

# NORA

NORA First  
Term Report



NORA – Norwegian Artificial  
Intelligence Research Consortium



With the vision of international relevance and excellence in AI research, education and innovation for Norwegian universities and research institutions.

NORA's vision

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# FIRST TERM

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# A Message from the CEO and Board Chair

## 1.1 A Message from the CEO

NORA was established as a collaboration within Artificial Intelligence, Machine Learning and Robotics (hereinafter referred to as "AI") between six universities and one research institute on 21 November 2018. NORA's secretariat has been operational since April 2019. This report covers the time period from 2018 - early 2022.

During these three years, NORA has grown from seven to fifteen partners. Eight universities, three university colleges and four research institutes now form Norway's most powerful AI collaboration. Such a wide-ranging and strong collaboration within one specific field is unprecedented in Norwegian academia. In addition, one of NORA's initiatives, NORA.startup, includes 30 of the most interesting AI startup companies in Norway.

I strongly believe that AI is the most important technology of our time and that in the future, we will look back at this time

as the golden age of AI in a similar way as we now look back on the golden age of electricity in the late 19th century or the golden age of quantum mechanics in the 1920s. However, the desire to collaborate in AI among Norwegian institutions not only reflects the importance of this field, but it also shows that AI is a field that greatly benefits from collaboration. AI research and development often utilise larger infrastructure, datasets and may be compute intensive. In addition, AI is not only a basic research field, but it is also an applied field with a pronounced societal impact. Through collaboration NORA adds value to the Norwegian AI community, making it possible to achieve more than we can do alone. This was also highlighted by Norway's former Minister of Digitalisation, Nikolai Astrup, in his speech at NORA's kick-off in 2019 where he said: "If you want to go fast, go alone. If you want to go far, go together."



“We are now three years into the NORA collaboration, but the journey has just begun.”

Klas H. Pettersen  
CEO of NORA



“It has been important for NORA to include everyone who does AI research, regardless of the size of the individual organisation.”

Tom Ryen  
Board Chair of NORA

100<sup>+</sup>

More than 100 events organised

1700

1700 newsletter subscribers

30<sup>+</sup>

More than 30 of the most interesting AI startups in Norway

40<sup>+</sup>

Workshops with attendees from 40+ countries

AI

NORA is Norway's leading research network in AI

15

NORA has a total of 15 partners

NORA's vision is international relevance and excellence in AI research, education and innovation for Norwegian universities and research institutions. NORA's first term runs to 31 March 2022, when NORA will be reorganised in order to reflect the growing number of partners, responsibilities and initiatives. In this First Term Report, you can read about our work to fulfil this vision. There are many highlights: NORA's research school, a national research school for researchers and students at NORA's partners supported and funded by the Research Council of Norway; NORA.startup, NORA's innovation branch which has been recognised by Innovation Norway as an innovation ecosystem for AI; NORA.EU, NORA's EU network for AI supported by the Research Council of Norway; Nordic Machine Intelligence, NORA's newly created free and open journal for AI; MedAI Transparency

in Medical Image Segmentation, a data competition which was a huge success with its 17 paper publications; Nordic AI Meet, an annual Nordic conference for young researchers; NORA's annual conference; CLAIRE's Oslo office, NORA's office is the host for CLAIRE; Female role models changing the field of AI in Norway, a campaign receiving attention from far outside Norway's borders; Aldirectory.no, an overview of the field of AI in Norway to mention a few. NORA has also been able to follow up many important research and innovation projects, among them AI-Mind, Norway's largest EU-funded research and innovation project. NORA has organised more than 100 events of varying size, such as webinars, talks and podcasts. The most successful was a two-day digital workshop on AlphaFold and RoseTTAFold with more than 600 attendees from over 40 countries. NORA

has sent out monthly newsletters with almost 1,500 subscribers and has been visible on Facebook, Twitter and LinkedIn.

All this was possible because of the great support and work from researchers and staff at our partner institutions.

It was encouraging to observe the dedicated support at NORA's general assembly 2021. NORA is now going into a new phase. We have greatly expanded and will consolidate many of the initiatives we have started. We will focus on the fields where collaboration adds value to the community and our partners.

I have greatly appreciated the support from the community, our partners, the Research Council of Norway, Innovation Norway and the Norwegian government. Together we've been building an internationally recognised community. We are now three years into the NORA collaboration, but the journey has just begun.

### 1.2 A Message from the Board Chair

Three full years have passed since NORA saw the light of day. The importance of a Norwegian research consortium in the field of AI was seen by some universities and research institutions three years ago. More and more universities, colleges and research institutes have joined, and we now have 15 partners. This has made NORA the most important research network in AI in Norway. NORA has had a role as advisor and conversation partner for Norwegian authorities. In addition, NORA connects Norwegian AI researchers to Europe through the CLAIRE collaboration. For the individual partners, NORA has been of great importance for research in the AI field locally. However, the most valuable benefit has been the collaboration between the partners, where professionals have made individual contacts across regions and organizations. NORA has made it possible to understand every part-

ner's individual strength in their AI research. Some are strong in fundamental research, algorithms and hardware adaptations. Others have their strength in applied AI. Some are strong on ethics and research on society in a world with an increasing use of AI. The potential of AI research is huge, and it is changing very fast. Globally, the research focus on AI is enormous. It is important that Norway and other Nordic countries contribute, and a national consortium strengthens this contribution, as already demonstrated.

NORA consists of both large and small partners. It has been important for NORA to include everyone who does AI research, regardless of the size of the individual organisation. NORA is owned and managed by universities, colleges, and research institutes. It has been important for NORA to stimulate the breadth of AI research, from fundamental research to

applied research, and further to innovation and start-ups.

During the three last years, NORA has become a consortium that includes an academic network, conference series, webinars, podcasts, a startup network, industrial network, and a research school, which recently received funding from the Norwegian Research Council. NORA's staff provides high-level service for all partners. Through NORA, the individual researcher at the partner institutions have access to resources that would not exist otherwise or would be harder to obtain.

NORA is Norway's leading research network in AI. We are now entering a new era with new challenges and tasks. Stimulating AI research in light of sustainable development will be crucial for the future, and I am sure NORA will do an outstanding job.

## Location of NORAs partners



# 2

## About NORA

NORA was established on 21 November 2018 to strengthen Norwegian research, education, and innovation within AI, as well as other relevant fields that support the development of AI applications.

NORA contributes to the development of joint research projects among partners, collaborates closely with startup companies in the AI-field, coordinates education, as well as strengthens the collaboration between the consortium partners' research communities and the business community.

NORA further contributes to positioning Norwegian research in AI in the international arena and has a special responsibility for developing activities aimed at Horizon Europe. In addition, the NORA secretariat creates meeting venues and hosts various events for researchers and students. NORA is also a member of CLAIRE – Confederation of Laboratories for AI Research in Europe and serves as the CLAIRE office in Norway/Nordics.

As of 31 December 2021, the NORA consortium consists of the following partners:

1. BI Norwegian Business School
2. Kristiania University College
3. NORCE Norwegian Research Centre AS
4. Norwegian University of Life Sciences
5. OsloMet – Oslo Metropolitan University
6. Simula Research Laboratory AS
7. SINTEF
8. UiT The Arctic University of Norway
9. University of Agder
10. University of Bergen
11. University of Oslo
12. University of South-Eastern Norway
13. University of Stavanger
14. Western Norway Research Institute
15. Østfold University College



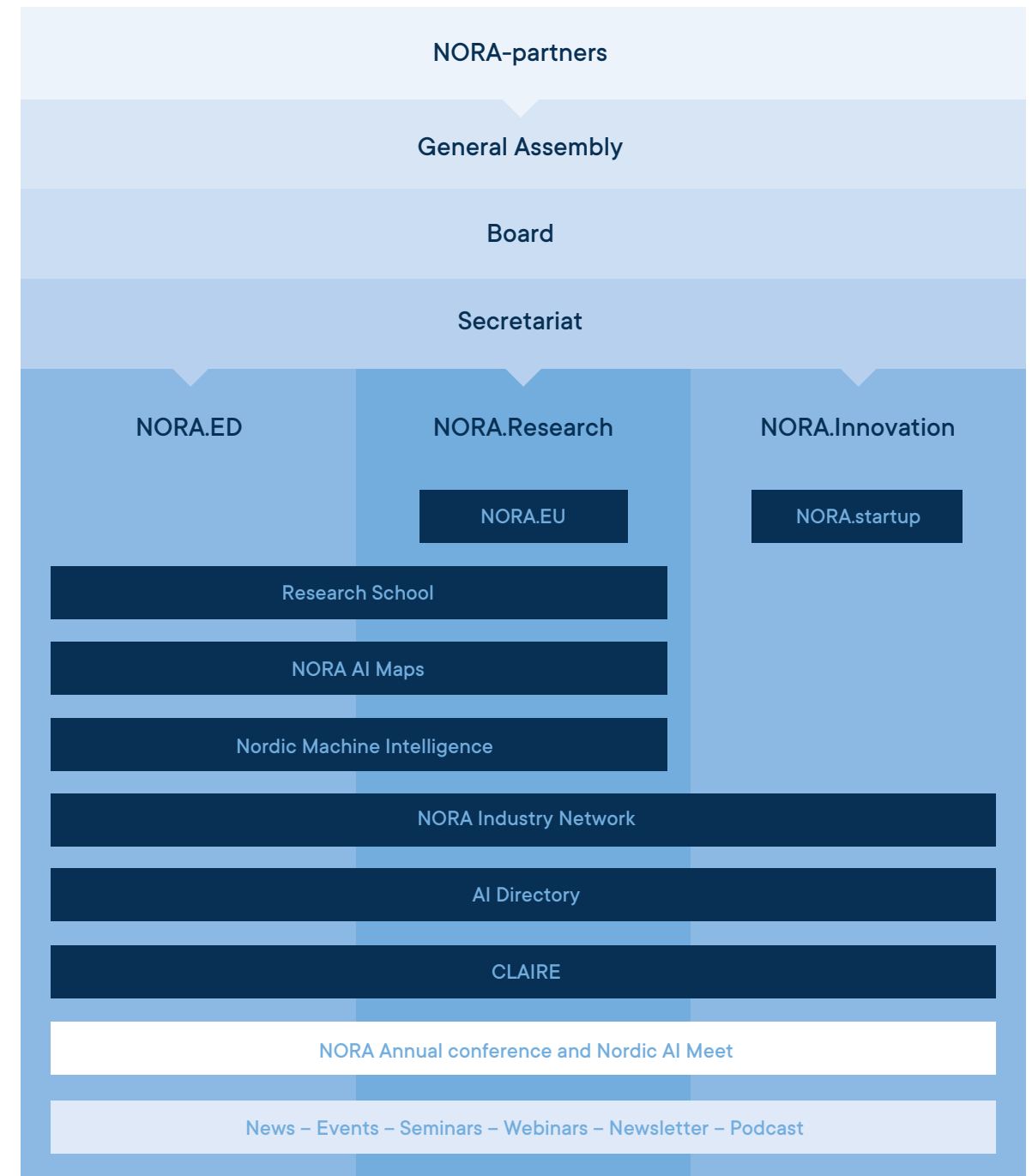


NORA kick-off  
April 2019



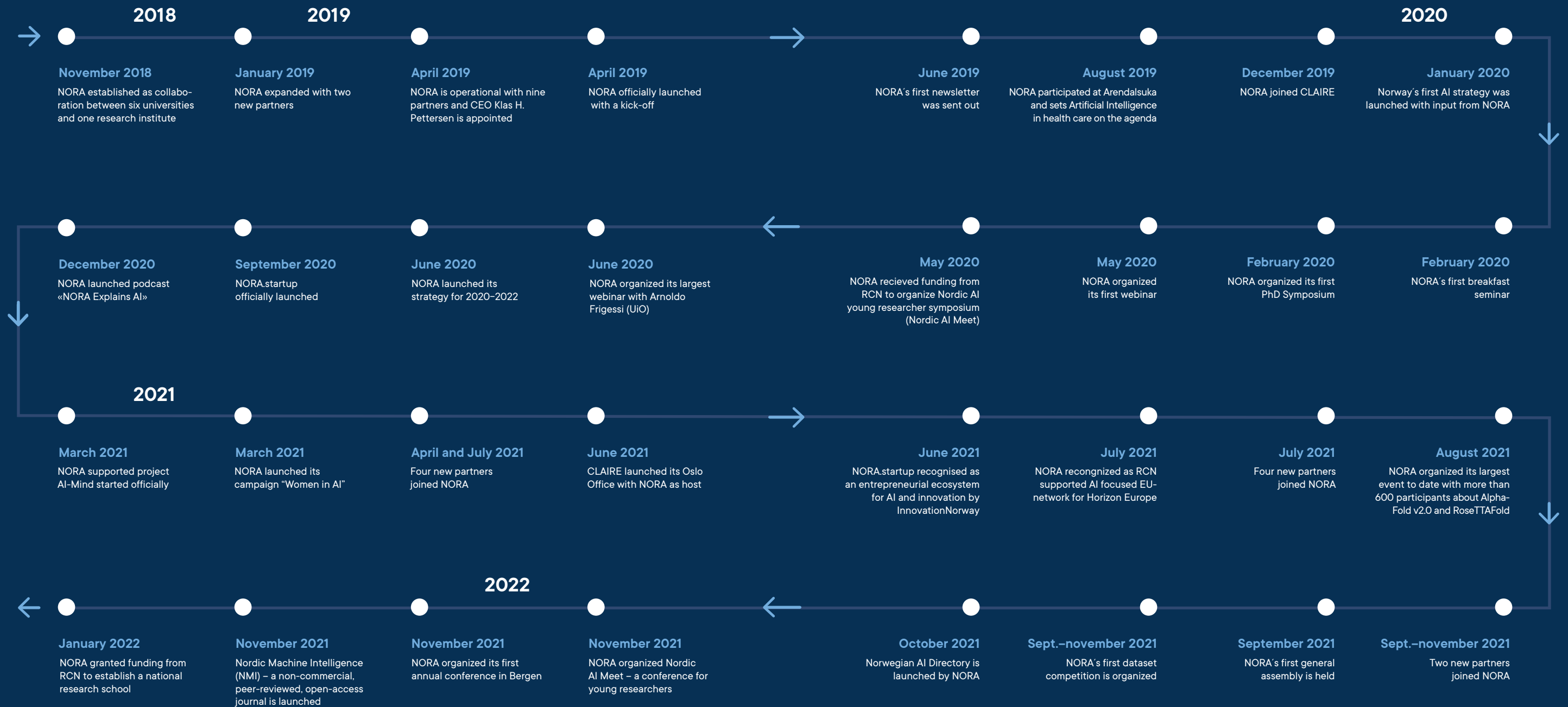
# NORAs programs and initiatives

The figure provides an overview of NORA's programs and initiatives. Several of the initiatives have their own governance structure with their own boards and committees.



# TIMELINE

# 2018–2022







# 3

## The people at NORA

The NORA Consortium Board represent NORA partners and is NORA's governing body. As of 31 December 2021, the NORA Consortium Board consists of 10 members. The NORA Secretariat oversees the day-to-day management of NORA and is located together with dScience at the University of Oslo.

# NORA Board of directors



**Board Chair, Tom Ryen**  
University of Stavanger



**Anders Andersen**  
UiT The Arctic University of  
Norway



**Christian Bjerke**  
Simula Research  
Laboratory AS



**Morten Dæhlen**  
University of Oslo



**Anne Cathrine Gjærde**  
Norwegian University of  
Life Sciences



**Ole-Christoffer Granmo**  
University of Agder



**Trond Runar Hagen**  
SINTEF



**Morten Irgens**  
OsloMet – Oslo Metropolitan  
University



**Inge Jonassen**  
University of Bergen



**Annette F. Stephansen**  
NORCE Norwegian  
Research Centre AS

# NORA Secretariat



**Klas H. Pettersen**  
CEO of NORA



**Sachin Gaur**  
Research Coordinator



**Birte Hansen**  
Innovation and Industry  
Coordinator



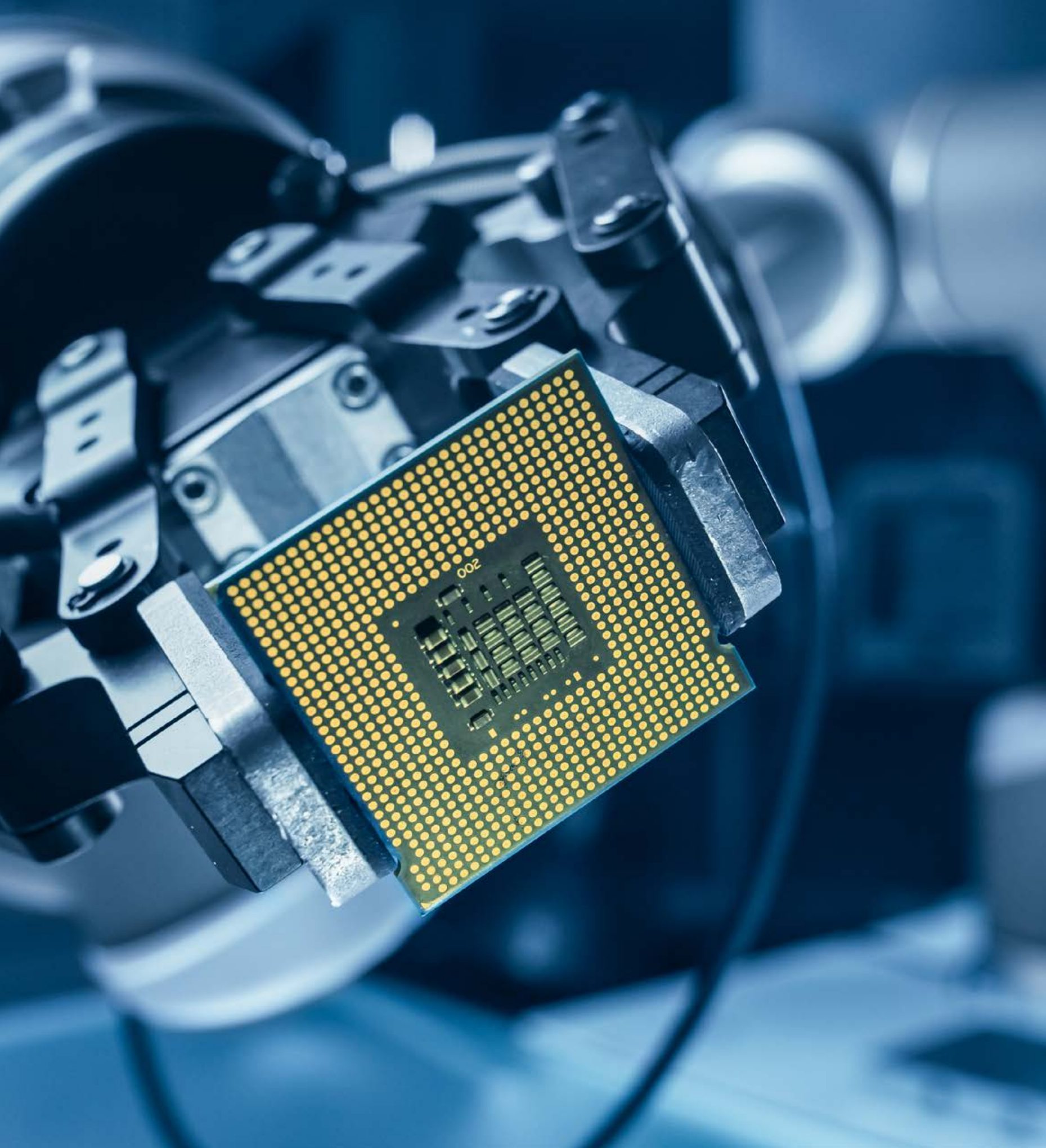
**Bjarte Håvik**  
Senior Policy Adviser  
(part time)



**Anam Javaid**  
Senior Communications  
Adviser



**Alex Moltzau**  
AI Policy and Ethics



# 4

## Strategy Overview

NORA developed a strategic plan for 2020–2022 in 2020. The strategy helped NORA prioritise and structure its work in order to achieve tasks set by the NORA partners. The strategy outlined NORAs ambition, vision, mission, and strategic goals.



**NORA's mission as outlined in the strategy is to:**

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



**NORA's vision as outlined in the strategy is:**

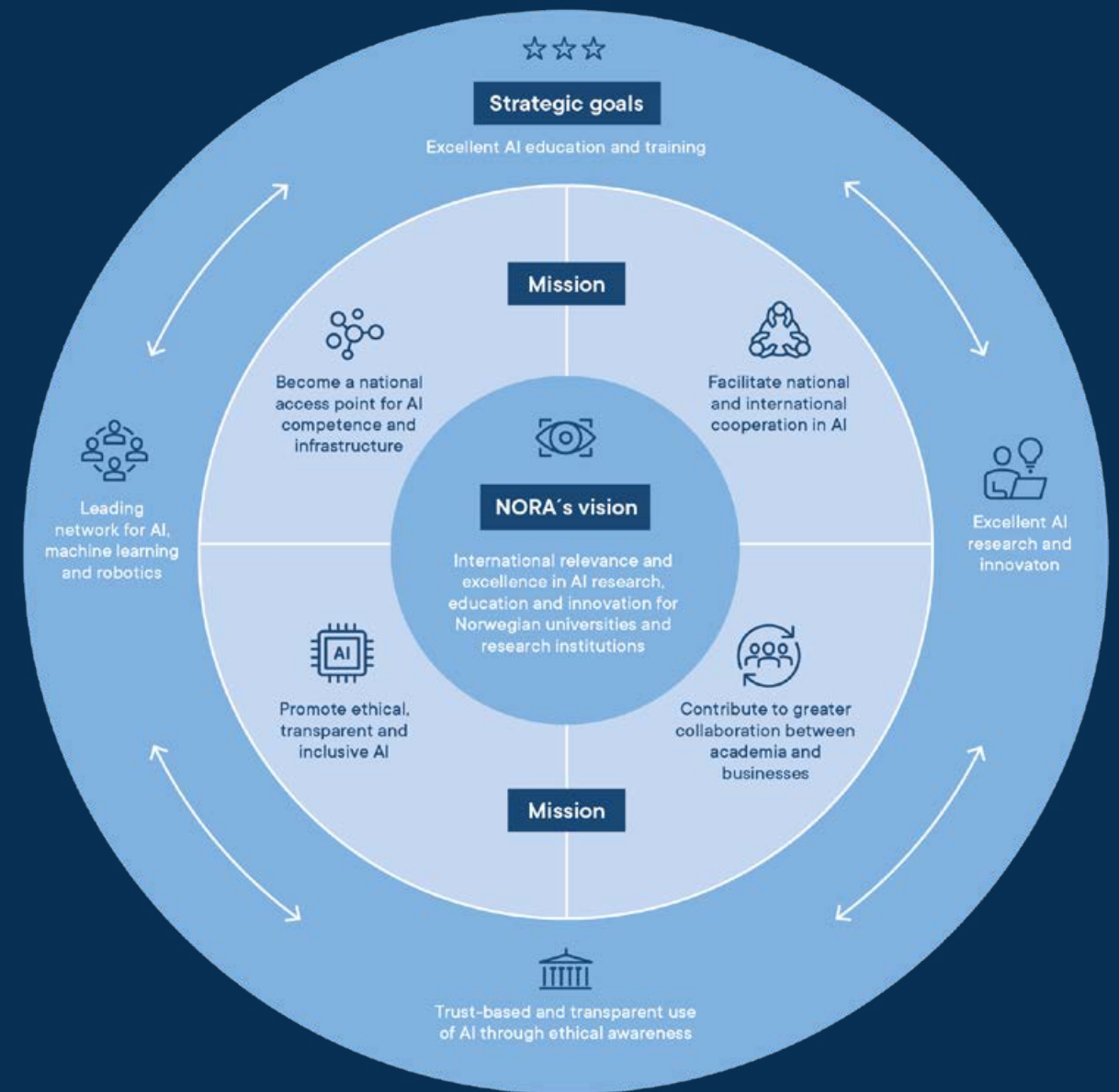
International relevance and excellence in AI research, education and innovation for Norwegian universities and research institutions



**NORA's ambition as outlined in the strategy is to:**

Become an internationally known AI research and education network

# Overview of NORAs strategy 2020–2022



NORA outlined four strategic goals that will help us move closer to our vision, ambition and mission. These are:



### 1. Excellent AI research and innovation, through:

- Providing support for and coordinating research applications
- Creating arenas for interaction and cooperation
- Taking an active part in establishing startup companies in the field of AI



### 2. Excellent AI education and training, through:

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



### 3. Trust-based and transparent use of AI through ethical awareness, through:

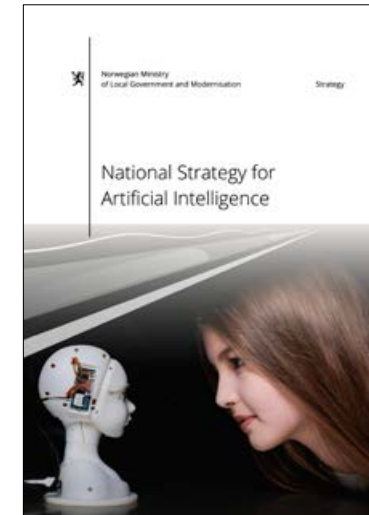
- Contributing to a more responsible and ethical framework for AI both nationally and internationally
- Promoting the use of fair algorithms to correct discrimination and human bias
- Raising awareness about AI among our partners and in society in general
- Creating NORA as a national brand and trademark in the area of trustworthy AI



### 4. Leading network for AI, machine learning and robotics, through:

- 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

# Launch of Norwegian AI Strategy



On Tuesday 14 January 2020, former Minister of Digitalisation, Nikolai Astrup, launched Norway's first strategy for AI, less than a year after the government had announced that it would be launching such a strategy.

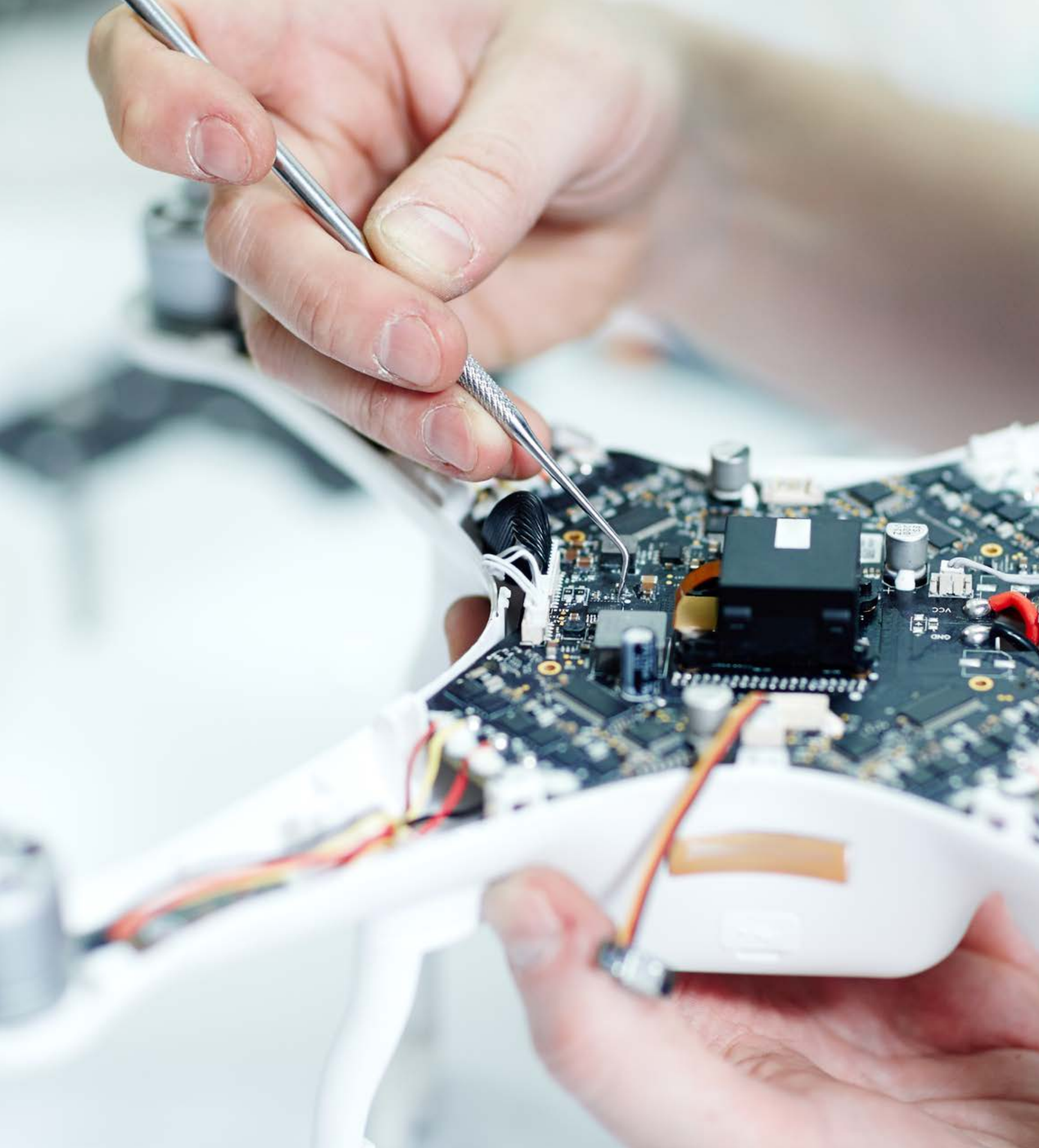
During the launch, former Minister Astrup emphasised that this was a field in rapid development, and that the strategy would not answer all questions regarding AI in Norway. However, the strategy will provide direction and thus serve as a framework for both public and private entities seeking to develop and use AI over time.

The strategy focuses on defining AI and on describing some areas where it will be important for Norway to exploit the opportunities offered by AI. Former Minister Astrup told the audience during the launch that much of the input and contributions to the strategy have been regarding data and regulations. Both topics have been extensively discussed in the strategy. The strategy outlines several measures and initiatives that the government will implement in the coming time.

The strategy describes Norwegian society as characterised by trust and respect for fundamental values such as human rights and privacy. The government wants Norway to lead the way in

developing and using AI with respect for individual rights and freedoms. This can become a key advantage in today's global competition. The government believes that:

- AI that is developed and used in Norway should be built on ethical principles and respect human rights and democracy
- Research, development, and use of AI in Norway should promote responsible and trustworthy AI
- Development and use of AI in Norway should safeguard the integrity and privacy of the individual
- Cyber security should be built into the development, operation and administration of systems that use AI
- Supervisory authorities should ensure that AI systems under their areas of supervision are operated in accordance with the principles for responsible and trustworthy use of AI
- During the launch, NORA's CEO asked the former Minister about the strategic incentives for strengthening AI in the higher education sector. In his response, the former Minister emphasised that the number of ICT students has increased through targeted funding in recent years. However, there are limits to this targeted funding. This means that universities and colleges must themselves prioritize this over something else, which can be challenging.



# 5

## Research

Research is one of NORA's core pillars. As laid out in the strategic plan, NORA aims to be an internationally known research and education network.

Norway has a great potential to succeed in the field of AI research. To utilise this potential, NORA is working to offer platforms for both fundamental and applied research that reflects the complexity, interdisciplinarity and diversity in the field of AI.

NORA has prioritised establishing and strengthening the NORA Research School as a research and education platform for NORA partners. Read more about the NORA Research School in Chapter 6.

International cooperation is fundamental in bringing Norwegian AI research to the forefront and to make NORA partners' research internationally visible. To give exposure to the Norwegian researchers abroad, NORA has entered into agreements with renowned institutes like the Alan Turing Institute in UK and the Helmholtz Information & Data Science Academy in Germany. The agreements pave the way for research residencies at

the institutes for Norwegian researchers. Read more about international cooperation in Chapter 9.

NORA has also taken steps to actively engage and coordinate Norwegian Centres for Research-based Innovation (SFIs) where NORA partners are involved, like Visual Intelligence (UiT), Big Insight (UiO) and Media Futures, with regular meetings. NORA has integrated input from these stakeholders in initiatives like the NORA Research School. Furthermore, NORA has also actively connected researchers for relevant calls for funding proposals, consortium building and cooperation.

NORA has organised many research webinars where various researchers at NORA partners have been engaged in sharing their research with the wider community. NORA has also organised workshops on cutting-edge topics and was one of the first initiators in the world to organise a workshop discussing the recent advances in methods of protein folding through the algorithms AlphaFold and RosettaFold.

## 5.1

# Connecting partners: AI-Mind



The AI-Mind application was successful, and 2021 was kick-off for this 14 million Euro project, the largest Horizon Europe R&I project within AI led from Norway

AI-Mind is a five-year EU-funded Horizon 2020 project on screening brain connectivity and dementia risk estimation in people affected by Mild Cognitive Impairment (MCI). AI-Mind is developing two AI-based tools that will identify dysfunctional brain networks and will assess dementia risk: the AI-Mind Connector and the AI-Mind Predictor. The AI-Mind Connector will fully automate the identification of early brain network disturbances; after enriching data from AI-Mind Connector with genetic and cognitive information, AI-Mind Predictor will provide an early marker of risk for dementia in people with MCI. Thus, the aim is to equip healthcare professionals with

innovative tools that will enable timely diagnosis and extend the window for preventive interventions and therapies.

NORA has been supporting AI-Mind and the project coordinator, Dr. Ira Haraldsen, through the application phase. Through NORA, Dr. Haraldsen has connected with AI researchers at OsloMet and to international researchers through CLAIRE.

The AI-Mind application was successful, and 2021 was the kick-off for this 14 million Euro project, the largest Horizon Europe R&I project within AI led from Norway.

The project's consortium comprises medical experts and opinion leaders on dementia, experts on AI, brain signal ana-

lysis, and computer science, SMEs and academic spin-off companies, patient and professional stakeholders and health technology assessment experts.

NORA now offer guidance and advice in the critical aspects of the AI-Mind project. We contribute as external support to all tasks related to AI-modelling of the AI-Mind Connector and AI-Mind Predictor. NORA's CEO Klas Pettersen is an active member of AI-Mind's Scientific Advisory Board. Among others, Pettersen participated in person in the project's General Assembly, which was held in Oslo in September 2021.

## 5.2

# Journal: Nordic Machine Intelligence

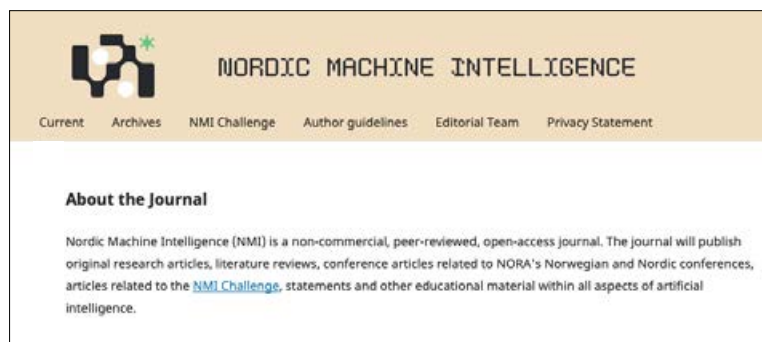
“2021 was the grand start for the NMI journal. We had a productive year publishing high-quality conference papers and are looking forward to an even more productive 2022 with excellent conference papers and journal papers”.

– NMI’s Editor-in-Chief, Anne Håkonsson

To promote open science and create a Nordic community within AI, NORA has launched the pan-Nordic journal *Nordic Machine Intelligence (NMI)*. The journal will publish a wide range of articles related to promoting research and education in all aspects of AI. The first volume of NMI was published on 1 November 2021 and published the results from the MedAI: Transparency in Medical Image Segmentation challenge.

The aim of the NMI journal is to provide a high-quality journal with complete, accurate, and concise research papers of interest for the international public arena. The ultimate goal is to position the NMI journal on the second level Norwegian Scientific Index bibliographic database. NMI is a collaborative project with Anne Håkonsson (UiT) as NMI’s Editor-in-Chief. Morten Goodwin (UiA), Klas Pettersen (NORA) and Michael Riegler (Simula-

Met) are the journal’s Associate Editors. Bjørn-Jostein Singstad at Oslo University Hospital is the journal’s General Manager. NMI is published through FRITT – A publication service at University of Oslo (UiO) for researchers and groups who want to establish a new scholarly Open Access journal or to convert an existing journal to Open Access.



Screenshot of Nordic Machine Intelligence

## 5.3

# EU Network for AI

“NORA.EU will undoubtedly be able to facilitate more and better applications for Horizon Europe from Norwegian researchers. NORA.EU will also be able to promote Norway’s interests in a field in rapid development”.

– NORA’s CEO Klas H. Pettersen

NORA was granted funding by the Research Council of Norway to build an AI focused EU Network for Norwegian stakeholders. The network, called NORA.EU, will help to mobilise and support researchers in the fields of AI to come together to apply for funds from Horizon Europe.

NORA has, since its inception, worked towards bringing Norwegian AI researchers together alongside other societal and industrial actors. By becoming an EU-network for Horizon Europe, NORA is now amplifying the Horizon Europe calls for Norwegian participation, facilitating the creation of consortiums and supporting relevant applicants through workshops, networking events and focused training programmes and activities, which will increase Norwegian participation in the Horizon Europe framework.

Internationally, NORA.EU has a close cooperation with several institutions, among others with CLAIRE. NORA hosts CLAIRE’s office for the Nordic countries and the UK.

NORA.EU has a steering group with broad representation from NORA partners, Innovation Norway and the Research Council of Norway. It also has several forums. The network is co-lead by NORA’s CEO along with Digital Norway CEO Liv Dingsør.



CEO of Digital Norway, Liv Dingsør and CEO of NORA, Klas Pettersen



## 5.4

# Data Competition

Competitions have been important for creating progress in the field of AI. The ImageNet<sup>1</sup> competition had an impact on creating the field of Deep Learning, and more recently the CASP<sup>2</sup> challenge has produced groundbreaking algorithms such as AlphaFold and RosettaFold. Building on the principles of open innovation and transparent science, NORA believes that data competitions are a key factor in enabling collaboration as well as competition among researchers. This may further result in creating the desired impact and visibility for Norwegian research in the field of AI.

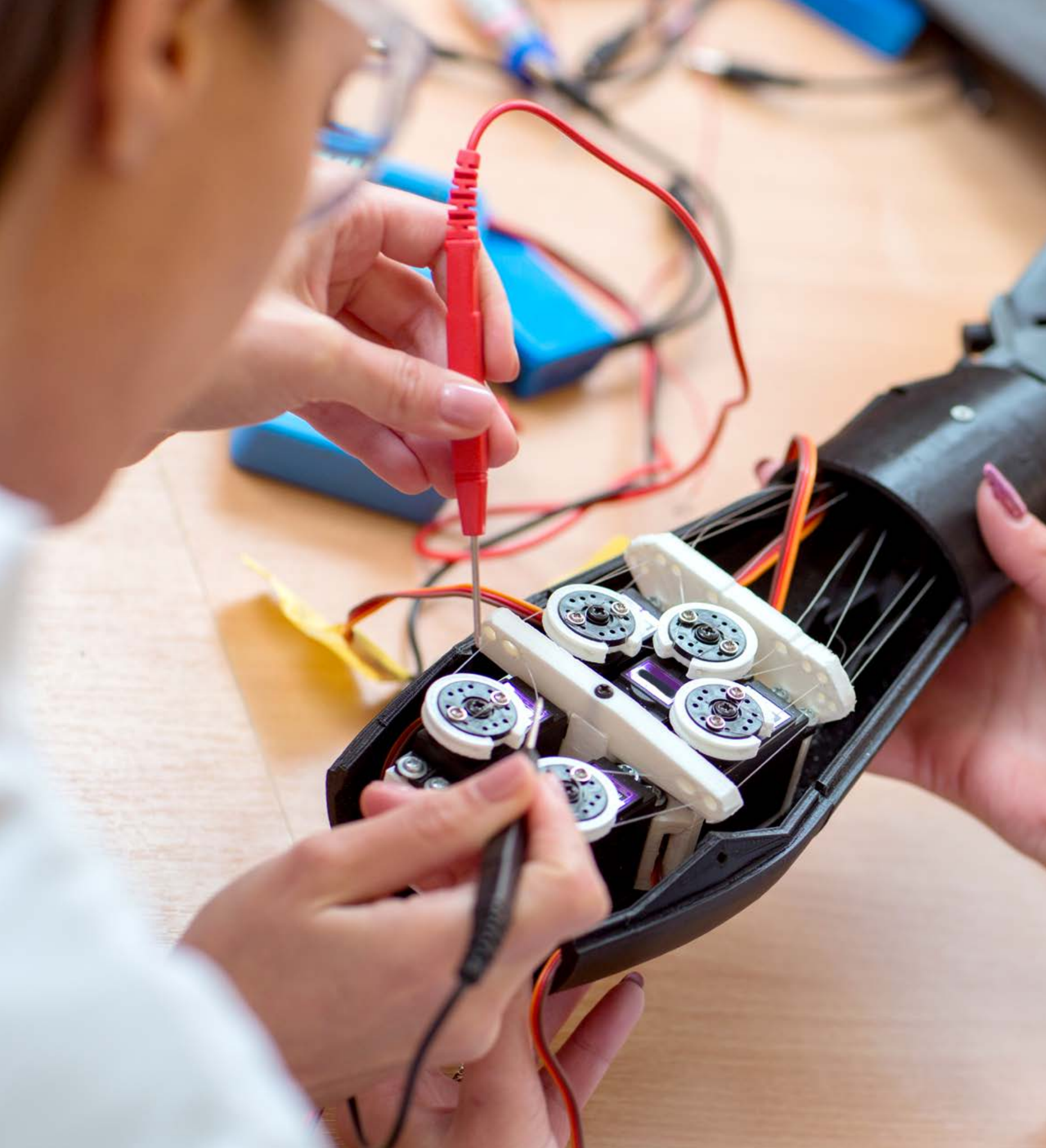
During the summer of 2021, NORA, in collaboration with Simula Research Laboratory, launched a dataset competition called MedAI: Transparency in Medical Image Segmentation. NORA and Simula

proposed a task that focused on medical image segmentation and transparency in machine learning-based systems. Three tasks to meet specific gastrointestinal image segmentation challenges collected from experts within the field were proposed. This included two different segmentation scenarios and a task on transparent machine learning systems that emphasises the need for explainable and interpretable machine learning algorithms. Results of the competition were announced at the NordicAIMEET conference. The winners were Adrian Galdran and Debayan Bhattacharya. NORA is grateful to Michael Riegler and his team for his extraordinary efforts in developing the competition and reviewing submissions.

<sup>1</sup>ImageNet (image-net.org)

<sup>2</sup>CASP – Wikipedia





# 6

## Education

Currently, the Norwegian higher education system offers AI-related research topics at most universities and university colleges. However, the courses are fragmented and not easily available to a larger number of students or early-stage researchers, and some subtopics of AI are not covered at all in Norway's higher educational system. Not every Norwegian university can afford to cover all the topics in the field of AI. This is supported by NORA's own analysis, which shows that there are gaps between courses available and the ambitions in this field. Hence, enabling the access to courses from one university to another and making certain courses available at the national level is a key goal for NORA.

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, the relevant stakeholders must take steps to encourage young people to study AI. 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.

By establishing a research school, access to specialised education in AI and AI-related topics will become more available,

and more topics within AI will be covered. A research school in AI will increase the level of AI education. A national research school will be an important and useful tool for sharing the national resources that exist within AI in terms of research and education. By interlinking parts of the PhD programmes, Norwegian universities will be able to provide a 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.

NORA has already played an active role in supporting the joint course on AI in Ethics at the University of Bergen and University of Oslo. Such initiatives have already enabled NORA to deal with the typical challenges that we may face in the future. In 2022, we're also planning intensive courses on topics like AI in Medicine/Life Sciences as part of the research school initiative, so that the students at NORA partner institutes can benefit.

NORA has an education committee which acts as an advisory body for sourcing and validating input on designing new courses and other interventions linked with AI education.

## 6.1

# Research School

NORA started the work of establishing a research school for AI as early as 2020. A PhD symposium was held in February 2020 and NORA's Education Council also discussed and planned the establishment of a research school. In 2021, the Research Council of Norway announced a call for "Research School for Quality and Relevance". NORA applied and the application was successful. As one of twelve successful applicants, NORA receives funding for the research school from 2022. The research school will cover basic and applied AI, machine learning and robotics, and it will be of relevance to the industry and public sector.

The primary objective of the research school is to raise the quality of the PhD education in AI to a leading European level, with a high degree of relevance for the labour market.

### The secondary objectives are:

1. Enhancing and filling gaps in the PhD education by commissioning new PhD courses and upgrading existing courses for wider participation.
2. Creating added value for the Norwe-

gian AI community by connecting the research school to the NORA research and innovation ecosystems.

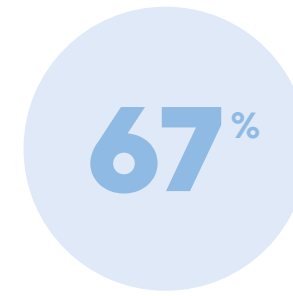
3. Bringing the stakeholders (industry, public sector, and others) together through industry days, workshops, internships, startup activities and innovation projects.
4. Empowering students by giving them responsibilities to organise technical tutorials and include them in the programme agenda of top-quality scientific events.
5. Facilitating student access to national high-performance computing infrastructure.
6. Enhancing international collaboration and increase the attractiveness of Norway as a destination for AI talent.

The organisation of the research school will include a research school board and several councils. NORA has chosen a radical approach towards gender equality in the research school. The research school board and all advisory councils are led by women. The board chair will be Cathrine Pihl Lyngstad, director of Data and AI at NAV. Marija Slavkovic (UiB) will lead NORA's Education Council, Mari

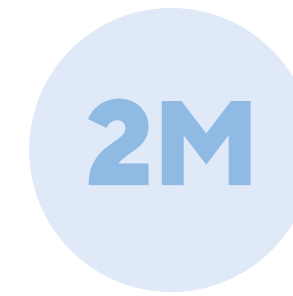
Serine Kannelønning (OsloMet) will lead the PhD Student Council and Signe Riemer-Sørensen (SINTEF) will lead the Innovation Council. Of the nine persons on the board, six are women (67%).

The research school's project manager is Arnaldo Frigessi (UiO), and NORA's CEO Klas Pettersen is the project administrator supported by the NORA secretariat. The funding is NOK 2 million per year, starting in 2022 for a maximum eight-year period. NORA partners will further contribute more than NOK 1 million annually.

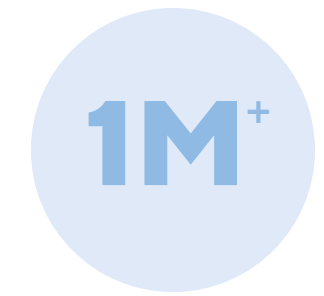
**The research school board will consist of NORA partners, Norwegian industry and the public sector.** The board chair will be Cathrine Pihl Lyngstad, who heads Data Science and AI at NAV. Other board members are Robert Jensen (UiT), also head of SFI Visual Intelligence; Marija Slavkovic (UiB), a driving force of AI education at UiB, who was also the driving force behind the NORA pilot PhD-level ethics course which is now conducted in collaboration between UiB and UiO; Liv Dingsør, CEO of Digital-Norway, one of the key industry-focused AI bodies in Norway, contributes with her strong industry insights and perspectives;



67% women in the board



2 million NOK in funding per year from RCN



More than 1 million NOK annually from NORAs partners

Kjersti Engan (UiS) and Nils-Olav Skeie (USN) bring strong experience from AI research and education; Hans Ekkehard Plesser (NMBU) has been the past board chair of the RCN-supported Norwegian Research School in Neuroscience and hence has solid experience in running and managing a research school; Signe Riemer-Sørensen (SINTEF) will enable important industry links with her experience and connections to a large number of industry-facing projects within AI; and Mari Serine Kannelønning (OsloMet), who will be a PhD student representative on the board. Riemer-Sørensen, Slavkovic and Kannelønning will lead the Education, Innovation and PhD Student Council, respectively.

**The Education Council** expands on an existing framework within NORA. The council gives advice on education and has been pivotal in the RCN application for NORA to become an RCN-supported research school. The education committee will act as the scientific resource pool for advising the topics of new PhD courses to be initiated, provide technical input for the scientific programmes

and evaluate student applications that may be solicited for the activities of the research school described above, such as a student exchange with our international collaborators.

**The Innovation Council** will be a new council at NORA. It will serve as a council for industry and public administrations. NORA's research institutes SINTEF, NORCE, Simula and Vestlandsforskning together with the SFIs, SFI Visual Intelligence, SFI Big Insight, and SFI Media Futures will be essential in bridging the NORA partners with industry. Several industry clusters will be represented on the council, among them Norway's three industry clusters for AI. Selected companies and public organisations will also have representatives.

**The PhD Student Council** is a council newly formed by NORA, comprising 24 PhD students spread across 9 NORA partners. Read more about the council in Chapter 6.2. *The International Advisory Council* will connect NORA to prominent international European AI networks and provide valuable input and insight based on their experience with their respective research schools and doctoral pro-

grammes. Members of the International Advisory Council will include representatives from WASP (Sweden), HIDA (Germany), the Alan Turing Institute (UK), FCAI (Finland), AI Pioneer Centre (Denmark) and CLAIRE (Europe).

### 6.2 PhD Student Committee

NORA considers young researchers at NORA's partners an important target group for our activities. Until recently NORA did not have a formal structure to collect the input of young researchers in shaping NORA's activities. Hence, NORA reached out to the PhD Students who previously participated in NORA Research School programme in 2020 and invited them to join a student advisory committee.

In the first call for nomination, NORA received replies from 24 PhD students representing a number of NORA partners. Mari Kannelønning from OsloMet was appointed as the leader of the student committee for 2021-2022 period. She actively participated in the panel discussion at Nordic AI Meet conference in 2021, sharing input on behalf of the student committee for future work.

# Research School Structure

Overview of the structure of NORA Research School

## Strategic partners

Centre for Digital Life Norway  
Uninett Sigma 2



**NORA Research School Board**  
Chair: Cathrine Phil Lyngstad



**Project Manager**  
Arnaldo Frigessi (UiO)



**NORA Secretariat (Executive body)**  
CEO: Klas Pettersen (NORA)



**PhD Student Council**  
Leader: Mari Serine Kannelønning (OsloMet)



**Innovation Council**  
Leader: Signe Riemer-Sørensen (SINTEF)



**Education Council**  
Leader: Marija Slavkovic (UiB)

## International Advisory Council

The Alan Turing Institute  
Helmholtz Association  
CLAIRE

Partners



## Universities / University colleges

### Universities / University colleges

University of Stavanger, University of Oslo, Norwegian University of Life Sciences, NORCE Norwegian Research Centre AS, University of Agder, Simula Research Laboratory AS, SINTEF, UiT The Arctic University of Norway, University of Bergen, Kristiania University College, Østfold University College, University of South-Eastern Norway, Norwegian Business School, Oslo Metropolitan University



## Research institutes / SFIs

### Research institutes / SFIs

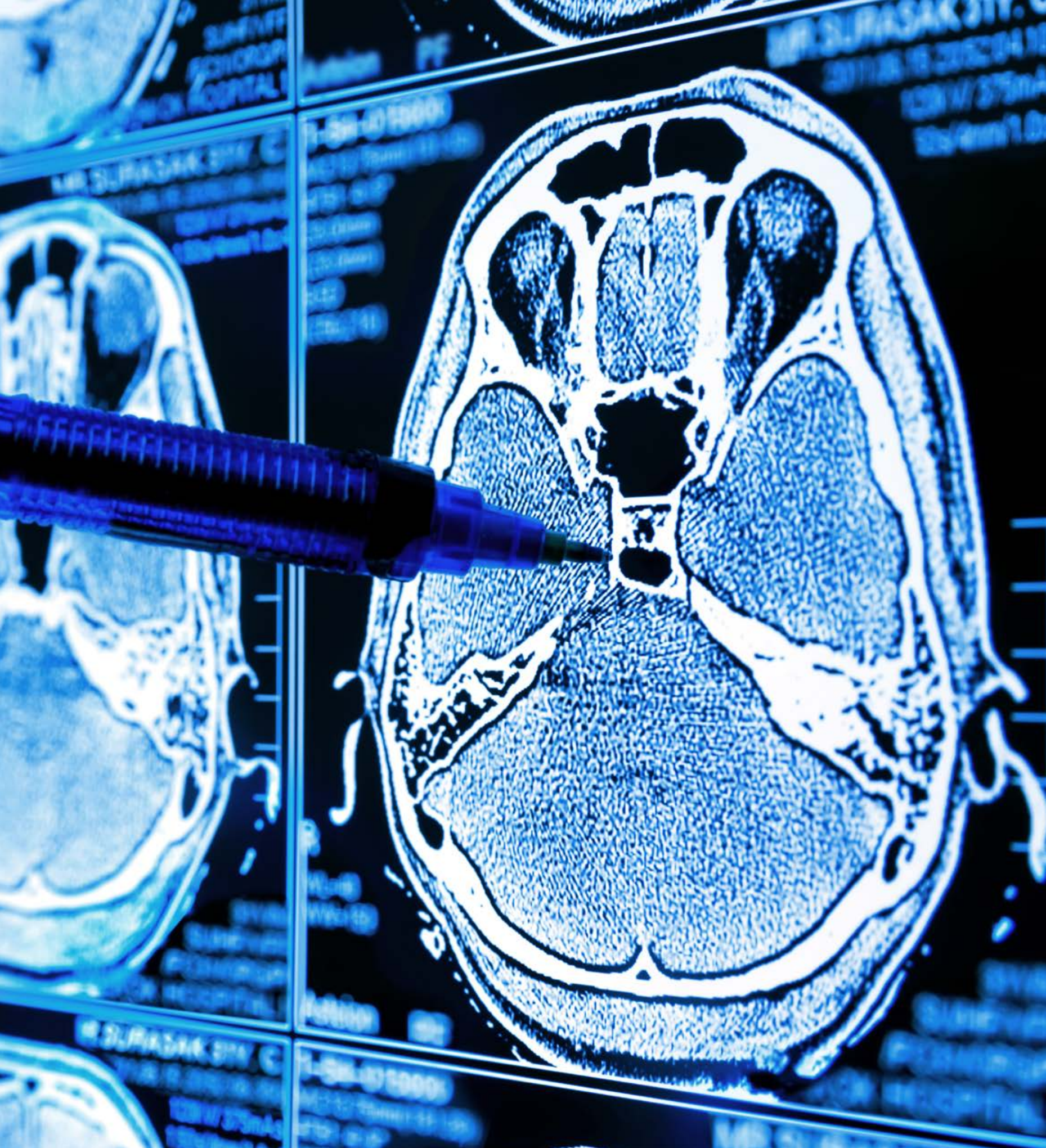
Visual Intelligence, BigInsight, Simula Research Laboratory AS, Media Futures, NORCE Norwegian Research Centre AS, SINTEF, Western Norway Research Institute



## Industry / Public Sector

### Industry / Public Sector

Norway Health Tech, Norwegian Cognitive Center, Oslo Cancer Cluster, Digital Norway, Oslo University Hospital, Cluster for Applied AI, NAV, Norges Bank Investment Management, Telenor, DNB, Skanska, Graphcore, NORA Startup Industry Partners



# 7

## Innovation

NORA has launched several initiatives to support innovation-driven research at our partner institutions. Through NORA.startup, we have established a network and meeting venue for the AI startup community and researchers. Through NORA.startup, NORA has created an arena for interaction and collaboration between startups and academia and we have taken an active part in supporting startup companies in the field of AI.

NORA has also recently established an industry network that is open to companies of all sizes, the public sector and non-profit organisations who are interested in AI and the opportunities this represents for value creation. The industry network works toward creating synergies between research and industry, by introducing and connecting research projects, new methods, and theory to industrial actors.

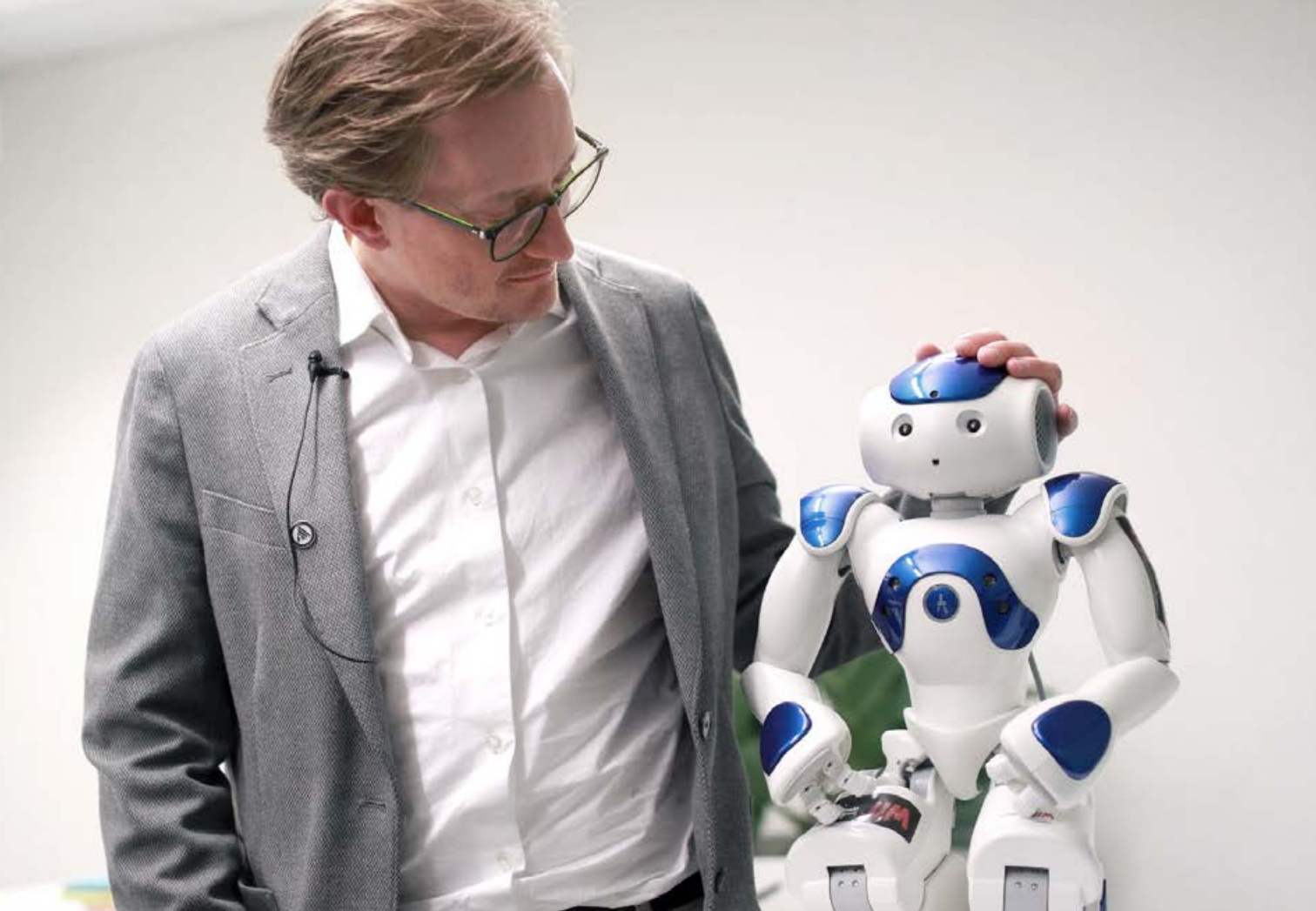
Both NORA.startup and the NORA industry network have created many arenas for industrial collaboration and research.

### 7.1 NORA.startup

NORA.startup was created based on an initiative introduced by the Simula Garage with the aim to build a national network for research-based innovation. Since its inception in September 2020, NORA.startup has been an active supporter of startups who wish to connect with the research community across Norway and has since become known as NORA's innovation platform.

The NORA.startup community has grown quickly. Currently, NORA.startup consists of more than 30 companies and more than 30 researchers. The network is continuously growing.

In 2021, NORA.startup became recognised by Innovation Norway as an important entrepreneurial ecosystem for innovation and AI. The recognition was an important milestone for NORA.startup, which acknowledged the work NORA has done for entrepreneurs who are driving the creation of startups in the field of AI.

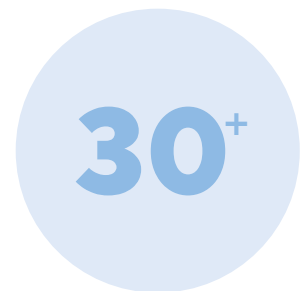


Morten Goodwin (UiA) interacting with a robot



Freyja Jørgensen introducing NORA.startup at NORA Annual Conference 2021

## NORA.startup | Key figures



NORA.startup consists of more than 30 companies



NORA.startup consists of more than 30 researchers



NORA.startup has hosted more than 25 webinars

NORA.startup is an innovation arena which facilitates networking and collaboration between existing actors in the Norwegian ecosystem, including universities, university colleges, research institutions, incubators, accelerators and startups. The network facilitates opportunities for collaboration in AI, machine learning and robotics, and supports startups or entrepreneurial researchers through a network of competence within the abovementioned fields.

NORA.startup is governed by a steering group consisting of representatives selected by the NORA Board. The members of the steering group have a broad professional span such as academic researchers, founders, representatives of incubators and accelerators.

NORA.startup has hosted numerous activities for its members, including themed webinars and workshops, in-person meet-and-greets

and funding days. NORA.startup has hosted more than 25 webinars addressing important questions such as sustainability, trustworthiness and diversity in AI while exploring various use cases of applied AI.

NORA.startup has also hosted many large both in-person and virtual events for members, amongst them events on public funding opportunities with Innovation Norway and the Research Council of Norway. Most importantly, NORA.startup has provided support and advice on writing applications, introductions to investors, introductions to academic projects and researchers through our webinars.

NORA.startup has become an arena for interaction and collaboration between NORA partners and startups, where NORA has taken an active part in supporting startup companies in the field of AI.

# Steering group NORA.startup



**Freyja Jørgensen**  
Innovation Manager, Simula Garage and head of the NORA.startup steering group



**Lars Ailo Bongo**  
Lars Ailo Bongo, Professor at UiT The Arctic University of Norway



**Anita Schjøll Brede**  
CEO and Co-founder of IRIS.ai



**Morten Goodwin**  
Professor at the University of Agder



**Lars Selsås**  
CEO and Founder of Boost.ai



**Sondre Pedersen**  
Co-Founder Findable



**Annette F. Stephansen**  
Research Director Digital Systems at NORCE



**Jørgen Veiby**  
Business Development Manager, Startuplab



**Birte Hansen**  
Innovation and Industry Coordinator, NORA



**Klas H. Pettersen**  
CEO of NORA

“NORA.startup grew out of an uncovered need for a knowledge-based and highly competent AI network, connecting ambitious entrepreneurs with researchers and students, genuinely pushing this field forward. The goal has always been to build this network gradually, tailoring it towards our members, while facilitating knowledge- and experience exchange. As the head of the NORA.startup steering group, I’m proud to see how this network has grown and proved useful for so many, and I’d like to extend a big thank you to the researchers, incubator-representatives and entrepreneurs for their support in making this possible”.

– Freyja Jørgensen, Innovation Manager the Simula Garage



Freyja Jørgensen at NORA Annual Conference 2021

NORA.startup members



## 7.2 Industry Network

The NORA Industry Network is a network for and of research-based business projects. The recent launch of the NORA Industry Network in January 2022 was a central accomplishment for NORA.

The members of the NORA Industry Network will benefit from the competence and experience from academic partners in the consortium. The NORA Industry Network aims to facilitate and strengthen collaboration between industry, researchers, students, research institutions and public actors. Industry to academic collaboration will be part of NORA partner institutions that will build strong platforms for knowledge and technology exchange, education, and training, provide access to talent and student collaboration, and most importantly, provide access to the top leading AI scientists, research labs and research institutes in Norway. The mission is to substantially increase AI-based research, innovation, and uptake in Norway through open and shared knowledge and technology exchanges.

Launching the industry network is an

important step in securing closer collaboration between the NORA partners and external actors, such as commercial enterprises and public actors. The NORA Industry Network is open to both private and public actors.

Including commercial enterprises and public actors in important events, such as conferences and seminars can help develop a shared understanding of the impact of AI on the future of industry. The Industry Network will focus on the significance of academic to industry collaboration as much of the research being conducted is in the field of applied AI. NORA will contribute as an important facilitator in connecting industry to relevant research projects and groups at partner universities.

NORA has already established central platforms for knowledge exchange, such as the Nordic AI Meet, the NORA Annual Conference and Industry Days. During the Nordic AI Meet Conference, we developed a special segment where industry is invited in to showcase how they're working with AI in their respective fields. In 2021, we invited Telenor, Cognite,

Soundsensing and Kongsberg Digital to introduce how AI, machine learning and robotics has been built into their solutions and products. By participating in the Nordic AI Meet and the NORA Annual Conference, industry representatives are exposed to pioneering research currently being conducted by researchers in the field of AI. Industry partners are also invited to introduce challenges and explore solutions with academic partners.

In 2021, NORA hosted the first Industry Day as a side event to the Northern Lights Deep Learning Conference. The conference is organised by SFI Visual Intelligence and is hosted by the UiT The Arctic University of Norway. The event featured four keynote speeches from Kongsberg Satellite Services, Graphcore, SINTEF Digital and Equinor. The event ended with a panel discussion addressing important subjects such as the value of industry to academic collaboration and how academic researchers can connect with industry to advance academic co-operation.

The collaboration between the In-

# NORA Annual Conference Startup Segment

The NORA Annual Conference is open to all NORA partners, non-NORA partners, industry and public actors, and of course, startups. During the NORA startup segment of the conference, all members were invited to have a booth and to present their startup including the idea that inspired the startup, the specific service/product they offer, the team behind the startup and how research-based innovation has played a part in building the startup, and the benefits of research-based collaboration. Soundsensing, BergenRobotics, Neddy, Disputas and Maigon all pitched the technical aspects of their services and solutions, giving researchers insight and inspiration as to how AI can be applied to solve real life problems.

Following the pitches, NORA hosted a panel debate on the topic: How can we improve collaboration between academia and the thriving startup community in Norway? Odd Gurvin, Project Leader of the Norwegian Cognitive Center moderated the debate between invited speakers Erlend Waaler, Head of StartupLab Bergen, Jakob Voigt, Industrial PhD at Neddy, Freyja Jørgensen, Innovation Manager at the Simula Garage and the Leader of NORA.startup steering group and Lars Ailo Bongo, Professor at UiT, co-founder of Medsensio and innovation coordinator at SFI Visual Intelligence.

“Academia and entrepreneurship seem like two opposites. Academia with time-consuming and thorough processes – and Startups with fast-paced and agile strategies and often a shortage of money.

Norwegian universities are behind Nordic universities when it comes to commercialising the results of research. At the same time Norwegian universities conduct research for about NOK 23 billion annually, it is obvious that the potential for commercialisation and innovation through new establishments is larger than what they deliver today.

So, there are a lot of questions that we should ask: Where is the Return on Investment on the billions put into research, how can we improve the commercialisation of research through startups, but the most important topic today is collaboration between universities and startups”.

– Odd Gurvin, Project Leader, Norwegian Cognitive Center





Meet and Mingle with NORA.startup



Gathering at Norwegian Cognitive Center for NORA.startup in connection with NORA Annual Conference

## Research school goals:



100 graduate students in 2022



200 graduate students by the end of the project period



25% industrial or public sector PhDs by 2029

dustry Network and the NORA Research School will be important. One of the aims of the research school is to collaborate with industry, public sector and startup companies. Through the research school, industry will have the opportunity to provide input on the development of courses in AI for the future, by contributing their knowledge of current educational gaps that should be addressed to meet future demands.

Through the research school, NORA will also encourage and increase the number of industrial PhDs in the field. The research school aims to serve 100 graduate students in 2022, steadily increasing to reach 200 graduate students by the end of the project period, with the goal of 25% industrial or public sector PhDs by 2029.

### 7.3 NORA as a European Digital Innovation Hub

The Digital Europe Programme (Digital) aims to deploy a network of European Digital Innovation Hubs (EDIHs) offering public and private organisations access to technology testing and support in their digital transformation. The initial network of EDIHs will be established from a list of hubs designated by the member states.

Only these designated candidates are eligible to submit a proposal.

Through an application to Innovation Norway, NORA is qualified to apply to become an EDIH under Digital. EDIHs will function as a one-stop shop that helps companies respond dynamically to the digital challenges and become more competitive by providing access to technical expertise and experimentation as well as the possibility to 'test before invest'.

After the qualification round, NORA collaborated with other qualified candidates from Norway and established a larger Norwegian EDIH consortium. The other partners are from qualified applications led by NTNU, Smart Innovation Norway and ÅKP AS. Digital Norway will have the coordinating role of this EDIH.

NORA also has a supporting role in the EDIH Ocean application, coordinated by NORCE.

### 7.4 Infrastructure Application

In December 2021, the Research Council of Norway announced that the Norwegian Artificial Intelligence Cloud (NAIC) will receive funding. The infrastructure will be the most powerful AI infrastructure in Norway. It will meet the AI needs of academia, SMEs, larger industry, startups,

and public administration. Gard Thomasen (UiO) is the project lead.

The entire Norwegian AI community will benefit from the infrastructure. Uninett Sigma2 AS and NTNU (NAIL) are partners of the project in addition to UiO and NORA partners. The goal is not only to build a physical AI infrastructure. The project will invest in computing, and an even larger part of the budget will go towards building competence and education around the infrastructure. We will provide user-specific assistance and develop a coherent infrastructure consolidating existing resources and new resources, paving a way to scale to future needs.

It should be mentioned in particular that NAIC will collaborate with the NORA Research School. Through joint workshops and training, NAIC and NORA will help the uptake of the NAIC infrastructure for Ph.D. students in relevant domains by introducing NAIC resources and services to university courses. The NORA secretariat will offer its services as a hub for communication, linking students and researchers to the NAIC infrastructure, and will give advice on projects related to AI. At the NORA Research School, specific workshops will be organised where Ph.D. students will bring their research

projects and will be offered on-boarding to NAIC. This will ensure a culture of using NAIC across Norwegian universities and research institutes.

NAIC will also be a strong driving force for collaboration between startup companies, research communities and the business sector, with emphasis on professional competence, expertise, development, and application of the abovementioned technologies. NORA.startup will be NAIC's tool to reach out to the startup companies. The NORA secretariat will lead dissemination, outreach, and community liaison, and will participate in procurement. We will demonstrate the use of the NAIC services in scientific and industry use cases. We will work with pre-selected use cases from the start and identify additional use cases through open calls.

AI infrastructure already hosted by the partners with a sufficient amount of accompanying storage will be publicised through a NAIC service catalogue and access procedures will be simplified. We will customise the factory model to accommodate needs of communities using existing e-infrastructures.

NAIC is a giant leap for Norway in becoming an AI country and will give Norway

a competitive edge in the very competitive field of AI technology.

### 7.5 Innovation Norway innovation Ecosystem for AI

The main goal of NORA.startup is to create a highly competent innovation ecosystem in AI, machine learning and robotics. NORA.startup was therefore a perfect match for Innovation Norway's call for creating innovation ecosystems.

From spring 2021, NORA has been funded as Innovation Norway's ecosystem for AI. The mission of the ecosystem supported by Innovation Norway aligns well with the mission of NORA.startup. The ecosystem will have a strong focus on dissemination and exchange of knowledge and experiences, both from a business and academic perspective. When the application was submitted, we had the goal of 25 of Norway's most competent startup companies in AI being affiliated with NORA.startup. This goal was already reached at the beginning of 2022. In addition, the ecosystem will organise 2-3 major events where NORA will assist with collaborative projects and investment opportunities with a focus on research and development. There will also be a focus on learning about each other's

skills. Both the startup companies and academics will benefit from the academic programme. NORA has been organising webinars and investment days, and NORA has provided service both for the research community and startup companies to make contacts with potential partners.

As part of building the innovation ecosystem, NORA has also built a competence database with a list of researchers and startup companies in Norway in AI, the [aidirectory.no](https://aidirectory.no).



# 8

## International Cooperation

### 8.1 Cooperation with other Institutes

International cooperation will be fundamental for bringing Norwegian AI research to the forefront and making NORA partners' research internationally visible. The key to success for Norwegian research lies in strategic collaboration with likeminded partners both in the Nordic countries, and active participation in the Horizon Europe framework, both of which NORA plays an important role in.

One example of such cooperation is the conference Nordic AI Meet. With the support of the Research Council of Norway, NORA organised the first Nordic AI Meet in 2021 and will organise this conference annually until 2025. The conference presents an excellent opportunity for NORA to bring together the top Nordic partners in the field of AI. NORA achieved great success in the first conference by establishing programmes and organising committees for the Nordic AI Meet which integrated the top players from the region, such as:

- WASP, Sweden
- AI Sweden
- RI.se
- Pioneer Center, Denmark
- Science AI Center, Denmark
- Finnish Center on Artificial Intelligence
- Icelandic Institute for Intelligent Machines

The active participation of committee members from these clusters and networks enables a strong Nordic collaboration and creates many opportunities for Norwegian research efforts to be integrated and visible at the regional level. Nordic AI Meet enables a platform for young researchers from the Nordic region to exchange notes and also presents an opportunity for research leaders to interact and inspire the community collectively.

Similarly, NORA also is responsible for running the CLAIRE office for the Nordic countries and UK, which again strengthens the pan-European link with a strong regional focus. The NORA secretariat interacts with other CLAIRE offices on a weekly basis to explore synergies and exchange notes on ongoing programmes and activities.

### 8.1.1 Helmholtz Information & Data Science Academy: HIDA

HIDA – the Helmholtz Information & Data Science Academy – is Germany's largest postgraduate training network in the field of information and data science.

HIDA is a hub for the exchange of knowledge and methods in the field of information & data science at the Helmholtz Association. Germany's largest research organisation. It serves as an umbrella organisation for six newly founded Helm-



### NORA organises the Nordic AI meet conference

holtz Information & Data Science Research Schools. They are linked by a network of 14 national research centres and 17 top-tier universities across Germany. Over the next five years, these data science research schools will train over 280 fully funded doctoral researchers.

NORA signed two agreements with HIDA in 2021. One agreement is called 'Friends of HIDA' which is to cross-promote opportunities of mutual interest in each other's network. The other is to pilot an exchange of young researchers (PhD students) in 2022 on the basis of problem statements floated by experts from both sides. If the exchange programme in 2022 is found beneficial by participating researchers, then the agreement maybe planned for a future period.

#### 8.1.2 The Alan Turing Institute

The Alan Turing Institute, headquartered at the British Library, London, was created as the national institute for data science in 2015. In 2017, because of a government recommendation, AI was also added to the scope. The institute is named in honour of Alan Turing, whose pioneering work in theoretical and applied mathematics, engineering and computing which are considered to be the key disciplines comprising the fields of data science and AI.

Five founding universities – Cambridge, Edinburgh, Oxford, UCL and Warwick – and the UK Engineering and Physical Sciences Research Council founded the Alan Turing Institute in 2015. Eight new universities – Leeds, Manchester, Newcastle, Queen Mary University of London, Birmingham, Exeter, Bristol, and



### NORA signed two agreements with HIDA

Southampton – joined the institute in 2018. Since its inception, the institute has been funded through grants from research councils, university partners and from strategic and other partnerships.

NORA has been in active discussions with the Alan Turing Institute, mainly regarding the international cooperation division to connect researchers from both sides on topics of mutual interest. The topics explored in 2021 for research collaboration are related to AI in dementia prediction and synthetic data in healthcare. NORA also involved the experts from Alan Turing in CLAIRE Oslo office launch and other NORA programmes in 2021 where we explored synergies and collaboration.

NORA has also reached a cooperation agreement with the Alan Turing Institute under the NORA Research School. Two Norwegian PhD students will be hosted every year at the Alan Turing Institute under the enrichment programme from 2022. NORA had also planned an official signing and exchange of MoUs with the Alan Turing Institute in London in Dec 2021, which unfortunately had to be postponed due to rising COVID cases. The cooperation is formally supported by the British Embassy in Oslo. NORA is grateful to the staff of the British Embassy for their support of this important collaboration.

#### 8.2 Claire

NORA started collaborating with the Confederation of Laboratories for AI Research in Europe (CLAIRE) in 2019. To support CLAIRE's efforts in Norway and Europe, NORA dedicates resources towards hosting activities and events in



### NORA helps host CLAIRE events in Norway

Norway both independently and in collaboration with the other CLAIRE offices. As the largest network for AI research, CLAIRE represents an important platform for cross-border collaboration and promotes Norwegian research in Europe. NORA actively contributes towards planning and executing CLAIRE events in Norway and is also a member of the CLAIRE Innovation Taskforce. The Innovation Taskforce leads the CLAIRE Innovation Network which aims to strengthen the relationship between researchers, industry and startups.

#### 8.2.1 CLAIRE and NORA Innovation Network Collaboration

In 2021, CLAIRE and NORA entered into a collaboration agreement regarding their respective innovation networks. When Norwegian companies become a principal partner in the NORA Industry Network, they immediately get dual membership in the CLAIRE Innovation Network. The CLAIRE Innovation Network was launched in 2021 and consists of companies, legal entities and groups within large companies that develop or use AI in their products/ services.

# CLAIRE NORA Office Launch – Opening ceremony

# CLAIRE

“It’s my humble opinion that cooperation, co-creation, and collaboration, is of the utmost importance for future innovation, and also absolutely essential for a sustainable future. As the ministry responsible for coordinating the government’s efforts to reach the UN sustainable development goals in Norway, I’m glad to see we’ve put our best efforts into developing technology that will be fundamental in solving our future challenges”.

Nikolai Astrup

Representing the CLAIRE office in Norway and the Nordic countries, the NORA office has dedicated resources towards the innovation and research network in CLAIRE. On the 3rd of June 2021, NORA and CLAIRE officially launched the CLAIRE Oslo Office. The Confederation of Laboratories for Artificial Intelligence Research in Europe (CLAIRE) opened four new offices in Zurich, Oslo, Paris, and Brussels. The new offices will complement the 4 existing offices in The Hague, Saarbrücken, Rome, and Prague. The CLAIRE Oslo Office was the second stop on the CLAIRE Roadshow, and the theme was The Nordic Model - Connecting Young Talent.

National actors representing NORA and Norwegian Open AI

Lab joined the event in addition to CLAIRE representatives and representatives from the Alan Turing Institute. The launch ended with a virtual networking event in Gathertown, where the actors invited had open booths which participants could visit virtually for a chat. The launch included a digital post event with 24 booths, ranging from Telenor, Graphcore, Smart Innovation Norway, University of Stavanger, University of Oslo, dScience, NORA.startup, European Startup Network, Oslo AI, Iris.ai, SINTEF, Norwegian Artificial Intelligence Network for Europe, Norwegian Cognitive Center, NORCE, Norway Health Tech, SFI Visual Intelligence, to mention a few.

Nikolai Astrup, the former Minister of Local Government and Modernisation recorded a video statement of support in honour of the launch of the CLAIRE Oslo Office:



Former Minister of Local Government and Modernisation, Nikolai Astrup



# 9

## Promote Ethical, Transparent and Inclusive AI

### 9.1 Ethics

NORA has a mission to promote ethical, transparent, and inclusive AI. A central part of this has been encouraging collaboration across member institutions on a PhD-level. Encouraging collaboration between members of NORA on ethics has been a focus that helped produce a new initiative. The PhD course INFO901 Introduction to AI Ethics is scheduled to be held spring 2022. The course is given jointly by Marija Slavkovic (UiB) and Miria Grisot (UiO). The students can register either at the University of Bergen or the University of Oslo. The lectures will include invited guest lecturers from among the international academic researchers in AI ethics, as well as NAV and Datatilsynet. Previously Marija Slavkovic also presented in a jointly organised webinar NORA hosted together with the Norwegian Open AI Lab on 30 April 2021 with a focus on 'machine ethics', the behaviour of machines towards human users and other machines.

Engagement with the national ethics committees has been important. In particular, the National Committee for Research Ethics in Science and Technology (NENT). Jim Tørresen (UiO) was on the committee responsible for the white paper 'Research Ethics Report on AI' (Norwegian: Forskningsetisk betenkning om kunstig intelli-

gens), which was commented on by NORA's CEO Klas Pettersen at the November 2019 launch. On 6 November 2020, NORA held a webinar with Jim Tørresen on the topic of Ethical Consideration in Robotics and Intelligent Systems Research<sup>3</sup>. This discussion was based on a report by NENT on ethical considerations of research on AI and work by Tønnesen. In this report, the overall recommendations were to (1) ensure human dignity, (2) localise responsibility, (3) enable auditability, (4) research communications, (5) recognise uncertainty, (6) ensure broad involvement, (7) privacy, (8) quality assurance and (9) access to data. NORA also took part in establishing the Norwegian Council for Digital Ethics (NORDE) in January 2020<sup>4</sup>.

In late 2021, NORA was approached by Abbey Lin who had been running a website for ethical AI resources, ethicalairesources.com. NORA had already made information about the field of AI more available through AI maps and the Norwegian AI Directory, and this resource was established with the aim to aggregate resources to assist in developing and deploying more ethical AI. This website is being redeveloped by NORA to provide a continuous flow of resources in AI ethics and to engage with the member community.

<sup>3</sup> [https://www.nora.ai/nora-webinars/201106\\_webinar\\_ethical\\_jim?vrtx=view-as-webpage](https://www.nora.ai/nora-webinars/201106_webinar_ethical_jim?vrtx=view-as-webpage)  
<sup>4</sup> <https://www.dataforeningen.no/digital-etisk-rad-er-etablert/>

“Artificial intelligence will play a pivotal role in achieving the SDGs. However, a developmental shift towards sustainable artificial intelligence ecosystems is required. This includes ensuring equality, open data access, green data centres, and reduced carbon footprints of algorithms”.

– Solve Sæbø, Professor at the Norwegian University of Life Sciences (NMBU)

### 9.2 Transparency

One of NORA’s strategic goals is trust-based and transparent use of AI through ethical awareness.

In the Norwegian government’s AI Strategy, collaboration with the EU has a clear commitment. The Norwegian State has adopted the seven principles shaped by the EU high-level expert group on AI as its basis for ethical and responsible development of AI in Norway. The fourth principle adopted is AI-based systems must be transparent:

1. Informing data subjects of processing.
2. Computer systems must not pretend to be human beings.
3. The right for people to know if they are interacting with an AI system.

On a national level, building capacity and accountability to tackle issues related to the field of AI has been of great importance. In this regard, NORA has worked to inform several initiatives across the Norwegian State. This has been done through meetings with the interdepart-

mental group for AI in the Norwegian State and involvements in various boards.

On a European level, the EU is introducing a risk-based framework through the proposed EU AI Act (AIA). NORA gathered input from legal researchers and technical AI researchers to assist the Norwegian government in their general input to the European Commission on their initial proposal. Transparency is also important in major international systems deploying AI that affect Norwegian citizens. On 29 November 2021, NORA invited the Norwegian Data Protection Authority (Datatilsynet), Faktisk.no (fact checker) and a security startup to a webinar to discuss the current challenges related to AI, misinformation and social entrepreneurship<sup>5</sup>. NORA has also supported FAIR data principles (Findable, Accessible, Interoperable, and Reusable) and responsible research and innovation (RRI). Several NORA researchers and NORA’s CEO are represented on the Data Infrastructure Committee (Norwegian: Datainfrastrukturutvalg) appointed by the Research Council of Norway on behalf of the Ministry of Education and

Research, writing a white paper on how Norway should organise infrastructure and promote fair data for research and public management.

### 9.3 Sustainability

NORA has been contributing to discussions about sustainability in the field of AI. This has been done by organising webinars on the topic, contributing to high-level discussions, and building awareness. One webinar held in 2021 was dedicated to Sustainable AI<sup>6</sup>. Solve Sæbø (prorector NMBU), who participated in the webinar, later the same year spoke at the High-Level Political Forum on Sustainable Development (HLPF). NORA assisted with the speech and the following statement was made regarding AI at HLPF 2021 on behalf of Norway:

“Artificial intelligence will play a pivotal role in achieving the SDGs. However, a developmental shift towards sustainable artificial intelligence ecosystems is required. This includes ensuring equality, open data access, green data centres, and reduced carbon footprints of algorithms”.

An example of a research group from

our members working towards this is the Nordic Centre for Sustainable and Trustworthy Artificial Intelligence Research (NordSTAR). The centre aims to establish a new paradigm in basic AI research, so-called sustainable and trustworthy AI. A webinar was held to introduce NordSTAR on 9 February 2021. Applied research in the emerging field of sustainable AI has also received attention. The Greener Logistics with AI webinar on 24 September 2021 is an example that focused on research conducted by SINTEF<sup>7</sup>.

### 9.4 Equality and Diversity in AI

In NORA, we actively strive to improve the position of and increase the visibility of women in the field of AI. By increasing the visibility of women actively contributing to the field of AI in Norway, we aim to inspire a more inclusive agenda in the otherwise male-dominated field of AI to ensure equality for future generations. Our goal is to raise awareness by promoting female role models and by portraying the

breadth of opportunities for AI in society at large. Through the women active in our AI campaign, we’ve brought together researchers, practitioners, students and industry representatives to address the gender disparity in the field and explore initiatives to ensure inclusivity and diversity in AI for the future.

The campaign started on 8 March 2021 on International Women’s Day. In honour of the day, we published the article ‘Female Role Models Changing the Field of AI in Norway’, which lists 74 women working in the AI field in Norway. The article includes short biographies and quotes from the women featured. When NORA published the article, there were 30 women listed, but the list grew shortly afterwards. While NORA started out with a short article, the article soon grew into a larger campaign which sparked promotion on our social media platforms. By promoting the biographies of the women and their accomplishments on social media, our network commented on and nominated colleagues,

friends and acquaintances who should also be included on the list. As the list grew, the relevance of the list also became abundantly clear. Organisations contacted us regarding the list and asked us for contact information of various representatives featured on the list. The article has proved to be useful as a reference tool for many actors when planning panels and debates on various topics.

Besides publishing the article promoting women in AI, NORA and NORA.startup have engaged in conversations with our partners on the topic of diversity and gender in AI. By focusing on the topic and by providing a platform for open discussion, NORA aims to develop initiatives that can increase the inclusion of a more diverse workforce in the future. In November, NORA.startup hosted a webinar session on Women in AI, where we invited female researchers, practitioners, and founders to address the gender disparity in tech startups and research and discuss initiatives to ensure inclusivity and diversity in AI for the future.



NLDL women in AI event

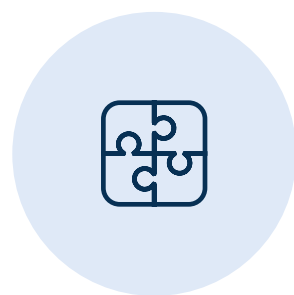
<sup>5</sup> [https://www.nora.ai/nora-webinars/29112021-norastartupwebinar\\_ai-misinformation-and-social-entrepreneurship.mp4?vrtx=view-as-webpage](https://www.nora.ai/nora-webinars/29112021-norastartupwebinar_ai-misinformation-and-social-entrepreneurship.mp4?vrtx=view-as-webpage)

<sup>6</sup> [https://www.nora.ai/nora-webinars/21052021\\_NORAstartup\\_webinar\\_sustainableAI?vrtx=view-as-webpage](https://www.nora.ai/nora-webinars/21052021_NORAstartup_webinar_sustainableAI?vrtx=view-as-webpage)

<sup>7</sup> [https://www.nora.ai/nora-webinars/210924\\_webinar\\_greener\\_logistics.mp4?vrtx=view-as-webpage](https://www.nora.ai/nora-webinars/210924_webinar_greener_logistics.mp4?vrtx=view-as-webpage)



NORA pushes for gender balance in all initiatives



NORA promotes inclusivity and diversity



NORA hosted a session on Women in AI

NORA also entered into a collaboration with the Northern Lights Deep Learning Conference 2022 to host a session on Women in AI. The Women in AI Event was organised as a side event at the Northern Lights Deep Learning Conference NLDL, which is a conference organised by SFI Visual Intelligence, hosted by UiT The Arctic University of Norway.

Through the Women in AI campaign, NORA has dedicated efforts towards supporting universities, university colleges, research institutions, startups, faculties, and individual researchers who wish to discuss and address the gender gap in

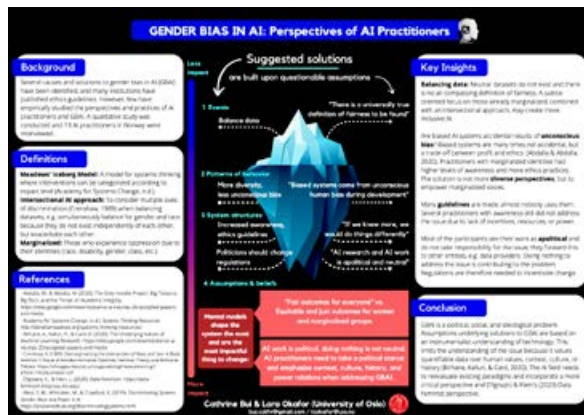
STEM education and in industry.

NORA is also involved at the British Embassy in Norway's Women in Tech initiative. The initiative aims to create an inclusive platform for women in tech, be they students, researchers, founders, or practitioners. The platform will offer events and activities for women in tech, and will be a community for networking, advice, and support.

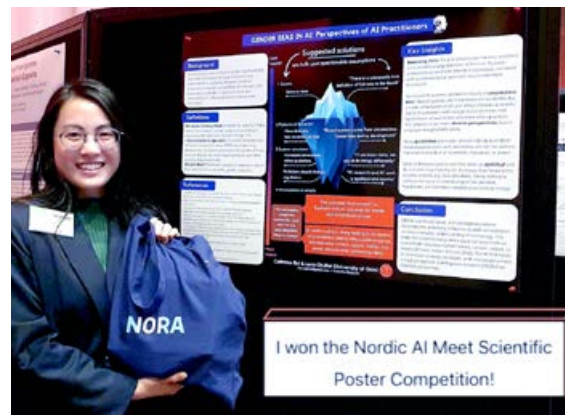
At NORA, we are continuously pushing for gender balance in all our initiatives. We strive to have gender balance in our webinars, conferences, and panels and on our board and elected committees. Inclusivity and diversity in AI form a vital

part of the vision and mission of NORA and of our partners, and we will continue to promote these principles in our agenda going forward.

The poster 'Gender Bias in AI: Perspectives of AI Practitioners' was created by Cathrine Bui and Lara Okafor, master's student at the University of Oslo. Through interviews, the study has found that an instrumentalist perspective of technology limited the practitioners' understanding of issues of bias because the view tends to value quantifiable data over human values, context, or history.



The poster Gender Bias in AI: Perspectives of AI Practitioners by Catherine Bui and Lara Okafor. Affiliation: University of Oslo



Catherine Bui at NordicAI Meet 2021, who together with Lara Okafor won the best poster award

# About the Women in Tech Initiative



Professor Kjersti Engan speaking at NORA kick-off event

Our Women in Tech initiative was created to build meaningful connections between smart-minded women through digital and physical spaces, driving change for women in business and academia.

Our aim? To provide an open and inclusive community which supports ambitious women in building skills, confidence, and networks, at every stage of their career, in a trusted community that shares ideas, challenges and celebrations.

This initiative was created by the British Embassy in Oslo in partnership with BI Business School, Capassa, Digital Norway, Microsoft Norway, NORA and Oslo Business Region.



Female role models in AI



# 10

## Mapping the Norwegian AI Landscape

### 10.1 Introduction

Part of NORA's mission is to become a national access point for AI competence and infrastructure. To fulfil this mission NORA has made it a priority to provide a comprehensive overview of ongoing research, education and innovation in the field of AI in Norway. NORA's list of academic AI entities has been made available online both through AI maps and the Norwegian AI Directory. The AI maps help provide a geographic overview of academic AI entities on national and a European level. The creation of the Norwegian AI Directory is focused on national access listing AI labs (including groups and centres), AI projects, educational courses, AI startups, AI conferences and funding opportunities.

### 10.2 AI Maps

The AI maps project was initiated to turn the tacit knowledge of the AI ecosystem at the NORA secretariat and our research consortium into an accessible display to

help all stakeholders get an overview of the field of AI in Norway and in Europe.

The Norwegian AI map is featured on NORA's website to provide an overview of both the members of the consortium as well as their research groups, institutes and labs related to the field of AI. As the Norwegian landscape of academic AI entities develops, the map will change accordingly.

The European AI map is displayed on the Confederation of Laboratories for Artificial Intelligence Research in Europe (CLAIRE) website, where all actors identified by NORA on a national level have been included to be shared in this international network. CLAIRE currently has a membership of over 435 labs and institutions. NORA helped to build this European map.

The first map contributes to mapping the Norwegian landscape, and the second map contributes to putting Norwegian AI research communities on the European map.

## The AI Directory contains information about:



18 AI Labs



786 AI Projects



156 University Courses

### 10.3 AIdirectory.no

During summer 2021, NORA together with summer interns began an effort to map AI projects, educational courses, and startups in Norway. Later this expanded to cover funding, conferences, and information about AI labs. As of 31 December 2021, the website contains information about: 18 AI Labs, 786 AI Projects and 156 University Courses.

As such it is a public resource in English to anyone attempting to navigate the field of AI in Norway and thus partly fulfils the goal of becoming a national access point. This resource has been shared repeatedly in the CLAIRE network and presented at NORA's annual conference 2021. Further interest has been expressed by researchers to contribute to building

this resource. The wish for the future of the project is to create better visualisations and gather data at a researcher level. Another idea has been to create an overview of AI deployment in Norway to help those interested to explore specific case studies of applied AI.

### 10.4 Norwegian AI Startup Landscape

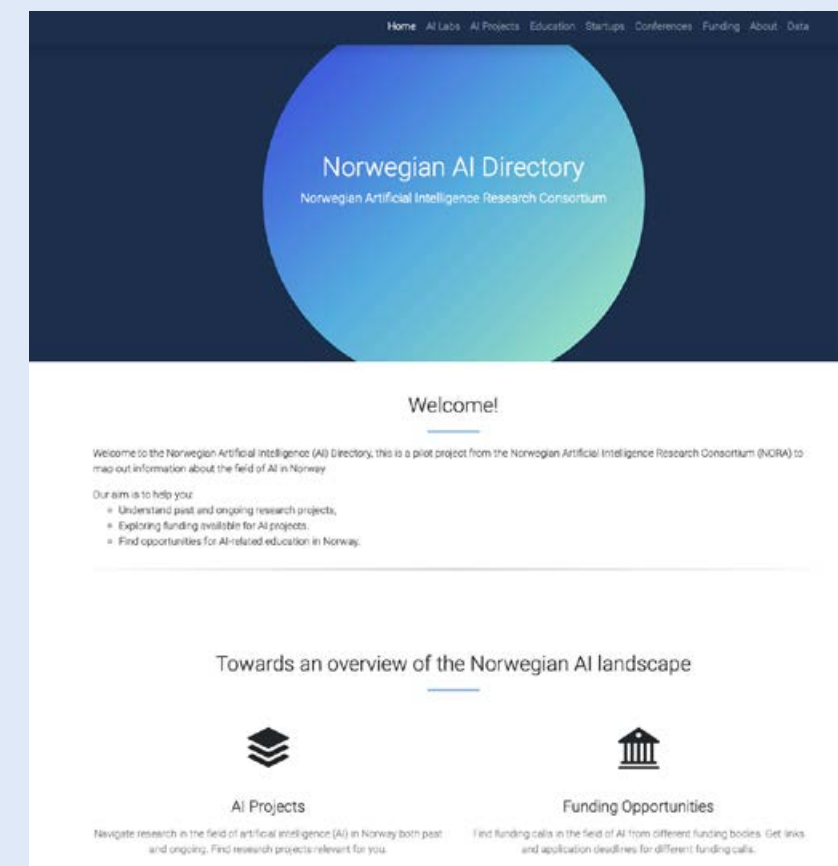
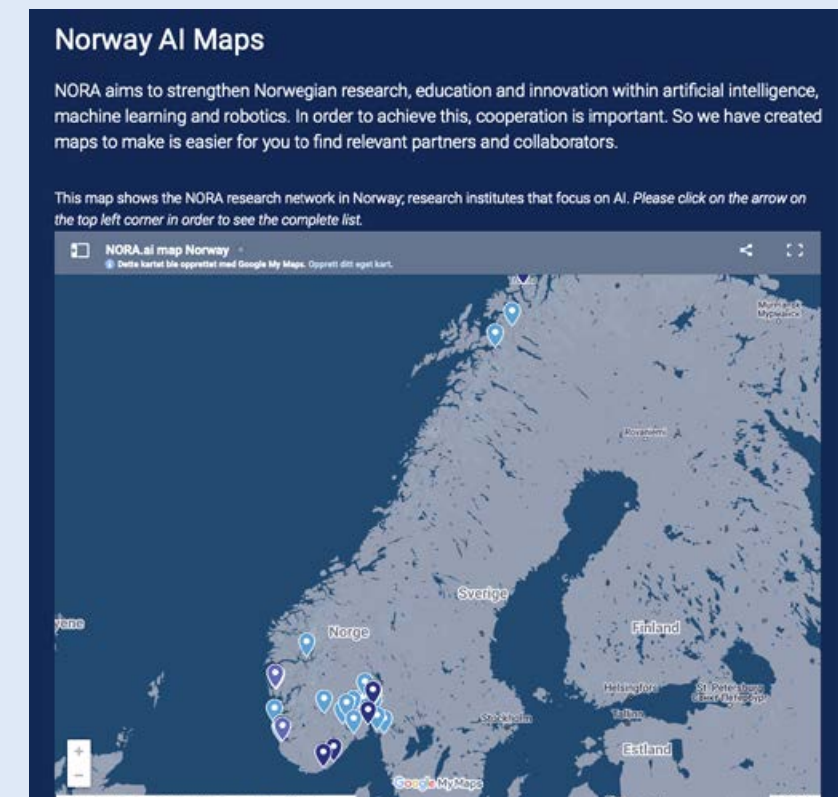
In January 2021, NORA, Smart Innovation Norway, and the Norwegian Open AI Lab (NAIL) joined forces to map the Norwegian AI Startup Landscape. The collaboration was formed as a precursor to an invitation to join the European AI Startup Landscape, which features more than 500 AI startups from France, Germany, and Sweden.

As the AI startup community in Norway continues to grow both in number but

also in maturity, NORA recognised the need to map the startup landscape in Norway. By showcasing and promoting the startups on the European AI Startup Landscape, we aim to introduce the great innovators in Norway to each other, as well as colleagues in Europe, early investors, and potential customers.

The Norwegian AI Startup Landscape will build on the mapping efforts of the AI Directory and will evaluate and quality check existing AI startups and give them a visible platform to showcase their technology and innovations. By creating such an open landscape, we provide the opportunity to corporations, SMEs, public actors, investors, and stakeholders, among others, to access AI partners they can trust.

AI Maps webpage



NORA AI directory





# 11

## Communication and Dissemination

NORA strongly believes in the power of collaboration and interaction. To achieve this, the right type of communication, meeting venues and arenas have to be created. In order to provide a platform for NORA's researchers and entrepreneurs, NORA frequently organises conferences, seminars, webinars and workshops.

NORA's webpage, [www.nora.ai](http://www.nora.ai), is NORA's primary communication and information channel. In addition, NORA has a presence on social media, such as Facebook, LinkedIn and Twitter.

### 11.1 Annual Conference

NORA was kicked off by a NORA conference in April 2019. The 2020 conference was cancelled due to Covid, but in 2021 we were able to organise an in-person conference in Bergen.

On the 17th and 18th of November 2021, NORA held its first Annual Conference in Bergen. More than 100 researchers

from across Norway gathered at one of Norway's most important meeting places for the AI-community.

The conference aims to gather the Norwegian AI research community and create a platform where invited speakers and participants can share research, ideas, theories, models, and new perspectives, and interact with peers from the field. Knowledge sharing and interaction were and will be at the centre of the conference, which hopefully will foster a strong community of researchers and practitioners, while bridging the gap between young researchers, startups, and industry.

The conference was open to all researchers from NORA universities, research institutes and university colleges. The conference was also open to representatives from non-partner organisations, industry, and the public sector.

NORA will continue to organise an annual conference, preferably in the spring.

## NORAs annual conference 2021 in Bergen



# 45 648 USERS 2019-2021

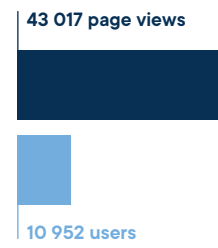
NORA's webpage has had 45 648 individual users and 167 566 page views in total from 1st April 2019 until the end of 2021

\*NORA was operational from 1st April 2019

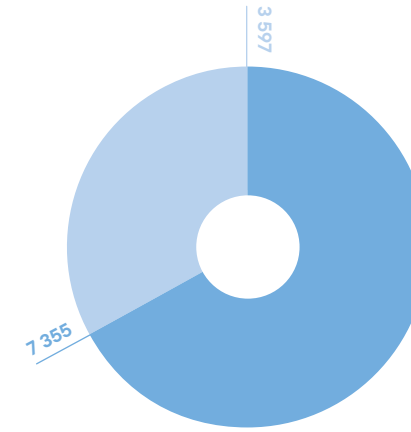
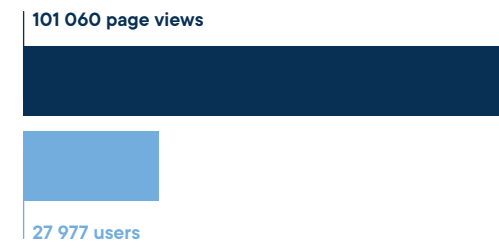
2019\*



2020

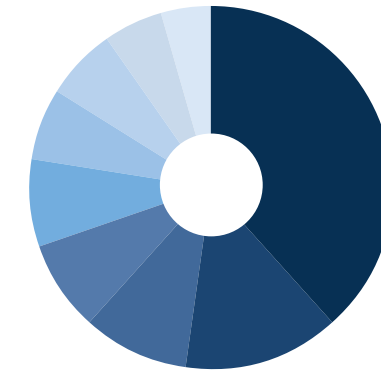


2021



**67% NORWAY**  
**33% WORLD**

67% of NORA's users (7 355 individuals) in 2020 were located in Norway

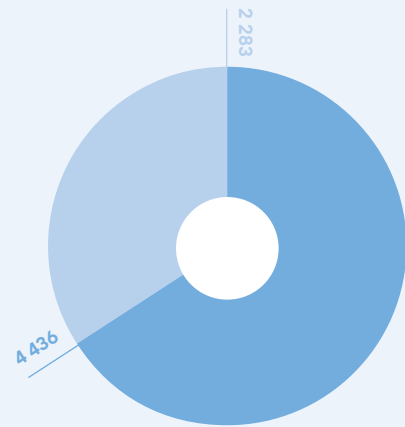


Top NORA.ai users abroad in 2020

- United States: 875 users
- India: 320 users
- China: 215 users
- Germany: 183 users
- United Kingdom: 177 users
- Sweden: 148 users
- France: 144 users
- Netherlands: 119 users
- Italy: 100 users

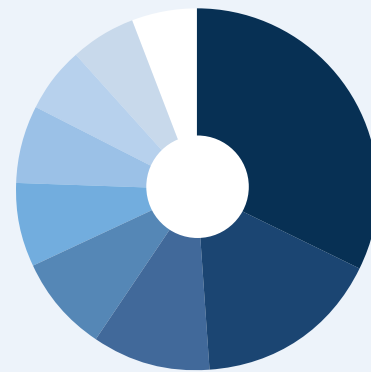
## NORA.ai top ten countries by users

## NORA.ai top ten countries by users



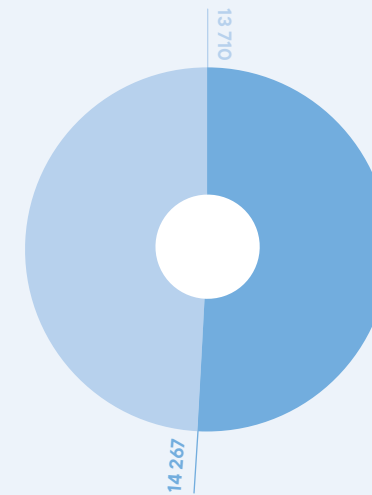
**66% NORWAY**  
**34% WORLD**

66% of NORA's users (4 436 individuals) in 2019 were located in Norway



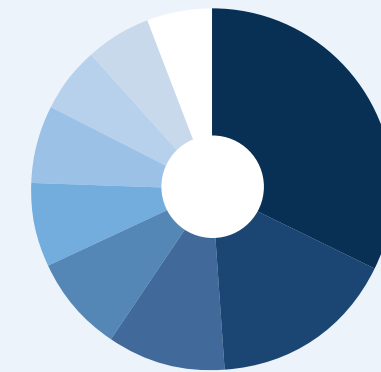
Top NORA.ai users abroad in 2019

- United States: 476 users
- Not set: 247 users
- Sweden: 157 users
- India: 126 users
- Canada: 112 users
- China: 99 users
- Germany: 90 users
- Japan: 86 users
- United Kingdom: 82 users



**51% NORWAY**  
**49% WORLD**

51% of NORA's users (14 267 individuals) in 2021 were located in Norway



Top NORA.ai users abroad in 2021

- United States: 3 504 users
- United Kingdom: 1 060 users
- Germany: 851 users
- India: 770 users
- China: 592 users
- Sweden: 588 users
- Finland: 574 users
- Netherlands: 574 users
- France: 501 users

NORA.ai users  
by country

**140 COUNTRIES**  
**6 CONTINENTS**



### 11.2 Nordic AI Meet

On the 1st and 2nd of November 2021, NORA, in collaboration with CLAIRE and Research Council of Norway, hosted more than 100 young researchers at the Nordic Young Researchers Symposium (Nordic AI Meet). The main purpose of the conference was to provide a platform for young AI researchers to exchange ideas, build collaborations and form a Nordic approach for building AI solutions for the societal good.

Although AI has received a lot of attention by society, the education and research in AI and AI-related areas need to be strengthened. Increasing knowledge, building networks and exchanging experiences will be crucial in determining how to approach the development and use of AI. The Nordic AI Young Researcher Symposium was conceived with these challenges in mind. The conference offered keynote speeches from prominent professors and researchers, oral presentations, industry presentations, academic posters, and panel debate, combined with the opportunity to interact and socialise with other researchers.

NORA believes in providing a platform for young researchers to present, discuss and promote their research. Therefore, a set of short oral presentations from selected PhD students/Postdocs were an integral part of the programme. Each PhD/young researcher received 15 minutes to present their PhD project/current research. View the list of invited speakers and project titles here.

Several young researchers also participated with posters illustrating their ideas. The posters stimulated discussion and exchange of ideas during the breaks. The winning poster was developed by Cathrine Bui. Alise Midtjord won the award for best oral presentation of her research.

The conference confirmed the need for more interaction and student exchange between the Nordic countries. One of the take-aways from the conference was that Nordic AI cannot be world leaders in all fields, but the Nordic countries can be leaders in some subfields. For Nordic AI to become world leaders, they need to take on the great challenges that align with Nordic values and where they have competitive advantages.



Professor Serge Belongie with Klas Pettersen



Left: Professor Samuel Kaski during his keynote at Nordic AI Meet



Professor Robert Jenssen, Professor Serge Belongie, Professor Samuel Kaski and Klas Pettersen



Above: Participants at NORA's first PhD symposium in February 2020.



#### 11.4 NORA Podcast

NORA has established its own podcast – NORA forklarer kunstig intelligens (NORA explains Artificial Intelligence). This is a podcast for everyone interested in AI and wanting an in-depth analysis of different topics.

The podcast is hosted by Klas Pettersen, CEO of NORA and Morten Goodwin, professor at UiA and deputy head of the Center for Artificial Intelligence Research (CAIR). In every episode, they have a guest visitor who helps us dig deeper into their specialised field. So far, the podcast has released six episodes.

#### 11.5 Newsletter

NORA frequently communicates with its partners, members, and other interested parties through a monthly newsletter. The newsletter has almost 1,500 subscribers and has become a useful tool to communicate activities and achievements at NORA, its partners, and the Norwegian AI community as a whole.

#### 11.6 NORA Seminars and Webinar Series

NORA hold regular Friday seminars and webinars. Due to the COVID-outbreak, mostly webinars have been held in the last two years. NORA has held a total of 51 webinars in the last two years, with an average of 46 attendees. These include both webinars with research topics and NORA.startup webinars.

#### 11.3 PhD Symposium

In the historic surroundings of Tøyen Hovedgård, NORA held its first PhD Symposium on the 25th and 26th of February 2020. The PhD Symposium was a two-day lunch to lunch event about AI-related topics for PhD students, followed by an informal dinner and a social event.

The event also marked the start of the NORA Research School.

During the two-day event, several lectures in the field of AI were given. The programme also allowed for mingling and networking, including screening of the new Norwegian movie iHuman.

# Number of NORA Newsletter Subscribers

# 289

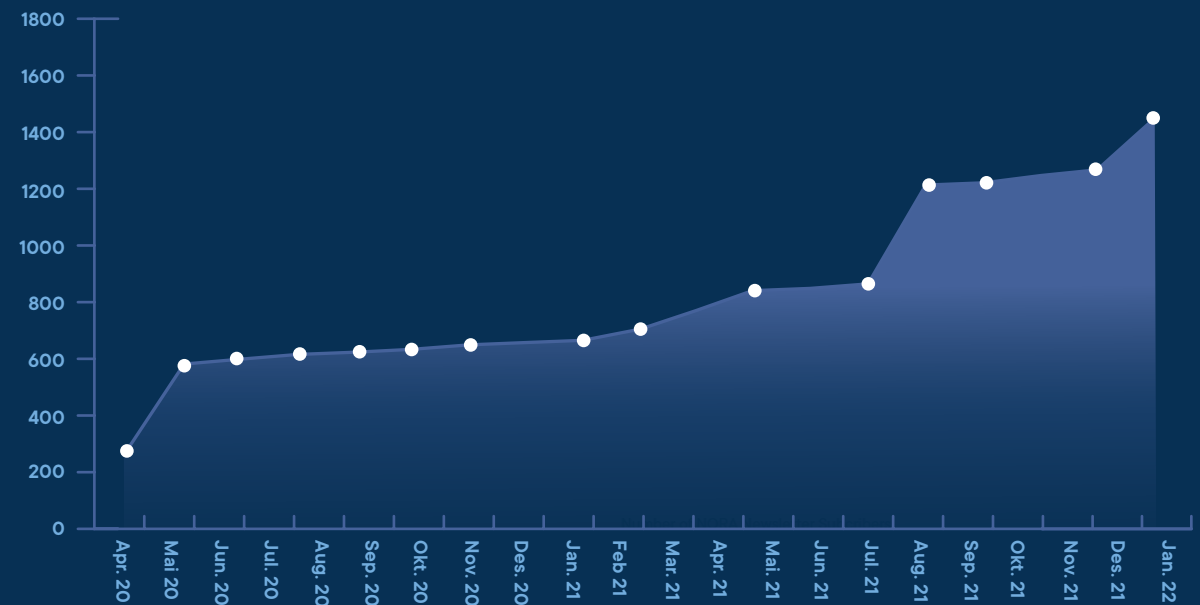
289 people signed up to receive NORAs newsletter by the end of april 2020

# 1700

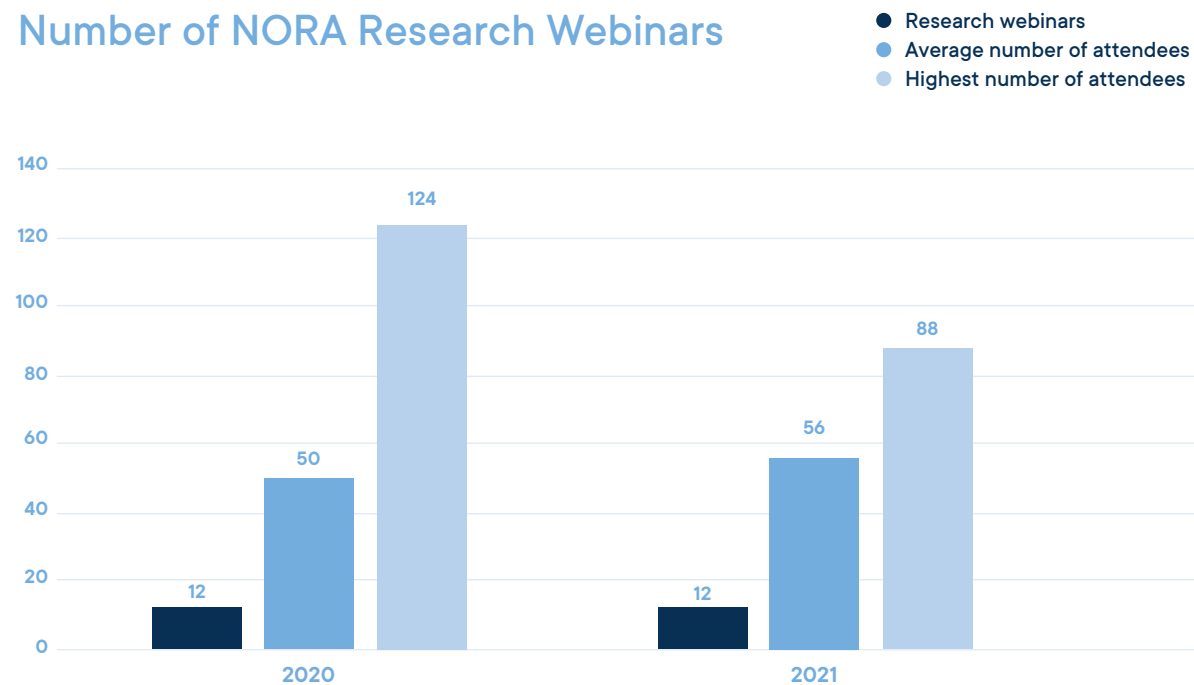
By january 2022 1700 people are currently receiving NORAs newsletter

# 77

An average of 77 people per month signed up, from april 2020–january 2022



## Number of NORA Research Webinars



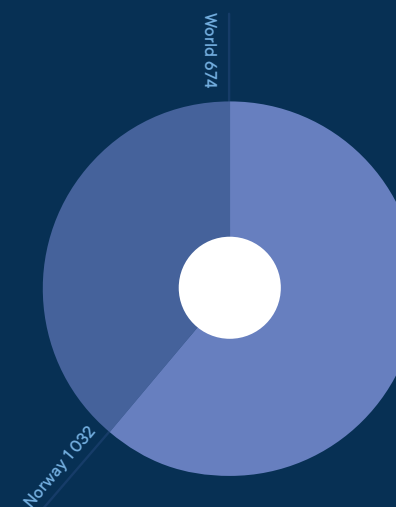
## Number of participants in NORA's webinars by country

**50<sup>+</sup>**

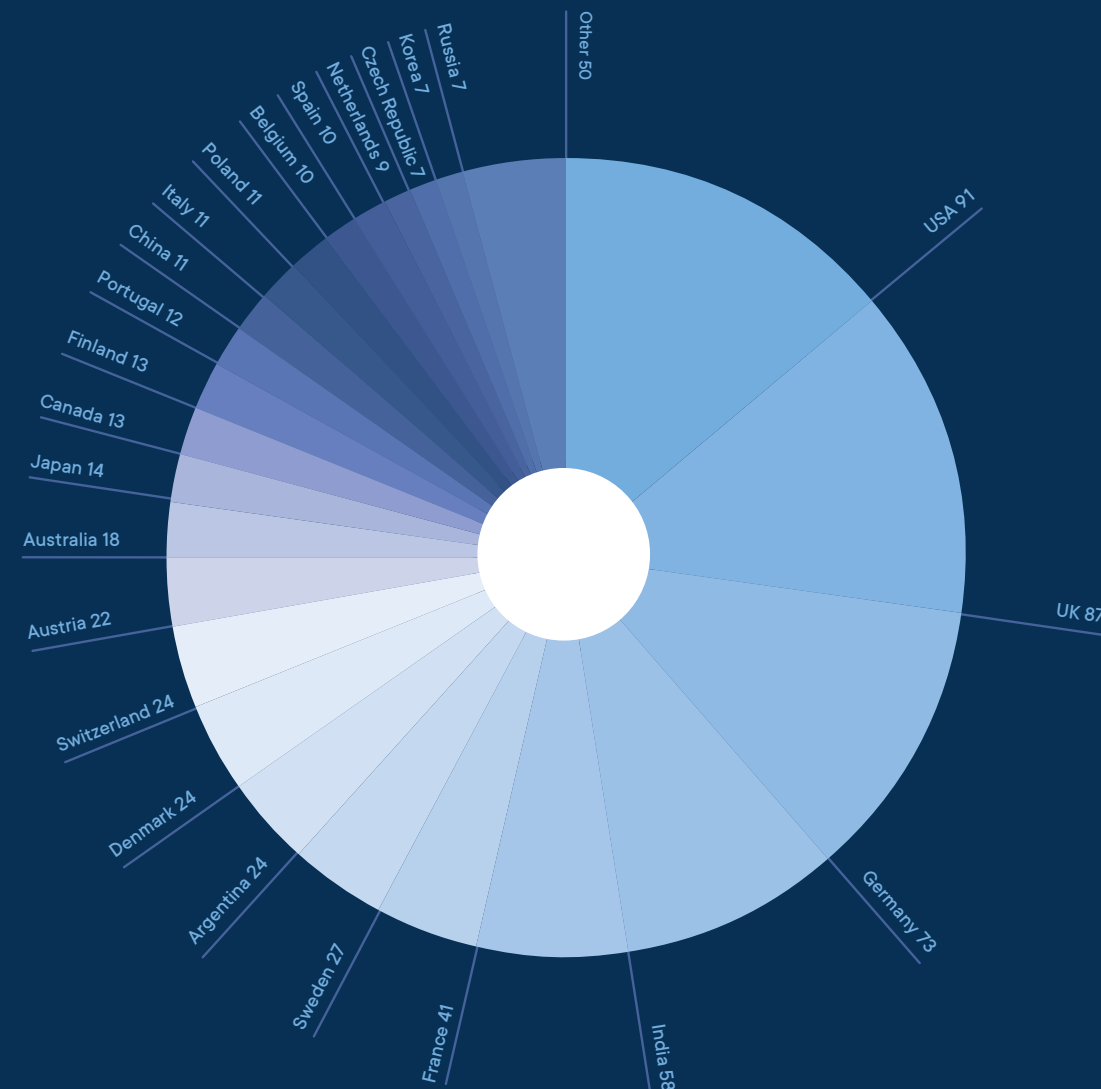
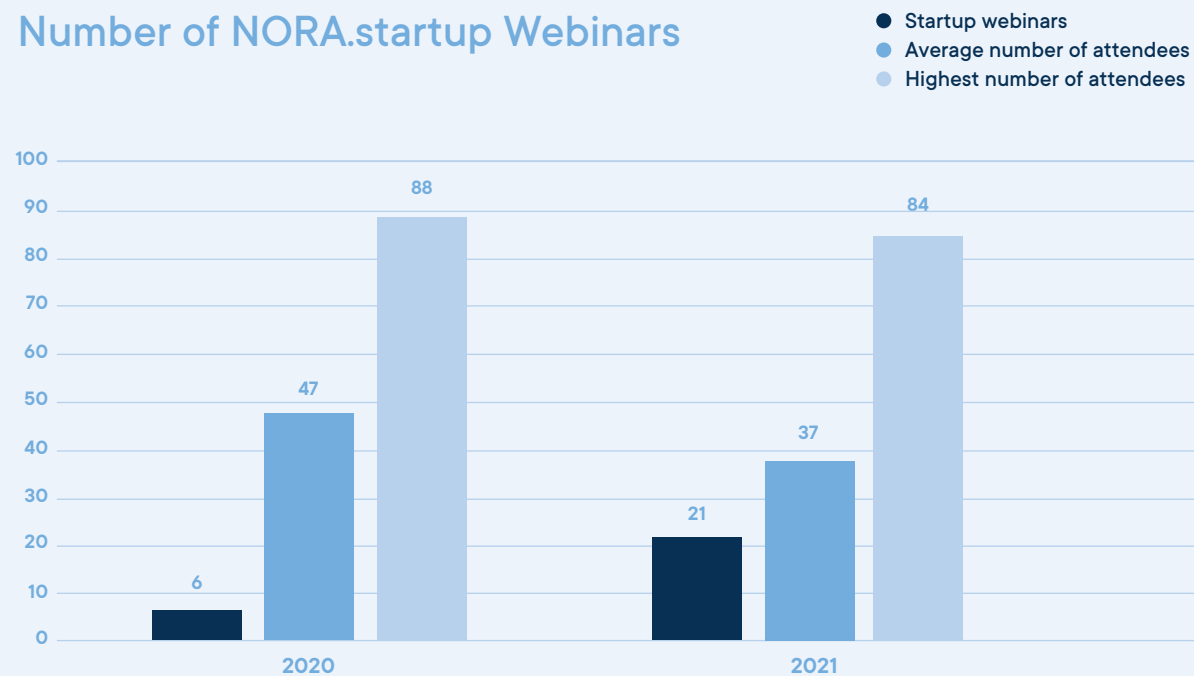
Users from more than 50 countries participated worldwide

**1706**

Users participated in NORAs webinars. 1032 (60%) were from Norway.



## Number of NORA.startup Webinars



11.7

# NORA Alphafold and Rosettafold Workshop

The Alphafold Rosettafold workshop resulted in as much as 15% (~15K visits) of the traffic to NORA's website in 2021!

**600+**  
researchers

**40+**  
countries

As Norway's leading and largest AI-network, NORA took it upon itself to organise a two-day workshop about the recent significant scientific discoveries related to protein folding on 30 August and 1 September 2021. The workshop saw participation from more than 600 researchers from all over the world covering more than 40 countries.

The workshop not only made NORA visible throughout the global community but also kick-started the process of providing large scale AI methods as an online service to Norwegian researchers. With the excellent support of the USIT staff (University of Oslo), NORA was able to organise the installation of AlphaFold

and RosettaFold on University of Oslo servers and on national infrastructure. These algorithms are now available to all the Norwegian researchers. During the workshop, NORA was able to provide researchers with the opportunity to use these advance methods. With the trend of AI methods in the field becoming large scale, NORA looks to play an important role in organising the installation and access to computational infrastructure as a service to Norwegian researchers on demand and at short notice.

This workshop provided an excellent opportunity for the NORA team along with stakeholders to pilot Algorithms as a service approach. We are happy to re-

port that even after the workshop ended, there is still demand from the researchers to access these installations. This proves the long-term benefit of these actions.

The workshop attracted world leading experts in the field of AI, Protein Folding and related topics, who presented their tools and methods, among other things. Among the keynote speakers were:

- Minkyung Baek from the University of Washington, who was the author of the first RoseTTAFold-article.
- Sameer Velanker, Team Leader for the Protein Data Bank in Europe.
- Randy John Read, Cambridge University

- Jim Brase, Co-lead of the ATOM consortium and Deputy Associate Director for Computing, Lawrence Livermore National Laboratory.

The workshop was held for participants who wanted to get hands-on experience with the tools and methods. Both algorithms were pre-installed on Norwegian supercomputers, and workshop participants were tutored on how to run AlphaFold v2.0 and RoseTTAFold. The goal of the workshop was not only to boost Norwegian and international research in protein folding and function by advanced AI methods, but also to inspire development of AI-powered biotech in Norway.

Map above: Countries represented at Alphafold and Rosettafold workshop



Klas Pettersen speaking at Alphafold and Rosettafold workshop



In 2022, we look forward to further strengthening AI in the life sciences network by linking together strong existing research environments and clusters.

#### 11.8 AI in Life Sciences

COVID-19 has put the field of life sciences under the spotlight, and we can agree that COVID-19 presented an unanticipated challenge to humanity to collaborate and speed up finding the vaccine and therapies to slowdown the exponential growth of the virus. The field of life science has seen an increasing use of AI methods in the discovery of drugs, and we have already seen good results over the last two years.

The AlphaFold and RosettaFold methods are a promising line of work which first appeared in 2020-21; the field is moving rapidly and has generated a lot of interest in the life science community. Norway has a good ecosystem in life science research with ecosystems such as Digital Life Norway and other research groups working at the forefront. Requirements shared by the community through interacting at workshops are as follows:

- Short training programmes on the emerging computational methods
- Access to computational infrastructure

NORA has also interacted with other large players in the field like AI Sweden and AstraZeneca, and it seems possible to join forces at the Nordic level to create a network to collaborate on shaping

the future of AI in life science. NORA is committed to bringing together various pieces of the puzzle and creating value for the community by regularly holding short training programmes on emerging methods and streamlining the access to computational infrastructure as much as possible. In 2022, we look forward to further strengthening AI in the life sciences network by linking together strong existing research environments and clusters.

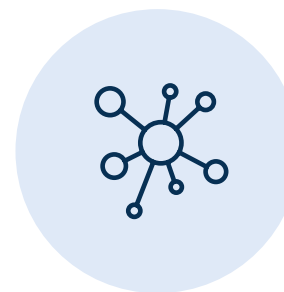
#### 11.9 Arendalsuka

With an estimated 75,000 visitors, Arendalsuka is by far Norway's largest political meeting venue. In collaboration with University of Agder (UiA), NORA was able to put AI on the agenda at Arendalsuka in 2019 with the seminar AI in the Health Sector: Key to a Longer Life, but...? The former Minister of Digitalisation Nikolai Astrup was one of the keynote speakers.

As the name indicates, the topic of the seminar was AI in the health sector. The development and use of AI in the health sector will lead to better diagnosis of diseases, better treatment of patients and a generally higher quality of life in the population. However, NORA wanted to discuss whether Norway will be able to take leadership in this sector from a political, legal, and technological perspective.



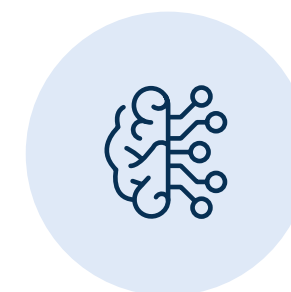
NORA Panel debate at Arendalsuka 2019



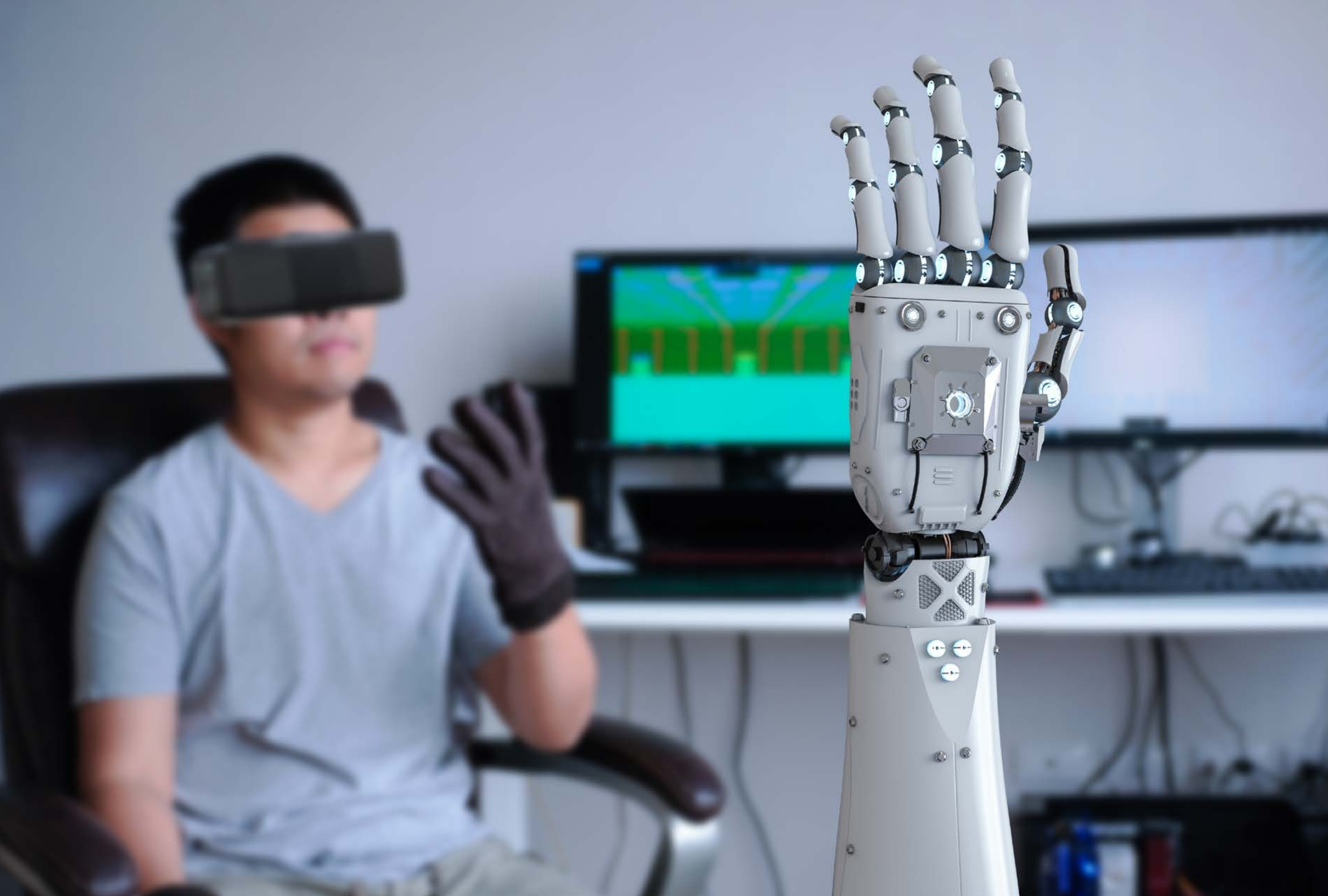
NORA and UiA put AI on the agenda at Arendalsuka



Arendalsuka is Norway's largest political meeting



NORA held a seminar about AI in the health sector



# 2018-2022



Norwegian Artificial Intelligence  
Research Consortium, NORA

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