to become a leading country within AI, greater efforts must be made to increase funding possibilities for new methods and tools.

AI has a huge business potential. To be at the forefront, Norway must invest in the development of new technologies within AI, which requires excellent research environments, both in fundamental and applied research. Through research coordination, information sharing, collaboration and by providing support in application processes, NORA can



help Norwegian researchers to receive more funding, both domestically and internationally.

Fragmentation between the research communities

NORA aims to assume the role as a Norwegian coordinating network in AI research and innovation and to create arenas for interaction and cooperation between the NORA-partners and the society in general. These arenas are important to avoid fragmentation and will include physical meetings such as conferences and workshops, but also digital meeting places, communication and collaboration platforms and video conferencing. A research school and a network for innovation will also serve to

build a strong AI community among the partners. In general, communication and distribution of information will be crucial in building a strong AI community and avoiding fragmentation between the research communities that actively participate in AI research.

Differences between the commercial and scientific approach to AI

The economic potential of AI-related technologies is great. Good cooperation between the business community and academia is critical for Norway's increased investment in AI.

The best way of strengthening this type of cooperation is through increased financial incentives and creating meeting

arenas. NORA will take an active part in establishing start-up companies in the field of AI, as well as strengthening collaboration between the consortium partners' research communities and the business community. NORA will also create arenas to facilitate contact between academia and the business sector.

Excellent AI education and training

In the coming years, Norway needs to increase the number of experts within AI. In order to meet the demanding digital transformation that Norway is facing, we must take steps to encourage young people to study ICT and AI. The number of study places within the field





To achieve excellent AI education and training, NORA will:

- Increase focus on AI in education and knowledge development, helping to create the workforce of tomorrow
- Conduct PhD-seminars, conferences and networking events
- Establish a research school in AI, machine learning and robotics, supporting graduate students at top international level
- Increase knowledge about AI in general

of AI must be increased. In order to meet the challenges we face both in business and research, it is especially important to focus on AI education at the master's and doctoral levels and to strengthen ICT in general at the bachelor's level.

The use of AI is interdisciplinary, and education should therefore be made available in all disciplines so that AI is presented as a useful tool in areas other than ICT. Fundamental ICT education needs to be strengthened all the way from primary school; not just coding, but how algorithms work, how software is developed and how machine learning methods work. At a higher level of education, it is important that the theoretical foundation for AI and the development of AI models become a central part of ICT education.

A national research school is an important and useful tool for sharing the national resources that exist within AI in terms of research and education-

al competence at the highest level. Norway has many excellent research environments whose specializations and strengths complement each other. In collaboration, these can provide necessary competences for PhD students in the field of AI. By interlinking parts of the PhD programs, our universities will be able to provide significantly better education than they can individually, while at the same time contributing to the development of a nationwide educational ecosystem among Norway's future AI experts. In cooperation with the partner institutions, NORA will establish an AI research school. A coordinated effort will increase the quality of the PhD study programs and presently uncovered topics can be adequately covered.

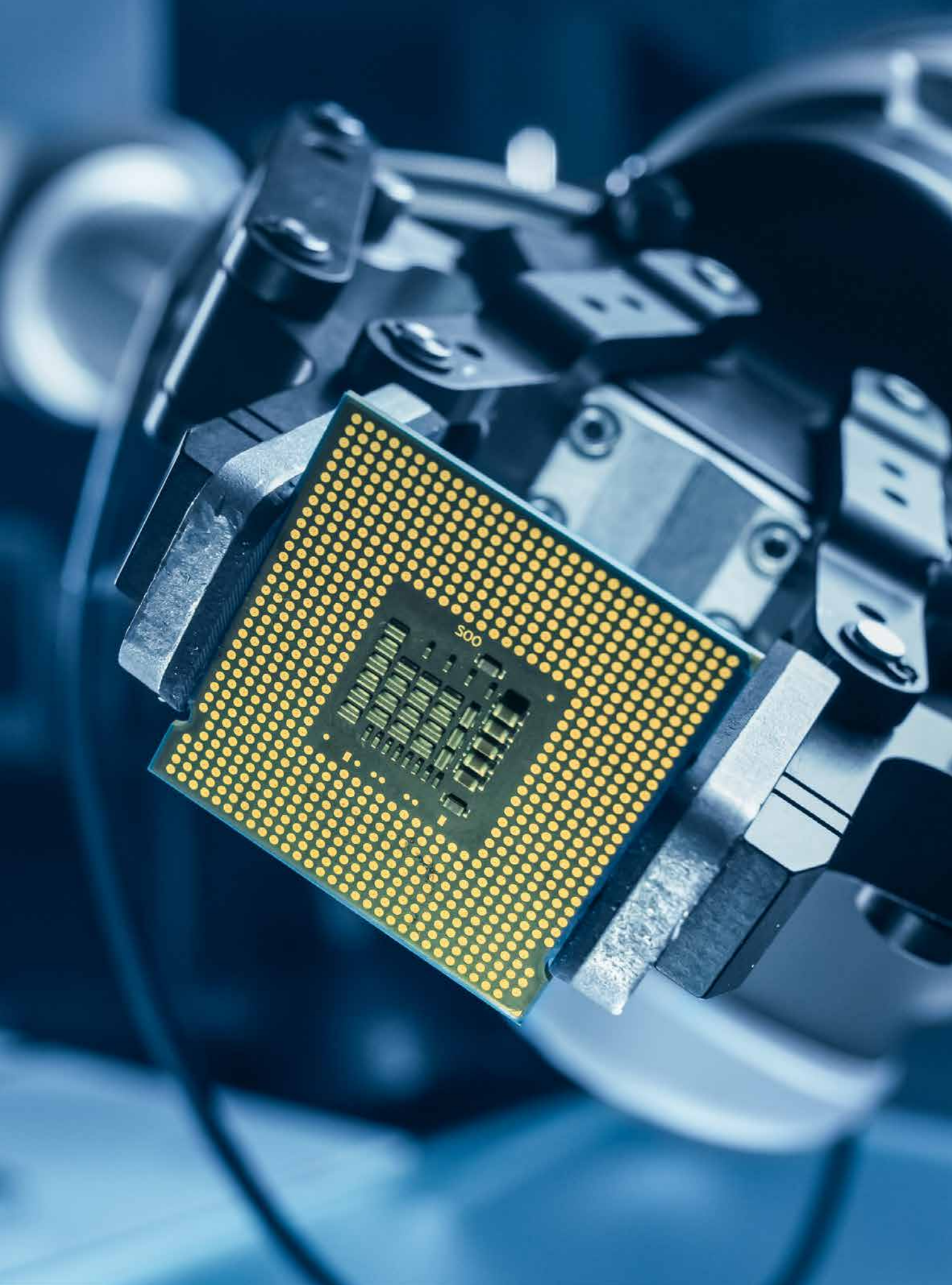
In order to be able to use AI in all parts of society, there is also a need to raise the general competence of the entire population, especially of workers

who are going to use AI technology. Previously, only specialists used advanced software. Now, AI is on its way into most software and tools, and the entire population will have to interact with advanced tools. It is important that people understand the choices such tools make, which judgments are used for decision making, as well as error margins and interpretation options. Researchers need to be more visible in the public sphere, and they must be good intermediaries who speak a language that people understand. NORA will help and encourage researchers to take part in the public debate.

Trust-based and transparent use of AI through ethical awareness

Even though AI holds a great potential for growth, research and innovation and better public services, increased use of AI also raises a number of ethical and legal issues in both the public and pri-





vate sectors. Many of the ethical issues are well known from previous work with data science. Others are new issues regarding responsibility for decision-making, such as in the use of autonomous technology.

In order to fully exploit the opportunities offered by AI, researchers must have access to comprehensive data. With respect to data, Norway is in a privileged position. For example, our birth register is unique, and thanks to an open and transparent tax system, we have access to data on taxes, bank deposits, debts, etc. Large amounts of data are collected in areas such as meteorology, seismology, climate research, healthcare and the oil indu-

stry. With respect to digitalization and register data, Norway is much better set than many other countries. Although many of the data sources may in principle be accessible, the process of getting access is often cumbersome. NORA will encourage and support systems for simplified and increased data accessibility. NORA will also encourage and support transparent and testable algorithms, accessible training data and open science in general. NORA will work to protect the privacy of citizens in the field of AI; at the same time we acknowledge that the use of registry data, for example in health care, may be used to develop algorithms that save lives, and we recognise the ethical dilemma of not using data.

AI gives technology the ability to make recommendations and even decisions in an entirely new way, where computers and algorithms play a larger role. This raises a number of questions regarding where the actual responsibility lies. The unsupervised use of AI provokes widespread ethical and legal issues. One part of the ethical issues relates to the responsibility for decision-making, such as in the use of AI-driven technology.

NORA will contribute to raising awareness about AI and its effects on the society. There are many assumptions and misunderstandings about AI, and its short-term and long-term impact on the society. NORA welcomes discussions about AI and its impact, and NORA will



To achieve trustbased and transparent use of AI through ethical awareness, NORA will:

- Contribute to a more responsible and ethical framework for AI both nationally and internationally
- Promote the use of fair algorithms to correct discrimination and human bias
- Raise awareness about AI among our partners and in society in general
- Create NORA as a national brand and trademark in the field of trustworthy AI

contribute to ensuring that the discussions are well-informed and fact-based. In NORA we also believe that the increased attention to AI and bias may be an opportunity to correct human bias and discrimination. After all it is easier to correct bias and discrimination in algorithms than bias and discrimination in humans.

Leading network for AI, machine learning and robotics

The AI sector in Norway is still small and fragmented. Efforts have been taken to increase the coordination and cooperation, and NORA itself is a result of this. There is a strong potential in increasing the cooperation in the sector, and many

challenges the sector is facing today can be addressed and solved through increased degree of cooperation, both within research communities, between research and business communities and between research communities and the public sector.

NORA's goal is to become a leading network for collaboration and cooperation between our partner institutions, as well as other related institutions and businesses. This will be achieved by common research projects and other types of cooperation. NORA partner institutions will work on common applications for funding, increasing the mutual collaboration and broadening the research and innovation support

network. NORA will also seek to become a hub of the Nordic AI, machine learning and robotics community, and an important player in the European community.

NORA's communication plan will be an integral part of achieving the necessary visibility and acceptance of NORA as a main node for research, education and innovation in Norway. Regardless of how much NORA partners may achieve, if these achievements and results are not properly communicated, the impact may be lower than expected.



To become a leading network for AI, machine learning and robotics, NORA will:

- Formalise and streamline the cooperation between the NORA-partners
- Become a prominent hub and research initiator in the Nordic countries
- Seek international cooperation and cooperation with businesses



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