Skisser med relevans innenfor

IKT

Tabell: Oversikt over skisser med relevans for området **IKT**

Prosjekt-nummer	Prosjekttittel	Søkerinstitusjon	Prosjektleder	Estimert søkt beløp fra NFR
316398	Experimental Infrastructure for Exploration of Exascale Computing, Phase II	SIMULA AS (UiB, UiT, OsloMET, NTNU, UNINETT Sigma2, Graphore, Dolphin Interconnect Solutions, Numascale)	Are Magnus Bruaset	94 500 000
316416	fourMs Lab Upgrade	UiO	Alexander Refsum Jensenius	4 998 930
316439	Wind Power Operation and Control Laboratory	SINTEF ENERGI AS (NTNU)	Karl Merz	50 000 000
316451	The USN I-Merse Extended Reality Laboratory	USN	Rigmor C. Baraas	56 250 000
316471	Autonomous Dynamic Integrated Ocean Observing System (ADIOOS)	NORCE	Rune Storvold	123 000 000
316479	Electric Future Accelerator Initiative? Laboratory	SINTEF ENERGI AS (NTNU)	Christian André Andresen	72 000 000
316488	Research infrastructure for preventative care	USN (Norway Health Tech, Nova Discovery, Vestre Viken Hospital Trust)	Hilde Eide	110 000 000
316497	Norwegian diachronic corpus 200-1814 (Norchron)	UiO (UiO, NTNU, HVL, Arkivverket, Najonalarkivet)	Janne M. Bondi Johannessen	35 473 000
316498	Infrastructure for the Digitalisation of Process Industry	SINTEF AS (USN, NORCE, Nofima, UiA)	Frode Brakstad	147 260 000
316508	NoDi - Norway Distributed: real-time audio-visual immersive communication research infrastructure	UiO (NTNU, UiT, UiA, Uninett)	Stefano Fasciani	28 857 000
316530	EBRAINS Norway: Norwegian Node of the European Research Infrastructure for Brain Research and Brain-Inspired Sciences	UiO (NMBU)	Jan G. Bjaalie	77 500 000
316545	ECCSEL Virtual laboratory	SINTEF ENERGI AS (SINTEF Industri, IFE, NORSAR, ECCSEL ERIC)	Francesco Finotti	120 000 000
316563	National bio-mechatronics infrastructure for ASSISTive and AugmeNting Technology in personalised healthcare	UiA (OsloMet, UiO, UiT, HVL, USN, UiS, I4Helse, NORA, NAIS, NOBIM, Sørlandet Hospital, Sunnaas Rehabilitation Hospital, SUH, NSCC, Norway Health Tech)	Filippo Sanfilippo	102 000 000
316564	The Norwegian Centre for Transmission Electron Microscopy II	SINTEF AS (NTNU, SINTEF, UiO)	Randi Holmestad	141 000 000
316565	Infrastructure for mobility and logistics research	TØI	Marianne Stølan Rostoft	50 000 000

316566	SEFIRE: Research infrastructure for knowledge-building on societal health, security and sustainability	**NIVA** (NIVA, VEAS, NTNU, FHI, NILU, NMBU)	Malcolm Reid	75 940 000
316583	Biobank Norway 4 - a National Biobank Research Infrastructure	**NTNU** (UiT, UiB, UiO, NTNU, Helse Nord, Helse Vest, Helse Sør-Øst, Helse Midt, Kreftregisteret, FHI, OUS)	Kristian Hveem	95 000 000
316588	Research infrastructure for urban water transportation and management	**NMBU** (NVE, FHI, NIVA, NGI, NIBIO)	Harsha Ratnaweera	79 000 000
316590	Fault and fracture characterisation and testing laboratory	**NGI** (NORCE, NORSAR, UiO)	Luke Griffiths	39 970 000
316598	Smart Buildings Energy and Indoor Air Quality e-infrastructure	**STIFTELSEN SINTEF** (SINTEF Digital, SINTEF Energi, NTNU Ingeniørvitenskap og NTNU Arkitektur og Design)	Karen Byskov Lindberg	32 700 000
316602	Norwegian Manufacturing Research Laboratory Phase 2	**NTNU** (SINTEF)	Kristian Martinsen	108 000 000
316605	National Infrastructure for AI-Powered Autonomous Cyber-Physical Systems	**UiA** (Gullknap aerial center, MIL, Omron, ABB, NORCE, NTNU, UiT, SIMULAMet, Hydo Energy, RedRock)	Linga Reddy Cenkeramaddi	174 000 000
316613	Robust and fault-tolerant network infrastructure with 5G access (ROBUST5G)	**SIMULA AS** (NTNU, UNINETT, Norwegian Metrology Service)	Haakon Bryhni	17 188 905
316614	Norwegian National Network Technology Research Laboratory (N3TLAB)	**UNINETT AS** (SimulaMet, NTNU, Telenor, UiO)	Otto J Wittner	27 672 000

Prosjektnummer: 316398
Tittel: Experimental Infrastructure for Exploration of Exascale Computing, Phase II
Søkerinstitusjon (partnere): SIMULA AS (UiB, UiT, OsloMET, NTNU, UNINETT Sigma2, Graphore, Dolphin Interconnect Solutions, Numascale)
Prosjektleder: Are Magnus Bruaset

Kort sammendrag:
The Experimental Infrastructure for Exploration of Exascale Computing (eX3, 2017 – 2022) [1] is an existing national research infrastructure for experimental research on High Performance Computing (HPC) technologies. These technologies are expected to be vital for emerging supercomputers, cloud services, and data centers, thus placing eX3-based research at the heart of the omnipresent digitalisation. The eX3 infrastructure is hosted by Simula Research Laboratory with NTNU, UiB, UiT, OsloMet, Uninett Sigma2, Dolphin Interconnect Solutions, Graphcore, and Numascale as partners. In the recently updated Norwegian Roadmap for Research Infrastructure [2], eX3 is listed as a key national infrastructure in ICT. After its first year in regular use, eX3 is already a vital asset in a large number of research projects [3], and has proven to be very attractive and unique also in an international setting. The international value of the infrastructure has recently been highlighted by being a core testbed in two EuroHPC proposals receiving outstanding scores (14/15 and 15/15) that are currently shortlisted for funding, and through an invitation to become a node in the European research infrastructure SLICES that is currently being proposed to ESFRI.

The current proposal targets the next generation of this experimental infrastructure, referred to as eX3-II. During the first phase of the eX3 infrastructure, the consortium has been allowed access to the internal technology roadmaps of several HPC vendors, which has resulted in giving Norwegian HPC researchers very early access to emerging technologies. In the eX3-II project, we will push this work even further and continue to build and run a national infrastructure that offers an experimental approach to exploring extremely heterogeneous (HPC) solutions. This will include handson access to next-generation HPC accelerators (including FPGAs and application-optimized processing units like ML/Deep-learning chips); emulators of quantum computers; emerging memory, storage, I/O and interconnection network technologies; and potentially other types of yet-to-be-announced disruptive HPC-relevant hardware.

The ambition of eX3-II is to facilitate continued world-leading Norwegian research and innovation towards the coming age of extreme heterogeneity in HPC. By means of the future-embracing experimental hardware testbed of eX3-II, Norwegian scientists and innovators, and their collaborators, will conduct research on utilization of massively parallel processors and heterogeneous systems of accelerators (e.g., explore FPGA optimization, research novel programming models, and develop next-generation software tools); research smarter networking (e.g., study in-network computing, dynamic network reconfiguration for resilience and congestion management, and alternative topologies and routing configurations in lossless networks); demonstrate capability and usability of HPC research results; collaborate with world-leading Norwegian industrial partners in their endeavor towards nextgeneration HPC hardware and software; and more. All consortium partners in the existing eX3 project have expressed interest in joining the next phase.

Prosjektnummer: 316416
Tittel: fourMs Lab Upgrade
Søkerinstitusjon (partnere): UiO
Prosjektleder: Alexander Refsum Jensenius

Kort sammendrag:
The fourMs lab (Music, Mind, Motion, Machines) is a world-class infrastructure for studies of human movement and physiology in an immersive multimedia environment. It is primarily used for studies of music-related body movement, music performance, and music psychology. In recent years it has also increasingly been used for linguistics, dance, sports, and well-being. The lab is central to the activities of RITMO Centre for Interdisciplinary Studies in Rhythm, Time and Motion, which has been a Norwegian Centre of Excellence since 2017.

Funding is sought for upgrading the main motion capture system of the lab. The original motion capture system from Qualisys was funded through the Research Council's infrastructure program in 2008, and installed in 2009. The more than 10-year old equipment is in dire need of replacement. Newer motion capture systems have much better spatial and temporal resolution than the current setup, and therefore allow for recording with higher accuracy and precision. We have recently also experienced a number of failures and errors related to the age of the electronics in the old system. This has caused down-time in the lab, when different parts of the system have had to be sent for repair. Clearly there is a need to do a major upgrade of the main hardware.

Over the years we have seen a growing interest in combining motion capture with other types of measurements, including physiological sensing and eye tracking. We therefore also apply for expanding some of the add-on systems in the lab, and prepare for better synchronization solutions with such systems. All in all, these upgrades and new investments are necessary for the fourMs Lab to continue to be a state-of-the-art research facility for the years to come. If funded, it will further strengthen University of Oslo as a world-leading institution for empirical music research, and open for even more interdisciplinary and international collaboration.

Prosjektnummer: 316439
Tittel: Wind Power Operation and Control Laboratory
Søkerinstitusjon (partnere): SINTEF ENERGI AS (NTNU)
Prosjektleder: Karl Merz

Kort sammendrag:
The Wind Power Operation and Control Laboratory (Wind Power Lab) is a large wind power plant, recreated at laboratory scale. Figure 1 shows a sketch of the idea. The facility fills a critical R&D gap between wind tunnels, or simulations, and full (multi-MW) scale wind plants. The key motivations are:

- there are a sufficient number of turbines to create the atmospheric boundary layer effect, over and beyond a simple superposition of the individual turbine wakes;
- the laboratory can be used to test and demonstrate advanced (low-TRL) ideas in wind plant design, operation, and control, which could never be implemented in a commercial plant due to insurance, warranty, and financial reasons;

- the facility will be accessible to students, researchers, and industry, and will be a sought-after infrastructure for national and EU projects on wind energy and renewables-dominated electrical grids.

The Wind Power Lab is unique in the world; there is no existing site of this sort, with a sufficient number of turbines to reproduce real large-scale wind plant layouts.

Prosjektnummer: 316451
Tittel: The USN I-Merse Extended Reality Laboratory
Søkerinstitusjon (partnere): USN
Prosjektleder: Rigmor C. Baraas

Kort sammendrag:

The I-MERSE Extended Reality (XR) Lab aims to be a leading national and international research infrastructure providing virtual reality, mixed reality, and augmented reality platform for research and innovation. It will be an enabling technology lab, in line with visions stated in the Long-term Plan for Research and Higher Education of technologies that may be applied broadly across various sectors and industries, which in the process address major societal challenges and strengthen Norwegian industries. Currently, Norway has limited capacity for XR as an enabling technology. Existing labs are limited to virtual reality capabilities with some mixed reality equipment. The most common equipment are headgears with limited or no simulators and other XR facilities and environments. This is a crucial weakness since, according to the Norwegian Roadmap for Research Infrastructure, Norway is in an "international technology race" and that this race cannot be won without a robust national infrastructure to support the necessary enabling technology, which, in this case, is XR technology.

The I-MERSE XR Lab intends to be this national infrastructure by being the first high-capacity XR Lab in Norway that can address a wide range of complex XR applications, allowing it to be a test bed for external academic and industry partners in private and public sectors. The lab will contain what existing labs lack, i.e., high capacity facilities for XR simulation and environments. With versatility of facilities, the I-MERSE XR Lab is able to support research, development and innovation addressing physical, physiological, psychological and sociological health-related challenges, transforming learning experience as well as learning outcomes in training and re-training of professionals, advancing the development of human-centred design solutions in business, government, education and society at large.

The interdisciplinary research centre, USN I-Merse, will be the core team responsible for the I-MERSE XR Lab, with expertise in XR research to develop a scientific community of outstanding quality within the fields of vision science, maritime safety and operations, pedagogy and education, marketing and ethics.

Prosjektnummer: 316471
Tittel: Autonomous Dynamic Integrated Ocean Observing System (ADIOOS)
Søkerinstitusjon (partnere): NORCE
Prosjektleder: Rune Storvold

Kort sammendrag:
ADIOOS is a new infrastructure for development of future in-situ observing systems using a breakthrough in adaptivity and efficiency by utilizing the latest technological breakthroughs in autonomous platforms, communication technology and computing power. A prototype observing system will be set up, designed to serve as a research platform to explore and develop future observing systems based on adaptable infrastructure that can be shaped to numerous applications.

ADIOOS will focus on three specific forecasting applications essential for the safe and sustainable exploitation the ocean space environment, these applications are meteorology, emergency response (algae blooms, oil spills) and marine ecosystems (biomass). The infrastructure will contribute to development of new technologies and modeling systems using the latest development in computing power, communication systems, autonomy and artificial intelligence. Even though this is a proposal for a new infrastructure it will also serve as an development platform to established infrastructures where new technologies can be developed and tested before being adopted into regular use in observing systems vital to creating sustainable long term time series such as SIOS (Svalbard Integrated Earth Observation System) and GEOSS (Global Earth Observation System of Systems).

The uniquely new feature of this infrastructure is that it will be autonomous, which means operational models will determine where and when to sample and which resources should be allocated based on analysis of uncertainty and sensitivity to input data in the forecasting, thus reducing uncertainty by doing the sampling where it has the optimal cost benefit effect, thus being an self-optimizing observing system, maximizing benefit while minimizing cost.

The infrastructure will serve scientists within geosciences, oceanography, meteorology, marine ecosystems, engineering, cybernetics, information and communication technology, physics and technology. The relevance to this wide range of user groups is the inherent multidisciplinary nature of observing systems where science and engineering development is tightly coupled.

Prosjektnummer: 316479
Tittel: Electric Future Accelerator Initiative Laboratory
Søkerinstitusjon (partnere): SINTEF ENERGI AS (NTNU)
Prosjektleder: Christian André Andresen

Kort sammendrag:
The vision of a zero-emission society is materializing in national and international policies and initiatives such as the EU Green Deal1. Strategy documents such as Energi212 and Digital213 outline the power system as a key component for the Norwegian transition towards such a society. A robust power system is critical to progress in the electrification of Norway. The future power system will also need to evolve according to present development trends often summarized through the 4 D's (Decarbonization, Digitalization, Decentralization and Democratization). In order to meet the ambitious goal of a zero-emission society, it is essential to research and develop technologies for

operating the future energy infrastructure considering faster dynamics, tighter market interaction, a larger degree of atomization, higher variability in both production and consumption patterns and a fundamentally increase in the level of digitalization in every part of the power system. ElectriFAI LAB will provide a research infrastructure to research, develop, test and demonstrate solutions for the future operation of the power system. The infrastructure will encompass the present needs for educational purposes (e.g. study programs in Digital Electrical Energy) and for research and development covering the TRL levels from prototyping to full-scale testing.

The ElectriFAI LAB is a collaboration between NTNU and SINTEF, supported by major industry actors. The new infrastructure will partly build on existing laboratories as the National Smartgrid Laboratory4 and the ElPowerlab5, and partly develop new research facilities. The infrastructure project is organized in 5 infrastructure groups spanning from grid emulations to market simulators to Human-Machine-Interaction facilities all interacting to make one integrated laboratory environment. A national infrastructure covering these focus groups is identified to be needed to enable the development that makes the operation of the future power system robust and efficient.

Prosjektnummer: 316488
Tittel: Research infrastructure for preventative care
Søkerinstitusjon (partnere): USN (Norway Health Tech, Nova Discovery, Vestre Viken Hospital Trust)
Prosjektleder: Hilde Eide

Kort sammendrag:
Preventable non-infectious chronic diseases cost the EU countries more than €700 billion each year in terms of management. This burden can be reduced if the value chain is re-designed to give more attention to prevention and prediction with corresponding economic benefit and improvement of citizens health.

The development of Health Tech and drugs has a new paradigm: human in silico trials. We are proposing to build a new research infrastructure for preventative care (IT-Prevent) by applying in silico modelling and simulation (M&S) to prevention, prediction and self-management. USN will build on its current assets to provide the foundations for the ITPrevent Platform, enabling early collaboration between existing research infrastructures, municipalities, health care providers and industry. Specifically, IT-Prevent will start by requesting proof of need for their idea from candidate teams combining industry with health & social care providers. Proposals will be assessed against criteria for prevention and predictive products (apps and devices) and related services. If proof of need is demonstrated then IT-Prevent will support testing proof of concept, technology validation and technology validated in virtual environments using in silico testing.

Prosjektnummer: 316497
Tittel: Norwegian diachronic corpus 200-1814 (Norchron)
Søkerinstitusjon (partnere): UiO (UiO, NTNU, HVL, Arkivverket, Najonalarkivet)
Prosjektleder: Janne M. Bondi Johannessen

Kort sammendrag:
The overarching goal is to build Norchron, a new, national, comprehensive database of texts across historic stages of the Norwegian language (200–1814), in terms of; 1) upgrading existing software, tools and services for its contents; 2) implementing specialised solutions for annotating of documents; and 3) providing transcriptions and annotations of text alongside images that will constitute the content of the searchable database. Such a corps would be unique resource for researchers studying language change, would also be a significant contribution to preserving an important aspect of the Norwegian cultural heritage.

The text material from the various historical periods is extremely varied both with respect to number of words and proportion of material previous annotated. The whole runic material contains 6000 words, with no previous annotation, Old Norwegian non-legal manuscripts contains as much as 700 000 words, of which 600 000 have already been annotated with some grammatical information. There are 10 000 diplomas in Old and Middle Norwegian, of which only a small part, 35 000 words out of 2 mill. words, have already been annotated. The texts from the newest period (Early Modern Norwegian) consist of 120 000 words, and have not been transcribed or annotated. The Norchron corpus will consist of 1.6 million words when ready.

The main tasks across all text types and historical stages are:

1. new transcriptions of some texts and improvements of others
2. development of a common XML structure for metadata
3. fill in metadata (source, geo location etc.) for each text
4. annotation of lexemes and word classes for all texts, and morphosyntactic features and syntactic structure of a selection of texts
5. translation at word-level (glossing) for all words
6. selection and identification of images of source material
7. programming of technical tools and the Glossa search system, including linking to other resources, such as maps and dictionaries.

It is anticipated that Norchron, with its open CC BY-SA 4.0 licence, will be widely used by researchers in linguistics, philology and history, but also by students and teachers in the education system and even members of the public.

Prosjektnummer: 316498
Tittel: Infrastructure for the Digitalisation of Process Industry
Søkerinstitusjon (partnere): SINTEF AS (USN, NORCE, Nofima, UiA)
Prosjektleder: Frode Brakstad

Kort sammendrag:
The INDIGO infrastructure will unite interdisciplinary competence in digitalisation and industrial processing, to build a national infrastructure that enables advances in land-based process digitalisation, including research in novel robust sensor technology and advanced analytics and modelling. This research will be supported by an advanced e-infrastructure that allows large-scale testing of technology and online process characterisation, including data visualisation, management and security.

Why digitalise? There is undoubtedly an international drive for digitalisation in the process industry, as seen by the number of white papers and reports 1,2,3,4,5. Digitalisation, which includes smart sensors, Artificial Intelligence (AI), Machine Learning (ML), Big Data, the Internet of Things (IoT) and Autonomous Systems, gives the potential for:

- Optimisation of recipe specification and raw materials feedstock into the processes and formulations
- Improvements to process control, resolution of quality issues, and equipment failure prediction
- Increased throughput, boosted yield and reduction of energy use x Improved exploitation of food raw materials and less food waste
- Process insight generation through online data and analytics

The vision of process digitalisation and the potential benefits is more or less adapted by the process industry. It is, however, a vision that is hampered by challenges, and requires a new way of researching and developing. INDIGO will address the challenges several industry sectors face when progressing to digitalised processes. One of the main critical pillars of digitalisation is the online data, often generated by sensors that link the physical data to the process analytics. Chemical and metallurgical processes expose sensors to harsh environments such as high acidity, high temperature, high magnetic fields, and scaling damage. The food industry struggles with natural variation of raw materials, seasonal variation, and hygiene constraints, and the challenge of obtaining reliable quality measures of highly heterogeneous biomaterials. The simple fact is that many of these challenges become evident over time and are not addressed by short term testing and demonstrations. The ability to conduct long-term testing in real online environments, with advanced analytics of large datasets, combined with theoretical models of the process, will open up a new form of research in digitalisation that will enable different sectors to benefit from each other.

Prosjektnummer: 316508
Tittel: NoDi - Norway Distributed: real-time audio-visual immersive communication research infrastructure
Søkerinstitusjon (partnere): UiO (NTNU, UiT, UiA, Uninett)
Prosjektleder: Stefano Fasciani

Kort sammendrag:
Norway Distributed (NoDi) is a real-time audio-visual immersive communication infrastructure as well as an innovative national cross-institution laboratory distributed across UiO, NTNU, UiA and UiT. The laboratory is composed of four physical rooms, one in each institution, in which the components of the infrastructure are permanently installed and managed. The rooms are equipped with state of the art system for audio, visual and data real-time communication. This is supported by a backbone network from Uninett providing a large bandwidth and low latency stable interconnection. When connected, these rooms provide a single virtual space enabling researchers to work together on a variety of tasks, including those that require tight synchronization, immersion, and a realistic feel of presence (telepresence). Each room represents a node in this constellation of connected spaces, and it also acts as a gateway to other locally connected rooms (within the same institute or campus) with less sophisticated yet effective telecommunication technology.

This infrastructure is rooted in the departments of music of four major Norwegian universities, and components of this infrastructure are aligned with the research needs in music related fields, such as tele matic music and music technologies. Real-time remote collaboration on music-related tasks is one of the most demanding applications for computer systems and networks. As a consequence, the intended infrastructure has a much larger scope and it has an unprecedented potential to benefit the research community and the society at large. Indeed the infrastructure allows to carry out long-term studies on synchronous online music collaboration (from performance to pedagogy), on communication and collaboration via immersive telepresence, on distance learning and education, as well as on the techniques and music technologies of the infrastructure itself. Finally, the infrastructure significantly broadens the spectrum of resources (human and physical) available for researchers in each institution through.

Prosjektnummer: 316530
Tittel: EBRAINS Norway: Norwegian Node of the European Research Infrastructure for Brain Research and Brain-Inspired Sciences
Søkerinstitusjon (partnere): UiO (NMBU)
Prosjektleder: Jan G. Bjaalie

Kort sammendrag:
The scope of this proposal is to establish a National node in EBRAINS: the European distributed Research Infrastructure (RI) for brain research and brain-inspired sciences. EBRAINS is currently a platform (https://ebrains.eu) developed by the EU Flagship Human Brain Project (HBP), with funding until 2023 and continued support for basic infrastructure through other ICT funding mechanisms. Seven institutions from across Europe, including the University of Oslo, have established EBRAINS AISBL (an International Non-Profit Organization based in Brussels, Belgium) to facilitate the effort of transforming the EBRAINS platform into a distributed RI on the ESFRI roadmap. The EBRAINS RI will lay the technical foundations for a new model of ICTbased brain research, driving integration

between data and knowledge from different disciplines, and catalysing a community effort to achieve a new understanding of the brain, new treatments for brain disease and new brain-like computing technologies. Through a range of services, allowing researchers to collect, share, access, analyse, and integrate brain data, and to perform modeling and simulation of brain function, EBRAINS will allow creation of the necessary synergy between the (often fragmented) different national efforts to tackle one of the most challenging targets of research: understanding the brain in health and disease. Users of EBRAINS will be basic, computational, and clinical neuroscientists, as well as developers of brain-inspired technologies for AI. Norway holds a leading role in the ongoing EBRAINS infrastructure developments. Within the distributed RI, the Norwegian Node at UiO will contribute to services in the domain of Data and Knowledge (FAIR data services), Brain Atlases and related analytical workflows, with partner NMBU contributing to Modeling and simulation services and the organization of the pan-European EBRAINS High-Level Support Team. With Norway being an active participant in EBRAINS, all researchers in Norway will have access to all services provided by EBRAINS.

Prosjektnummer: 316545
Tittel: ECCSEL Virtual laboratory
Søkerinstitusjon (partnere): SINTEF ENERGI AS (SINTEF Industri, IFE, NORSAR, ECCSEL ERIC)
Prosjektleder: Francesco Finotti

Kort sammendrag:
ECCSEL V-lab aims to help tackle the remaining gapstowards large-scale deployment of CCS and realise the RCN's vision of ensuring that

resources are opened to all relevant research institutions and industries in the country. It will do so by guaranteeing high-quality, industrially relevant data generation from national research infrastructures and ample data sharing both nationally and internationally, levering on international research cooperation entities from NCCS and ECCSEL ERIC.

ECCSEL V-lab responds to (a) the need for coordination and integration of existing ECCSEL infrastructures, (b) the need to improve access to the RIs and enable an integrated approach tothe EU FAIR (Findable, Accessible, Interoperable, Reusable) data policy, and (c) the need to ensure thecompetitiveness of Norwegian industry towards a sustainable future. ECCSEL V-lab is composed of two parts: (a) a digital infrastructure to provide a unified approach in sharing, processing, storing, and interpreting data generated from the activities of ECCSEL Research Infrastructures (RI); and (b) the first step towards Tiller Sustainability Lab, a National industrial-scale and competitive industry and energy processes. The digital infrastructure is divided into four user cases (UC), each addressing a specific portion of the CCS value chain. The UCs are designed to integrate relevant partner institutions, thus enhancing cross-institutional cooperation. The physical infrastructure addresses the vision of a national, industrial-scale research infrastructure for a sustainable industry.

Prosjektnummer: 316563
Tittel: National bio-mechatronics infrastructure for ASSISTive and AugmeNting Technology in personalised healthcare
Søkerinstitusjon (partnere): UiA (OsloMet, UiO, UiT, HVL, USN, UiS,I4Helse, NORA, NAIS, NOBIM, Sørlandet Hospital, Sunnaas Rehabilitation Hospital, SUH, NSCC, Norway Health Tech)
Prosjektleder: Filippo Sanfilippo

Kort sammendrag:
Vision and objective. The national biomechatronics infrastructure for ASSISTive and AugmeNting Technology in personalised healthcare (ASSISTANT) will be an interdisciplinary research infrastructure that focuses on the concept of human empowerment with support by technology, which will fundamentally improve human life. ASSISTANT will enable the exploitation of assistive and augmenting technology to provide personalised healthcare with shorter and efficient response times such that the costs are minimised, and patients can manage independent living. To achieve this, it is required to envision cross-disciplinary knowledge that cannot be found in a single research group and needs a transnational effort to reach a wide community of researchers, users, patients and practitioners. The necessary core discipline is biomechatronics. Moreover, different additional expertise are needed, such as eHealth, Robotics, Human-Machine Interaction (HMI), Internet of Things (IoT), Signal Processing, and cognitive Artificial Intelligence (AI). It is essential to synergistically integrate these disciplines working jointly to create new conceptual, theoretical, methodological, enabling and translational innovations that move beyond discipline-specific approaches. ASSISTANT will boost innovation, efficiency and sustainability in the field of personalised healthcare.
The overall objective of ASSISTANT is to establish a novel national research infrastructure that will encourage cooperation and networking across patients, practitioners, technology providers and service levels, to lay the foundations for better personalised assistive healthcare with shorter and efficient response times such that costs are minimised and patients can lead a more independent life with equalisation of social health inequalities. The objective of this infrastructure is twofold, first to developed the necessary national infrastructure comprising the leading institutions in biomechatronics, eBealth, robotics, BMI, information and communications technology (ICT), IoT, signal processing, and machine learning (ML); second, to establish a digital cooperative networking framework to reach the desired wide community of researchers, patients and practitioners. This will contribute towards implementing the future of personalised assistive healthcare.

Prosjektnummer: 316564
Tittel: The Norwegian Centre for Transmission Electron Microscopy II
Søkerinstitusjon (partnere): SINTEF AS (NTNU, SINTEF, UiO)
Prosjektleder: Randi Holmestad

Kort sammendrag:
The Norwegian Centre for Transmission Electron Microscopy (NORTEM) is a large-scale, national infrastructure organized by NTNU, UiO and SINTEF serving academia and industry with high level research in terms of education, use, and research project deliverables. The first NORTEM project, granted by RCN in 2011, opened new laboratories in two nodes (Oslo and Trondheim) in the second half of 2013. The establishing phase of NORTEM ended in 2016 when a world class TEM Centre offering access to a range of TEM techniques had been realized. Since then we become a successful, highly used and internationally recognized national infrastructure.

The NORTEM vision is to have ‘A world-class TEM Centre providing access to expertise and state-of-the-art infrastructure for fundamental and applied research within the physical sciences in Norway’.

Since the investments became operative in 2013, there have been substantial technological developments within TEM and the needs of the Norwegian research environments have evolved. In addition, NORTEM has gained experience on how to run a national large-scale facility with this complexity and broad spectrum of applications. To fulfill the vision and needs of NORTEM, new investments are required. This outline describes the needs and the plans for the NORTEM II period from 2022 to 2026. The new investments will make Norway internationally competitive by offering new state-of-the-art detector technology to the Norwegian research environment, following the new developments in TEM on in-operando, multidimensional data acquisition, and in particular offer new possibilities in studies of advanced functional materials. With the new investments NORTEM will be able to give access to a unique national and world-class TEM infrastructure with state-of– the-art facilities and expertise.

Prosjektnummer: 316565
Tittel: Infrastructure for mobility and logistics research
Søkerinstitusjon (partnere): TØI
Prosjektleder: Marianne Stølan Rostoft

Kort sammendrag:
Together with Mobility Lab, TØI will establish a single-sited test arena for new mobility and logistics solutions. This proposal is related to the need to fund the research infrastructure within the test arena and in line with national and EU policies within development of connected, cooperative and automated mobility (CCAM). The arena will contribute to the development of comprehensive transport solutions in order to help solve societal needs and challenges related to climate, the environment, road safety and business development. The logistics sector in particular is characterized by many small companies and low operating profits, and unfortunately the number of proper evaluations and analyses of the impact of new solutions are few. TØI will develop the research infrastructure to allow for better and more data-based evaluations in the future, enabling systematic assessment of the impact of new solutions.

The arena will be a living lab, where new transport solutions are tested and evaluated in an urban, real life environment. At the test arena, applied research into the effects and consequences of the new solutions will be conducted. Research will be user-centred by focusing on how road users perceive and use the solutions, how road users interact (safety), the flexibility, as well as the efficiency of the solutions. In addition, research will focus on the impact of the new solutions on greenhouse gas and local emissions, and the local environment (noise etc.).

In order to conduct this research, new research infrastructure is needed. The infrastructure will consist of equipment and facilities for collecting, handling, analyzing and storing relevant data, as well as making this data available for other users. Relevant data will be collected from vehicles and their interaction with the surroundings, other road users and the environment.

Prosjektnummer: 316566
Tittel: SEFIRE: Research infrastructure for knowledge-building on societal health, security and sustainability
Søkerinstitusjon (partnere): NIVA (NIVA, VEAS, NTNU, FHI, NILU, NMBU)
Prosjektleder: Malcolm Reid

Kort sammendrag:
Municipal wastewater (or sewage) is generally regarded as just waste with no real value. However, sewage represents an inexhaustible repository of information and is said to mirror society: disease [1], antimicrobial resistance [2], diet [3], human exposure to chemicals and environmental stimuli , micro-plastics [4], use of narcotics [5], and the impact of allergies can all be measured in sewage. In addition, the impact of most domestic and industrial activities, and modern living in general, are also part of the information included in sewage. Collectively, this allows for unprecedented holistic research into societal activity and wellbeing, and in turn allows informed management decisions regarding public health, pollution and security [6].

SEFIRE proposes to establish unprecedented national infrastructure to take advantage of this novel field of investigation and turn waste into research, societal improvement and value. The development of a near-real time national sewage surveillance system for the analysis and acquisition of these indicators would dramatically increase our ability to govern or manage timely and effectively and even predict future events [7]. While the scope may differ greatly between the fields of public health, environment and security, these fields share a common need for accurate data to aid research and ultimately make successful decisions and to measure the impacts of those decisions.

SEFIRE will also establish a tool to allow retrospective mining of information that could have been neglected before. By establishing a national centre for sewage-based services for use at research and governmental level, SEFIRE will increase the interaction between research infrastructures and improve the coordination of existing and future research and monitoring programs.

Prosjektnummer: 316583
Tittel: Biobank Norway 4 - a National Biobank Research Infrastructure
Søkerinstitusjon (partnere): NTNU (UiT, UiB, UiO, NTNU, Helse Nord, Helse Vest, Helse Sør-Øst, Helse Midt, Kreftregisteret, FHI, OUS)
Prosjektleder: Kristian Hveem

Kort sammendrag:
Biobank Norway 4 will build upon a ten-year experience as a well-established, mature, national biobank research infrastructure, comprising 11 partners (NTNU, UiO, UiB, UiT Norges arktiske universitet, FHI, Helse Sør-Øst, Helse Vest, Helse Midt, Helse Nord, OUS and the Cancer Registry). With a rapidly increasing number of users both nationally and internationally, there is a subsequent need to further develop the infrastructure to meet the growing requests and requirements from the research community with a stateof the-art infrastructure handling a vast number of biospecimen and large-scale data sets. We will develop i) An integrated infrastructure for precision medicine, by utilizing the huge potential in existing clinical biobanks and quality registries in the health care sector as well as genetic data from almost 400 000 participants in population-based biobanks, linked to registry-based phenotype data. A precision medicine environment will be implemented and managed on a national level as well as a national forum for precision medicine for all relevant stakeholders,

including industrial collaborators, study participants and patients. We will seek funding for further digitalization of biobank samples in a multiple omics approach The corona pandemic has fully demonstrated the necessity of an efficient and operational national biobank network and a ii) Biobank network for clinical urgency, can be a significant prerequisite for supporting various clinical studies both to monitor the development of the pandemic, testing repurposing of existing drugs and the introduction of new treatments. We will refine our biobank platform to meet these needs as effectively as possible in the future. Other major priorities will be iii) Integration with the Health Analyses Platform and data handling, iv) National network of disease-specific biobanks, v) Prospective biobank recruitment from hospital sector and primary health care, vi) Digital biobanking, vii) Investments in automated storage facilities, viii) Participation in international biobank infrastructure networks (BBMRIERIC), ix) ELSI, including Biobank Participant engagement and x) Quality biobanking

Prosjektnummer: 316588
Tittel: Research infrastructure for urban water transportation and management
Søkerinstitusjon (partnere): NMBU (NVE, FHI, NIVA, NGI, NIBIO)
Prosjektleder: Harsha Ratnaweera

Kort sammendrag:
Norwegian water distribution and wastewater transport (sewer) systems are in dire conditions. Leakage from water distribution systems are significantly higher in Norway compared to the European average, and there is significant risk related to contamination of drinking water from the environment. Additionally, the climate change has rapidly increased the frequency and intensity of precipitation, leading to unprecedented challenges regarding stormwater management, both in terms of quantity and quality. Resulting flash floods and overflows are leading to health, environmental and economical threats.

The National Centre for Water Infrastructure1 is under establishment at Campus Ås, spearheaded by Norwegian municipalities together with key stakeholders from the water industry. RIWER will be implemented along 5 pillars covering structural aspects of pipe networks, water quality within and outside the pipes, managing stormwater using blue-green solutions (BGS)2 and a data management hub. Taking advantage of the remarkable developments in the Data Sciences, the RIWER concept gives a unique opportunity to take the Norwegian research and innovation strengths and capacities in water transport and management to an internationally leading level. RIWER intends to innovate these systems with comprehensive real-time surveillance of water quality providing high quality spatial and temporal data for research and decision-making in public health and environmental management. The systems will be deployed with state-of-the-art process surveillance, predictions and control to increase the cost-effectiveness in network rehabilitation and to minimise negative consequences. This will be based on unparallelly comprehensive in depth understanding of the state and fate of infrastructure, pollution and actions to meet the challenges in the next decades, as the first facility worldwide combining all these inter-related aspects.

RIWER is a collaborative effort between NMBU3, NIPH, NVE, NIVA, NGI as well as several other stakeholders representing the existing and leading knowledge and facilities. Thus, RIWER is designed to be a powerhouse closely linked to the National Centre for Water Infrastructure with satellites and virtual nodes complementing it.

Prosjektnummer: 316590
Tittel: Fault and fracture characterisation and testing laboratory
Søkerinstitusjon (partnere): NGI (NORCE, NORSAR, UiO)
Prosjektleder: Luke Griffiths

Kort sammendrag:
Understanding fracture processes within the subsurface, and their influence on geomechanical, geophysical, and fluid transport properties is vitally important for oil & gas production, geological carbon storage, geothermal energy storage and production, slope stability, groundwater resources and seabed installations. Laboratory testing of rock and soil under controlled and realistic stress and fluid pressure conditions allows us to understand the influence of fractures on such properties. However, it is difficult to observe local deformation mechanisms and structures as they occur, and instead we often rely on post-test analysis. Recent advances in CT scanning technology allow for rapid, ultra-high-resolution, multi-scale imaging—ideal for characterisation and time-lapse imaging of laboratory samples of rock and soil during advanced testing. At the same time, fluid flow within fractures and the associated chemical and thermal processes have strong—yet poorly understood—implications for the geomechanical properties and behaviour of fractured rock. There is a lack in dedicated national infrastructure to address this topic, and we envisage that simultaneous flow and mechanical experiments, combined with high-resolution CT imaging, can lead to unique datasets shining a spotlight on such complex processes. To extend this knowledge to the field requires upscaling, and borehole geophysics and measurement of the hydraulic properties of fractures has been identified as a key tool to calibrate the detailed models developed in the laboratory and transfer knowledge across scales.

NGI has a long history of laboratory testing of geomaterials and has recently developed a strong expertise in 3D microCT-imaging and developing CT-transparent testing equipment, as well as monitoring laboratoryscale microseismicity to understand failure processes. NORCE has state-of-the-art laboratories dedicated to investigation of multiphase and multicomponent fluid flow in porous media. A combined infrastructure, integrating our complementary expertise in both laboratory and field investigations, would provide a unique opportunity for directly observing fracture and fault formation within rock and soil and linking complex mechanical, thermal, and chemical processes to geoengineering parameters of interest. As such, we propose a Fracture & Flow Lab. Infrastructure improvements across these two laboratories will include: a new micronano-CT scanner with moving source and imager; mechanical testing equipment (shear box and high temperature triaxial and tensile loading apparatus) and advanced geophysical instrumentation; and borehole logging equipment for measurement of field-scale hydraulic properties. Importantly, this infrastructure will require a dedicated data management system. This e-infrastructure will leverage competence and software solutions from NORCE to provide an interactive and robust access to the generated data, thus facilitating data reuse, visualization, analysis and promoting collaboration.

Prosjektnummer: 316598
Tittel: Smart Buildings Energy and Indoor Air Quality e-infrastructure
Søkerinstitusjon (partnere): STIFTELSEN SINTEF (SINTEF Digital, SINTEF Energi, NTNU Ingeniørvitenskap og NTNU Arkitektur og Design)
Prosjektleder: Karen Byskov Lindberg

Kort sammendrag:
SmartBuildingHub will contribute to merging the gap between R&D on energy-efficient & flexible buildings and R&D on Smart Grids. To achieve this, it is crucial to have well organized and interlinked databases consisting of detailed measurements (sub-metering beyond the main meter) with high time resolution (hourly data and even minute data in some cases) of electricity use, heat use, onsite energy generation, occupancy, and indoor climate parameters, as well as electric mobility. Currently, there is no infrastructure in Norway, giving access to researchers and solution developers for deep insight into the energy and indoor climate in buildings. Further, SmartBuildingHub will also contain hardware and software for stationary and portable equipment to conduct detailed sub-metering in selected pilot buildings, to enable detailed analyses of the indoor climate and energy use of buildings. In the e-infrastructure, the data will be organized per building category, e.g., small house, apartment block, office, school, hotel, and geographical location. The business model for SmartBuildingHub consists of two levels of access for external users: free access, with summarized and average annual values to give an overview of the key indicators, and paid access, containing high-resolution values, parameters distributions, and correlations between variables for detail analysis such as planning, sizing, etc. The e-infrastructure of SmartBuildingHub will be linked to the national e-infrastructure of Sigma2/NORID. For the sensor data collection, SmartBuildingHub will acquire additional edge and sensororiented data storage and processing support.

Prosjektnummer: 316602
Tittel: Norwegian Manufacturing Research Laboratory Phase 2
Søkerinstitusjon (partnere): NTNU (Stiftelsen SINTEF and SINTEF Manufacturing AS)
Prosjektleder: Kristian Martinsen

Kort sammendrag:
Norwegian Manufacturing Research Laboratory (project #269898) MANULAB is a national infrastructure for manufacturing research. MANULAB aims at creating an infrastructure capable of performing cutting edge research with state-of-the art equipment, and to support the Norwegian manufacturing industry to increase its global competitiveness and sustainability. Partners are; Norwegian University of Science and Technology (NTNU), SINTEF Industry and SINTEF Manufacturing AS. NTNU is project coordinator and professor dr.ing. Kristian Martinsen is the project manager. MANULAB is currently funded by 78 MNOK from the Norwegian Research Council. This draft proposal is for the second phase of MANULAB, based on the original MANULAB proposal, although there are updates from the original proposal given changes in the needs and the research state-of-the art. We claim this equipment is necessary to achieve the complete MANULAB concept as described in the original proposal. With three partners and four geographical nodes the current phase 1 might be under critical mass. The phase 2 equipment will complement the phase 1 equipment in the following laboratory nodes; The Wireless sensor systems lab, the Additive Manufacturing (AM) lab, the Industry 4.0 lab, NAPIC one-piece flow aluminium forming line, IDEALAB for product and process development, Laser robotic welding lab, AMT SLM and The Gleeble thermomechanical testing

machine. In addition, there will four new laboratory nodes; The polymer lab, the Nano AM lab, the Nano CT lab and the ceramics AM laboratory. These four new sub-laboratories mean that MANULAB will widen the scope to a fully multimaterial national research infrastructure, where metals, polymers and ceramics are included. Furthermore, MANULAB phase 2 will introduce nanoscale manufacturing with the nano-AM laboratory and the nanoscale Computed Tomography X-ray laboratory (CT).

Prosjektnummer: 316605
Tittel: National Infrastructure for AI-Powered Autonomous Cyber-Physical Systems
Søkerinstitusjon (partnere): UiA (Gullknap aerial center, MIL, Omron, ABB, NORCE, NTNU, UiT, SIMULAMet, Hydo Energy, RedRock)
Prosjektleder: Linga Reddy Cenkeramaddi

Kort sammendrag:

The primary objective of this Infrastructure proposal NI-AI-CPS is to build the National Infrastructure for Artificial Intelligence (AI) powered Autonomous Cyber-physical Systems (CPS). This infrastructure will enable both ongoing and beyond state-of-the-art research in the directions of inter-connected autonomous systems, mobile walking robots, socio-technical systems such as urban transportation, within the context of smart cities and autonomous precision agricultural systems. This infrastructure includes: large Unmanned Aerial Vehicles (UAVs) and Unmanned Ground Vehicles (UGVs) testbed at Gullknapp aerial Center in Arendal and University of Agder (UiA); 5G network testbed to support research in the communication technologies (mmWave communications with the provision to evolve beyond 5G); autonomous AI-powered collaborating vehicles including connected UAVs, UGVs, autonomous walking robots, communication modules enabling communication among different entities, namely, UAVs to UAVs, UAVs to UGVs and UGVs to UGVs communication modules; smart sensor modules; The research activities and associated use case application will be very diverse, including, among others, vehicle to everything (V2X), driver assisted vehicles mixed with autonomous vehicles (AVs), beyond visible line-of-sight (BVLOS) for Drones, Robot Shed for off-the-shelf robots as well as Makery-made robots, industrial Internet-of-Things (IoT), advanced embedded computing platforms for data processing and AI modules, smart energy systems and management for autonomous cyber-physical systems. The main objectives are:

- to build a connected autonomous vehicles research, development, industrial and educational platform for improved research in autonomous networked systems including UAVs, UGVs, autonomous mobile walking robots and context-aware sensor systems, autonomous agricultural systems, high speed communication systems for connected vehicles which will be highly relevant for Norwegian Industry.
- to build a scalable, reconfigurable, and adaptive IoT using edge computing based distributed infrastructure for reliable and secure transmission of information among autonomous connected vehicles.
- to build a decentralized local processing framework and a federated processing framework where the processing and intelligence is done both in cooperation between local processors and fusion centers.
- to enable the rapid development and testing of modular sensors in autonomous cyber physical infrastructure for autonomous systems. Reduce the timeline of product development and testing of modules for autonomous systems for both researchers and companies to test new modules quickly.
- to facilitate the secure control of complex cyber-physical infrastructure online, facilitate data storage, access for future projects and research in cyber-physical systems with embedded AI modules.

Prosjektnummer: 316613
Tittel: Robust and fault-tolerant network infrastructure with 5G access (ROBUST5G)
Søkerinstitusjon (partnere): SIMULA AS (NTNU, UNINETT, Norwegian Metrology Service)
Prosjektleder: Haakon Bryhni

Kort sammendrag:
As our society becomes increasingly dependent on wireless communication, the need for improving robustness is increasing rapidly. This trend is accelerating with the upcoming adaptation of 5G networks which will become the digital backbone of our mobile, connected society. Current wireless and wired telecom infrastructures are not sufficiently robust compared to the extreme dependency we have to a healthy telecom infrastructure. Operators are under strong pressure to operate their networks at a lowest possible cost and both regulation and automation is needed to improve reliability. Furthermore, new user groups are encouraged to share a common infrastructure to save cost and leverage state of the art technologies. This trend increases the requirements of robustness of the underlying architecture since our society relies not only on critical consumer services like communication services, banking, shopping and logistics, but also applications traditionally served by dedicated networks such as military, emergency (e.g. TETRA) and railroad signalling networks (e.g. GSM-R) which all evaluate 5G as a key part of their network infrastructure in the future. 5G represents very demanding requirements for the cellular operators and the network infrastructure vendors which need new standards and new technologies both at the infrastructure and network management level.

The complexity of configuration and adjustment of telecommunication networks to respond to rapid changes in demand has recently led to the vision of Self-driving networks [1] which measure, analyze and control themselves in an automated manner. Self-driving networks can react to changes in the environment (e.g., demand), while exploiting existing flexibilities to optimize themselves. Furthermore, the advent of large-scale machine learning can also benefit self-driving networks and over time develop to faster reconfiguration and more reliable operation compared to manual configuration by human operators. This method is of particular interest in 5G to ensure rapid reconfiguration in case of failure which requires automated response to demand, changes in geographic load in the network, change in network capacity and loss of connectivity with minimal impact for critical applications.

The infrastructure will be distributed with 5G access nodes in Oslo and Trondheim, interconnected by fast optical links with automatic reconfiguration and edge computing resources. The infrastructure will build on top of the existing 5G infrastructure at SimulaMet, the eX3 supercomputer at Simula and laboratory and network infrastructure available at UNINETT and NTNU.

Prosjektnummer: 316614
Tittel: Norwegian National Network Technology Research Laboratory (N3TLAB)
Søkerinstitusjon (partnere): UNINETT AS (SimulaMet, NTNU, Telenor, UiO)
Prosjektleder: Otto J Wittner

Kort sammendrag:
During the coming years telecom operators in Europe (and worldwide) target to roll out and deploy 5G infrastructure. Early deployments will deliver enhanced mobile broadband and massive IoT at the edge of the network. Later deployments will target reorganisation of the core into fully

reconfigurable and software/firmware defined networks where resources, being both physical and virtual (VNFs), are to be shared and traded between operators at a regular basis.

Network function virtualisation (NFV) design, organisation and trading is a research domain of immense complexity. In the coming years, being able to run larger scale experiments in realistic environment will enable trustworthy results to be presented by researcher to innovation partners. Reliability and security in NFV based 5G infrastructure are critical areas especially given regulatory bodies' push towards moving critical services to commercial networks.

In parallel with the advent of NFV, several "new IP" initiatives are emerging. To better support development of future Internet based services new protocol variants are suggested. Practical experimentation with such protocol in realistic environments will be crucial for their acceptance.

The goal of N3TLAB is to build, operate and provide a country-wide network technology laboratory that may be configured to resembles different next-generation networks. N3TLAB aim for 20 nodes located in different geographical location in all of Norway. Each node will provide fast general-purpose processing and storage with high capacity network access (100Gbps), programmable hardware (P4), traffic generators/sinks, high precision clocks, optical test units and more. Nodes will be interconnected by a meshed network combining several network technologies. In addition, a novel gateway to enable safe mirroring of traffic from operational networks into experimental setups, will be developed and made available. 5G radio access equipment will also be considered.

The infrastructure will be developed by the partner institutions, and later operated by Uninett, the Norwegian research network operator. While priority to access the infrastructure will be given to the partner institutions and the Norwegian network research community in general, other external partners, academic and commercial will be offered the opportunity to access the lab when required.