

Department of Computer Information Science

Masteroppgaver 2021

Marker valg for å avgrense hvilke oppgaver som skal vises.

Hovedprofil / Studieretning

Datateknologi (740)

- ☐ Databaser og søk (84)
- ☐ Kunstig intelligens (195)

Informatikk (480)

- ☐ Programvaresystemer (114)
- ☐ Databaser og søk (68)
- ☒ Kunstig intelligens (191)
- ☐ Interaksjonsdesign, spill- og læringsteknologi (107)

Helseinformatikk (14)

- ☐ Helseinformatikk (14)


Information Systems (86)

- ☐ Information Systems (85)

Datateknologi (740)

- ☐ Digital virksomhetsutvikling (69)
- ☐ Interaksjonsdesign og spillteknologi (105)
- ☐ Programvareutvikling (110)
- ☐ Algoritmer og HPC (64)
- ☐ Datamaskiner og systemprogramvare (48)
- ☐ Visuell databehandling (64)

Faglærere (35)

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|---|--|--|--|
| <input type="checkbox"/> K. Bach (7) | <input type="checkbox"/> P. Haddow (5) | <input type="checkbox"/> P. Mikalef (10) | <input type="checkbox"/> T. Theoharis (13) |
| <input type="checkbox"/> K. Balog (3) | <input type="checkbox"/> S. Hvasshovd (4) | <input type="checkbox"/> E. Monteiro (1) | <input type="checkbox"/> H. Trætteberg (2) |
| <input type="checkbox"/> D. Cruzes (3) | <input type="checkbox"/> A. Imran (2) | <input type="checkbox"/> H. Nguyen (4) | <input type="checkbox"/> G. Tufte (4) |
| <input type="checkbox"/> K. Downing (8) | <input type="checkbox"/> M. Jaccheri (2) | <input type="checkbox"/> S. Petersen (4) | <input type="checkbox"/> T. Veiga (3) |
| <input type="checkbox"/> A. Elster (6) | <input type="checkbox"/> A. Kofod-Petersen (1) | <input type="checkbox"/> H. Ramampiaro (4) | <input type="checkbox"/> Z. Yang (6) |
| <input type="checkbox"/> B. Gambäck (21) | <input type="checkbox"/> H. Langseth (6) | <input type="checkbox"/> M. Ruocco (9) | <input type="checkbox"/>  . Özgöbek (3) |
| <input type="checkbox"/> M. Giannakos (7) | <input type="checkbox"/> F. Lindseth (4) | <input type="checkbox"/> K. Sharma (4) | <input type="checkbox"/> P. Öztürk (5) |
| <input type="checkbox"/> J. Gulla (8) | <input type="checkbox"/> O. Mengshoel (6) | <input type="checkbox"/> R. Sætre (2) | <input type="checkbox"/> T. Aalberg (1) |
| <input type="checkbox"/> O. Gundersen (5) | <input type="checkbox"/> R. Mester (15) | <input type="checkbox"/> P. Sætrum (3) | |

Vis oppgaver

Sorter etter: **Faglærer** ▼

Oppgaveforslag (191)

Kerstin Bach (7)

AI & eHealth: Case Base Evolution

A interesting problem in personalized decision-support systems for improving an individual patient's health, is to combine general clinical guidelines with past experiences of that same or similar patients. In the [EU project selfBACK](#), in which we tightly cooperate with the Department of public health and nursing at NTNU, we combine rule-based reasoning with case-based reasoning to capture these two knowledge types. The target problem is Low-Back Pain, and the aim of the project is to develop and thoroughly test a mobile phone app that will give a patient advice on how to improve his/her lower back conditions, in a short or long term. Activity data is continuously captured via a wrist band and used alongside subjective information on pain and functionality. This project will focus on case-based reasoning and data analytics investigating the evolution of cases over time.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  + Lenke: 

AI-based prediction in aquaculture

As fish farming sites move to areas more exposed to harsh wind, wave and current conditions there is a growing need for monitoring and decision support, as well as remote and autonomous operations tied to transport, put out, feeding, sorting, delousing, treatment and slaughtering of the fish. The cost of having to interrupt such operations is substantial.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  + Lenke: 

Human Activity Recognition from Accelerometer Data in HUNT4

Data captured by body worn sensors provides an excellent opportunity for assessing the physical activity of patients and hence creating behavioral profiles over time. Particularly patients with chronic disease can receive tailored advice on how to increase their activity and hence improve their overall life quality.

[[Vis hele beskrivelsen](#)]

Status: Tildelt Eget for:  Lenke: 

Machine Learning to improve the Air Quality in Trondheim

Over the last year we have created a dataset with information on air quality data and we started to explore machine learning methods for predicting the air quality for the next 12/24/48 hours as well as visualize the results.

In this thesis we would like to continue this work and investigate time series methods as well as reinforcement learning methods targeting the effect of decisions taken to improve the air quality.

This work will be part of a collaboration with Telenor Research under the ongoing AI4EU research project (<https://www.ai4eu.eu/>).

[[Skjul beskrivelse](#)]

Status: Tildelt Eget for:  + Lenke: 

Recognition of Sleep Patterns on Sensor Data Streams (HUNT4)

Data captured by body worn sensors provides an excellent opportunity for assessing the physical activity of patients and hence creating behavioral profiles over time. Particularly patients with chronic disease can receive tailored advice on how to increase their activity and hence improve their overall life quality.

The focus and challenge for this project and master thesis is the selection, implementation and improvement of pattern recognition and data mining techniques to identify sleep patterns from sensor data. The data will be provided by NTNU's medical faculty (DMF), while this thesis should focus on the data analysis. The captured data sets will be streaming data from two acceleration sensors recorded at 100 Hz.

During this work you will build on previous work that does a basic classification of awake/sleep phases and extend the model finding various sleep patterns. Also investigating different sleep stages is a possibility. The implementation will be evaluated in collaboration with DMF, who is also providing background information on the data.

Once the experimental set up is created, different existing algorithms should be evaluated and their strength and weaknesses pointed out. Based on this analysis, a follow-up master thesis can be defined focusing on improving existing algorithms and validated in a real world setting.

[[Vis hele beskrivelsen](#)]

Status: Tildelt Eget for:  + Lenke: 

Reinforcement learning to actuate in Trondheim's air quality

Under the AI4EU project (<https://www.ai4eu.eu>) a urban simulator of Trondheim is being developed, based on the SUMO traffic simulator. SUMO is an open source traffic simulator that is developed to simulate realistic road networks. As a side effect it also models the pollutant emissions of vehicles which allows us to model the effect of traffic pollution in an urban scenario. Traffic data is publicly available which can be inputted to the traffic simulator and obtain realistic simulated traffic patterns. This simulator serves as a tool that captures the realistic patterns of air quality data and can be used as an environment to train autonomous agents, both in what concerns to improve air quality levels and the quality of the information on pollution levels.

Therefore, the goal of this thesis is the deployment of agents that learn, through reinforcement learning algorithms, from data coming from this simulator. The goal of the agent can be defined on the setup of the project. Some examples are:

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:   Lenke: 

Towards a realistic urban simulator of Trondheim

Under the AI4EU project (<https://www.ai4eu.eu>) a urban simulator of Trondheim is being developed, based on the SUMO traffic simulator. SUMO is an open source traffic simulator that is developed to simulate realistic road networks. As a side effect it also models the pollutant emissions of vehicles which allows us to model the effect of traffic pollution in an urban scenario. Traffic data is publicly available which can be inputted to the traffic simulator and obtain realistic simulated traffic patterns. The final goal is to have a tool that captures the realistic patterns of air quality data and can be used as a tool either for evaluation of future scenarios in decision support systems and as an environment to train autonomous agents, both in what concerns to improve air quality levels and the quality of the information on pollution levels.

Therefore, the goal of this thesis is to build up from the current simulator development and improving its realism, including but not limited to:

- Inclusion of more pollution sources: currently, only emissions from traffic are modeled (which contributes mostly to NOx levels) but air quality levels are influenced also by ships, wood burning fireplaces, air dust (which depends on the season), etc.

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Status: Valgbart Eget for:   Lenke: 

Krisztian Balog (3)

Intent classification for conversational AI

Conversational agents, such as Apple's SIRI, Amazon's Alexa, or the Google Assistant are capable of handling a broad range of requests. In the context of such conversational AI systems, the objective of this project is to develop a machine learned classifier that determines the underlying intent of user utterances.

The project involves the following specific tasks:

- Developing a categorization system of possible intents (e.g., requesting information, clarifying request, providing additional details, critiquing the system, stating/removing personal preferences, etc.)
- Devising appropriate classification methods; both traditional feature-based and neural (deep learning) approaches might be explored.
- Creating a data collection for training and evaluation.

[[Skjul beskrivelse](#)]

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Narrative-driven recommendations

Many online services provide users with recommendations, to help them find items of interest in the enormous space of available choices. Popular examples of such recommender services include videos (YouTube), music (Spotify), movies (Netflix), online shopping (Amazon), etc. These services typically base their recommendations on items liked/disliked by users.

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Status: Tildelt Eget for:  Lenke: 

Scientific literature recommendation

Many online services provide users with recommendations, to help them find items of interest in the enormous space of available choices. Popular examples of such recommender services include videos (YouTube), music (Spotify), movies (Netflix), online shopping (Amazon), etc. In this project, we wish to provide recommendations for scientific literature to researchers.

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Status: *Tildelt* Egnet for:  Lenke: 

Daniela Soares Cruzes (3)

Quality Assurance for AI-based Systems

The purpose of this thesis, that can be chosen as project and as thesis, by one or two students and also by several groups is to support the implementation of AI software inside the Software Development process. Each student (or couple of students) will study a sub theme of the theme SE and AI, study the literature, plan an empirical investigation to collect data from processes that involve software engineers and software companies.

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Software Engineering and AI

Software engineering and AI

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Software Engineering and Smart Society

The purpose of this thesis, that can be chosen as project and as thesis, by one or two students and also by several groups is to support the implementation of AI software inside the Software Development process. Each student (or couple of students) will study a sub theme of the theme SE and SmartSociety, study the literature, plan an empirical investigation to collect data from processes that involve software engineers and software companies.

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Keith Downing (8)

Cycle GANs for Forgery Detection

Generative Adversarial Networks (GANs) are popular, though challenging, deep-learning tools for generating instances (e.g. images) with similar characteristics to those from a training set. Cycle GANs extend the technique further by learning mappings between two domains by training only on exemplars in the two domains, independently, not from pair samples from each domain. This mapping then allows the Cycle GAN to convert an example in one domain to a hypothetical version of itself in another domain. For example, a Cycle GAN might train on paintings of two artists (Rembrandt and Van Gogh) and then be able to convert a Van Gogh painting to the Rembrandt style. Similarly, a Cycle GAN can be used to convert black-and-white to colored images.

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Deep Learning for Pollen Dating

Anthropologists, archaeologists and climatologists use many tools for dating and reconstructing environments thousands and millions of years in the past. One such tool, palynology (pollen dating) uses microscopic pollen samples, consisting of hundreds or thousands of diverse pollen grains, to identify characteristic "pollen zones", which often provide unique time tags. Unfortunately, this requires considerable human labor, as scientists stare for hours at 3-dimensional microscopic images full of pollen grains of many different species.

This project will attempt to automate the processes of isolating, classifying and counting pollen grains in microscopic images by employing state-of-the-art deep-learning tools and techniques such as Deep Convolutional Networks, YOLO (you only look once) and Transformers. Although a few attempts have been made at applying deep learning to palynology, this is still a very open problem in need of further investigation.

A good article on pollen classification with deep learning is the following:

<https://www.idi.ntnu.no/~keithd/master-projects/2020/pollen-classification-2019.pdf>

Please read my general policy for master-student selection here:

<https://folk.idi.ntnu.no/keithd/advice/masters-selection.html>

[[Skjul beskrivelse](#)]

Status: Valgbart Eget for:  Lenke: 

Deep Learning for Satellite Image Analysis of Ships

In cooperation with VAKE (a Norwegian space-tech startup located in Oslo), this project investigates the use of deep neural networks for detecting ships in satellite images. The task is complicated by the fact that many of these ships have "gone dark" and do not wish to be detected, due to their covert and/or illegal activities. This project is a follow-up to one of a similar theme that VAKE carried out last year.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Designing Causal Models of Blinding Retinopathy of Prematurity (ROP) with Evolutionary Computation (COPY)

Retinopathy of Prematurity (ROP) is a serious disease in preterm-born babies that often leads to blindness. Given several key parameters that have been shown to be helpful in predicting ROP (along with data from several thousand patients), evolutionary computation will be used to design quantitative models of the interactions of these parameters to thereby enhance the predictive power of these parameters. This work is in cooperation with ophthalmologists at St. Olav's hospital and is more fully described here:

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Explorations of Evolutionary Computation for Network Design and Control

Evolutionary Computation (EC) facilitates a very creative, open-ended, automated design process that has led to a wide variety of inventions, from satellite antennas to furniture to robots. In this project, the general target area is networks, and will be used to determine both the overall topology (i.e. interconnectivity patterns) and the individual behaviors of the network nodes. The project itself is "open ended" in that a student may suggest an application area where networks are a natural modelling tool, such as power or communication grids, or even the spread of disease (where networks are often used to assess pandemic risks).

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Status: Valgbart Eget for:  Lenke: 

Network-Based Pandemic Modelling

The spread of pathogens involves a complex combination of factors such as incubation time, virulence, and contagiousity of the virus; behavioral tendencies and demographics of the carriers (a.k.a. vectors); and the general composition and connectivity of the environment. In this (rather open-ended project), students will implement and deploy tools for building abstract graph-theoretic models of environments (thus permitting wide variance in the capacity and connectivity of regions) within which simulated pathogens and vectors interact. Via thorough experimentation, interesting conclusions should be drawn concerning relationships between environmental topology and important viral and vectorial characteristics. No background in biology is required, but interested students must be willing to read extensively on relevant topics within epidemiology and network theory, a well-explored combination in the scientific literature. The use of techniques from bio-inspired artificial intelligence will also be encouraged.

Please read my general policy for master-student selection here:

<https://folk.idi.ntnu.no/keithd/advice/masters-selection.html>

Status: Valgbart Eget for:  Lenke: 

Semi-Supervised Learning of Time-Series Data

In this project, deep learning methods such as Restricted Boltzmann Machines (RBMs) and Deep Belief Networks (DBNs) will be used to classify hand gestures based on time-series data from a single measurement location. The RBM and DBN rely heavily on local learning rules to detect patterns in unlabeled sensory data, but they then exploit the (relatively few) labeled cases to perform supervised learning (via backpropagation) as a final network-tuning process.

Status: Valgbart Eget for:  Lenke: 

Unsupervised Learning using Athletic Time-Series Data

This project involves a combination of unsupervised clustering techniques with (supervised) deep learning (using recurrent neural networks) to group time-series data generated by sensor-laden athletic training gear. This is a cooperative effort with US Positronix and is described in slightly more detail here:

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Anne C. Elster (6)

Autotuning for HPC -- several subprojects!

The following subprojects may be refined/changed to suit the background and interests of the student selecting this project.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Fish Size and Feature Detection Using GPUs and Cameras with Sonar Data

This project will combine GPU and visual computing using state-of-the-art GPUs and underwater camera data that also records sonar data to try to extract, for instance, the size of fish in a large fish farm to evaluate the health of the fish.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Investigating New GPU Features for Performance (NVIDIA Tegra and/or Betsy)

Look into how effective the current optimization techniques are for GPUs on the newest platforms, including exploring how to use these GPU's tensor processors for HPC applications and/or how selected benchmarks scale on the new Supercomputer Betsy at NTNU.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Machine Learning for GPU-based HPC

Explore using ANN and other Machine Learning techniques for auto-tuning of HPC applications.

Details will vary depending on the student's interest and background.

Contact Prof. Elster (elster@ntnu.no) for details and to set up a Zoom meeting.

Requirements: TDT 4205, TDT4200 + preferably an AI course

Status: Valgbart Eget for:  Lenke: 

Parallel Algorithms for GPUs

This project is for the top students from TDT4200 (or equivalent) that want to explore how Graphical Processing Units (GPUs) may be utilized to offload computations in either multi-core and/or clustered environments. Projects within this theme may be refined further with Elster's industry contacts, or take a more theoretical route.

Contact Anne Elster (elster@ntnu.no) to set up a Zoom meeting for April or May 2020.

Requirement: TDT4200 or similar (e.g. Supercomputing, Computational physics)

Status: Valgbart Egnnet for:  Lenke: 

Seismic Simulations on GPU - Fall 2020

This project is a collaborations between HPC-Lab at IDI and Prof. Børge Arntsen, Petroleum Engineering and /or Schlumberger.

Details to be flushed out shortly, but feel free to email Elster (elster@ntnu), if interested.

TDT4200 or equivalent required.

Status: Valgbart Egnnet for:  Lenke: 

Björn Gambäck (21)

An emotion sensitive chatbot for improved mental health

Chatbots that can carry on a dialogue with no direct goal (chit-chat) have developed rapidly in recent years and are often based on deep reinforcement learning or transfer learning strategies, where deep learning is used to pre-train models on large out-of-domain datasets and then fine-tune on some in-domain data. This project would look at dialogues related to mental health and predict the user's mood. The language that people use and the ways they use it can provide information about their mental health state, with several researchers over the last 50 years having based mental health predictions on the users' choice of words and on word frequencies. The results clearly indicate that increased usage of emotion-oriented language is related to increased mental well-being, with the people benefiting the most from talking, writing and chatting about their mental health being those that also initially use a higher frequency of words conveying positive emotions.

Status: Valgbart Egnnet for:  Lenke: 

Automatic detection of pro-eating disorder (pro-ED) social media users

Pro-eating disorder groups (pro-ED) are social media sub-cultures that encourage disordered and dangerous eating behaviours, e.g., Pro-Ana (pro-anorexia), Pro-Mia (pro-bulimia) and Thinspro (Thinspiration, a combination of "thin" and "inspiration"). Automatic detection of users sharing, supporting or following pro-ED content can provide information for understanding and preventing eating disorders, as well as for social media moderation. Data on some such users on Twitter have already been annotated, but to fully apply machine learning algorithms such as deep learning to the problem, more data need to be gathered, tentatively from various sites such as Twitter, Reddit and Tumblr. The thesis work would then experiment with applying various machine learners to this data.

Status: Valgbart Egnnet for:  Lenke: 

Automatic music transcription with deep learning

The field of Music Information Retrieval (MIR) has gained a lot of momentum in the last couple of years with the advancement of deep learning methods, while music source separation has become feasible as a pre-processing step following several recent projects. Polyphonic piano music transcription has also seen progress with the Onsets and Frames model (Hawthorne et al. 2018) based on bi-directional Long Short-Term Memory recurrent neural networks. Fully automatic music transcription would be highly valuable for musicians not only as an educational tool but also when arranging music and combining acoustic and electric music in live performances. Data collections such as the Million Song Dataset and derivatives from it like the Lakh MIDI Dataset and the Lakh Pianoroll Dataset gives possibilities for large scale supervised learning in this domain.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Egnnet for:  Lenke: 

Computational Creativity

To be creative, we need to produce something which is new, meaningful and has some sort of value. Computers are able to support humans in creative processes, but to also themselves be creative or to assess if an idea or a product is creative. A master thesis project on computational creativity can investigate any creative field matching the interests and backgrounds of the student or students (language, design, music, art, mathematics, computer programming, etc.), and concentrate on one or several aspects of computational creativity, such as the production, understanding or evaluation of creativity, or on computer systems that support human creativity.

Status: Valgbart Eget for:  Lenke: 

Computational Linguistic Creativity

Computational linguistic creativity can be aimed at creating systems that either are creative themselves (e.g., generate poetry, write lyrics to music, produce analogies or metaphors; or chatterbots), or try to understand creativity (e.g., identify sarcasm, understand humour or interpret rhymes), or support humans in creative processes (such as PhotoShop in the image domain), or evaluate creativity.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Computational Musical Creativity

Computers have been used in music both as support for creativity and as creative agents themselves, and both for the composition of the music scores and for writing lyrics. The first algorithmic composition system appeared already in the 1950s (the Illiac suite, Hiller & Isaacson 1958), and since then rule-based systems, stochastic methods, grammar-based methods, neural networks, and evolutionary methods have all been utilised to compose music, and/or for generating lyrics. A master thesis on the topic could address any of these strands and approaches, depending on the student(s) background and interests.

Status: Valgbart Eget for:  Lenke: 

Emphasis Selection for Written Text in Visual Media



The project will investigate automatic methods for emphasis selection (choosing candidates for emphasis) in short texts, and should be based on work towards the SemEval 2020 shared task "Emphasis Selection for Written Text in Visual Media". The topic of the shared task is specified by the organisers by: "word emphasis is used to better capture the intent, removing the ambiguity that may exist in plain text. Word Emphasis can clarify or even change the meaning of a sentence by drawing attention to some specific information, and it can be done with Colors, Backgrounds, or Fonts, Italic and Boldface."

Status: Valgbart Eget for:  Lenke: 

Enterprise-scale smart document search [AI lab pitch]

[external project with Norconsult Information Systems, NOAS]

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Status: Tildelt Eget for:  Lenke: 

Entity-level sentiment impact analysis in social media texts

A key aspect of sentiment analysis is identifying the target(s) of the opinion, that is, to determine which entities in a text the expressed sentiment relates to. Exploring how textual entities are related to a text's overall sentiment can yield information on how given entities are portrayed in social media, e.g., on Twitter. This requires the application of sentiment analysis techniques as well as named entity recognition and linking, and the use of heuristic or grammatical features to determine entity relevance and sentiment strength.

Status: Valgbart Eget for:  Lenke: 

Evolutionary Algorithms for Language Processing

Natural language processing grapples with an ever-changing and moving target. The focus of study, natural language, is natural because it changes, interacts and evolves in various directions. The bio-inspired computational methods described as evolutionary computation and/or genetic algorithms create computational models that evolve a population of individuals to find a solution to a given problem. This project will investigate how evolutionary computation can be employed in some natural language processing task, ranging from efforts to induce grammars to models of language.

Status: Valgbart Eget for:  Lenke: 

Gender and/or age based author profiling

Until a few years ago, gender-based language studies mainly concentrated on speech. However, social media texts now provide plenty of data for extracting author profiles based on parameters such as gender, age and geolocation, while on the other hand posing new challenges for language analysis due to the often unconventional and abbreviated language used, as well as other characteristics of social media text such as usage of hashtags, emojis, emoticons, code-switching (mixing languages), etc. In addition, many users do not volunteer their actual and true profiles. The theme for this thesis project would thus be investigate automatic (machine learning) methods to either extract and classify author profiles in online texts, or to figure out whether one specific user (or type of user) could have written a given text (i.e., cyber forensics).

Status: Valgbart Eget for:  Lenke: 

Graph-based representations of the dialogue state (and application to human-robot interaction) [AI lab pitch]

[external project at Norsk Regnesentral]

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Identifying characteristics of persons vulnerable to social media extremism

Extremist groups take to social media since they facilitate cheap, quick, and broad dissemination of messages, and allow for unfettered communication with an audience without the filter or 'selectivity' of mainstream news outlets. There have in recent years been substantial efforts to identify members already belonging to extremist organisations and track their Internet activities. The present proposal, however, is primarily aimed at the individuals targeted by the extremists, i.e., persons susceptible to their ideas. The goals would be to profile persons vulnerable to extremism and intercept them before they fully turn to the extremist organisations, and to identify sources of extremism and hate-speech in order to preventively destabilize extremist networks.

Status: Valgbart Eget for:  Lenke: 

Identifying Online Hate Speech and Cyber Bullying

During the Spring of 2017, parliamentary committees in Germany and the UK strongly criticised leading social media sites such as Facebook, Twitter and Youtube for failing to take sufficient and quick enough action against hate-speech, with the German government threatening to fine the social networks up to 50 million euros if they continue to fail to remove hateful postings within a week.

With legislation in other countries set to follow, properly identifying hatespeech is a pressing issue, not only for the major players, but also for smaller companies, clubs, and organisations that allow for user-generated content on their sites. Many such sites currently use slow, manual moderation, which mean that abusive posts will be left online for too long without appropriate action being taken or that content will be published with delay (which might be unacceptable to the users, e.g., in online chat rooms).

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Status: Valgbart Eget for:  Lenke: 

Informasjonselementer i tekst [AI-lab pitch]

[Eksternt prosjekt sammen med Nasjonalbiblioteket, se komplett beskrivelse på:
<https://folk.idi.ntnu.no/kerstinb/ailab/2020/pitches/25.%20NLP- Informasjonselementer%20i%20tekst.pdf>]

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Native Language Identification

Native Language Identification is the task of identifying the native language of a writer based solely on a sample of their writing in another language. The task is typically framed as a classification problem where the set of native languages is known beforehand. Most work has focused on identifying the native language of writers learning English as a second language. The master thesis work connects to previous work in IDI's AI group and potentially involves participation in a "shared task competition" on Native Language Identification where training and test data is made available by the organisers (such as <https://sites.google.com/site/nlsharedtask2013/>).

Status: Valgbart Eignet for:  Lenke: 

NLP with Deep Learning and Advanced Machine Learning for Information Retrieval from Text Archives [AI Lab Pitch]

[Project at Arkviverket / National Archives of Norway; Contact: Javad Rezaie. See <https://folk.idi.ntnu.no/kerstinb/ailab/2020/>]

The aim of this project is to apply NLP, deep learning and advanced machine learning techniques and technologies for information retrieval from raw documents. This information can be used to determine both the right context and metadata for the archives, as well as whether the archives contains sensitive information and could be made available for a given person.

Preliminary results on finding context information in some of analog, digitized and digitalborn archives using classical machine learning algorithms (i.e. Logistic Regression, Random Forest) and pre-trained deep neural networks (i.e. BERT based models) are very promising and there are much more opportunities to explore.

Status: Valgbart Eignet for:  Lenke: 

Plagiarism Detection

The task of plagiarism detection is to look at a given a document and establish whether it is an original or not. It can be further divided into two sub-tasks: source retrieval and text alignment. The aim of the thesis work would be to solve one or both of them (tentatively depending on whether one or two students worked together). In source retrieval, the task is: given a suspicious document and a web search API, retrieve all plagiarized sources while minimizing retrieval costs. While the task of text alignment is: given a pair of documents, identify all contiguous maximal-length passages of reused text between them.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Sentiment Analysis in Tweets

In recent years, micro-blogging has become prevalent, and the Twitter API allows users to collect a corpus from their micro-blogosphere. The posts, named tweets, are limited to 140 characters, and are often used to express positive or negative emotions to a person or product. In this project, the goal is to use the Twitter corpus to do sentiment analysis, that is, to classify tweets as to whether they express positive or negative opinions, or are neutral/objective. The work could build on previous master theses at NTNU, and potentially aim to participate in a shared task competition on Twitter Sentiment Analysis.

Status: Valgbart Eignet for:  Lenke: 

Sentiment Analysis of Figurative Language in Twitter

The master thesis project is aimed at the automatic classification of tweets containing figurative language, that is, language which intentionally conveys secondary or extended meanings (such as sarcasm, irony and metaphor). Such figurative language creates a significant challenge for sentiment analysis systems, as direct approaches based on words and their lexical semantics often are inadequate in the face of indirect meanings. One goal of the project is to find a set of tweets that are rich in figurative language, another goal is to determine whether the writer of each such tweet has expressed a positive or negative sentiment, and possibly the degree to which this sentiment has been communicated.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Societal Sentiment Analysis: Predicting Social Media Personalities, Values and Ethics

Several models can be used to find out how users' social media networks, behaviour and language are related to their ethical practices and personalities. Such models include Schwartz' values and ethics model and Goldberg's Big 5 model that defines personality traits such as openness, conscientiousness, extraversion, agreeableness and neuroticism. The thesis project would investigate applying such models to social media text and how the user personalities are reflected by the social networks that they participate in and develop.

Status: *Valgbart* Eget for:  + Lenke: 

Michail Giannakos (7)

A Tool for In-Video Feedback: Design and Evaluation

Supervisors: Kshitij Sharma, Michail Giannakos
Place: LCI Lab: <https://lci.idi.ntnu.no/>

[[Vis hele beskrivelsen](#)]

Status: *Tildelt* Eget for:  + Lenke: 

Adaptive and Gamified Learning Technologies to Support Motivation and Engagement

Supervisors: Zacharoula Papamitsiou, Michail Giannakos, Alf Inge Wang
Place: LCI Lab: <https://lci.idi.ntnu.no/>

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Eget for:  + Lenke: 

Collaborative code editing tool: Design and Evaluation

Supervisors: Kshitij Sharma, Michail Giannakos
Place: LCI Lab: <https://lci.idi.ntnu.no/>

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Eget for:  + Lenke: 

Generalizability of eye-tracking and EEG features

Supervisors: Kshitij Sharma, Michail Giannakos
Place: LCI Lab: <https://lci.idi.ntnu.no/>

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Eget for:  + Lenke: 

Multimodal Learning Analytics for video-based learning

Supervisors: Kshitij Sharma, Michail Giannakos
Place: LCI Lab: <https://lci.idi.ntnu.no/>

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Eget for:  + Lenke: 

Utilizing Electromyography (EMG) as an Input Modality for Head-Mounted Displays (HMDs)

Supervisors: Evangelos Niforatos and Michail Giannakos

[[Vis hele beskrivelsen](#)]

Status: *Tildelt* Eget for:  + Lenke: 

Wearable Memory Augmentation: Moving Cued Recall out of the Lab

Supervisors: Evangelos Niforatos and Michail Giannakos

[[Vis hele beskrivelsen](#)]

Status: *Tildelt* Egnet for:  Lenke: 

Jon Atle Gulla (8)

Active learning for industrial entity matching with machine learning

Cognite are bringing modern cloud software and data analysis to many industrial companies. A common obstacle for industrial companies is that they have data residing in many different systems without common identifiers (equipment, time series, 3D models, documents, etc). To gain value from digitalization it's important to be able to work across several data sources - e.g. click on something in a 3D and see its sensor time series. Entity matching is the problem of deciding which records from two different data sources refer to the same real-world entity.

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Conversational Approach to News

Traditional media houses publish news stories that are either updated or replaced with new stories as events are unfolding. The stories are presented as complete texts that are supposed to be read from beginning to end. For small devices like mobile phones it may be interesting to look into other ways of presenting news stories. In some recent experiments news stories have been broken up into several pieces that have either been structured as a conversation or presented piece by piece by avatars.

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Explainable Recommender Systems

In news recommendation both collaborative filtering and content-based recommendation techniques are used. Often contextual features like time and location, as well as additional data from social media, are also taken into account to personalize news services to each individual reader. Due to the complexity and number of recommendation strategies employed, it is difficult for the reader to understand the logic behind the recommended articles. The lack of transparency hampers readers' trust in the system and makes it hard to detect flaws in the recommendation engine.

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Explaining Fake News

Fake news stories are stories that deliberately try to disinform readers or spread hoaxes via traditional media channels. Their intent is to mislead in order to damage parties, people or organizations, or for financial gains. Recent work on network analysis, linguistic properties and classification has tried to use machine learning and other techniques to detect fake news stories by contrasting them with verified true stories. Unfortunately, even if a fake story is identified, the techniques have not been very good at explaining why the story is considered fake.

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Industrial entity matching on documents with machine learning

Cognite are bringing modern cloud software and data analysis to many industrial companies. A common obstacle for industrial companies is that they have data residing in many different systems without common identifiers (assets, time series, 3D models, documents, etc). To gain value from digitalization it's important to be able to work across several data sources - e.g. click on something in a 3D and see its sensor time series. Entity matching is the problem of deciding which records from two different data sources refer to the same real-world entity.



[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Industry friendly modeling for labeled property graphs

Cognite is delivering digital twin and industrial IOT software to industrial companies across manufacturing, oil&gas and power&utilities. The core of Cognite's offering is called Cognite Data Fusion(CDF) and is powered by a labeled property graph concept that enables flexible modeling of industrial information systems for small and larger companies to collaborate in projects and in operations.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Interactive industrial entity matching with machine learning

Cognite are bringing modern cloud software and data analysis to many industrial companies. A common obstacle for industrial companies is that they have data residing in many different systems without common identifiers (assets, time series, 3D models, documents, etc). To gain value from digitalization it's important to be able to work across several data sources - e.g. click on something in a 3D and see its sensor time series. Entity matching is the problem of deciding which records from two different data sources refer to the same real-world entity.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Value of AI Technologies

AI and Big Data technologies are central in many digitalization or digital transformation projects. They are sometimes used to cut costs of existing services, but the technology is often adopted to offer improved or brand new services. There are today best practices from many industry sectors, and practitioners and researchers have worked out guidelines for the integration of AI in organizations. However, many projects suffer from a lack of understanding how the nature of AI affects technical infrastructures and business strategies, and social and ethical implications are often underestimated and not sufficiently addressed.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Odd Erik Gundersen (5)

Image analysis for sustainable water and land use

Description of project that this task is a part of: prosjektbanken.forskingsradet.no/#/project/NFR/289725/Sprak=en

Status: Valgbart Eget for:  Lenke: 

TrønderEnergi: Deep probabilistic time-series forecasting

Problem description

In 2020, TrønderEnergi will operate more than 200 wind turbines. State of the art ML algorithms give point predictions. They do not state how certain they are about the result. The task is to investigate machine learning methods that predict power production and provide an uncertainty estimation. A special focus will be given to evaluation.

Data

Wind turbine power production. We have more than five year of data for 50+ turbines.

Challenges

Get good probability distributions.

Status: Valgbart Eget for:  Lenke: 

TrønderEnergi: Explainable time-series forecasting

Problem description

TrønderEnergi has several forecasting systems utilizing machine learning methods in commercial operation. The systems are used and the forecasting is monitored by domain experts in the

operating center at Berkåk. The domain experts do not have any training and knowledge in the machine learning methods, but they do have to make decision based on their output. At times the experts need to understand why a forecast has the value it has. The literature has to be reviewed, prototypes should be developed and evaluated by domain experts.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

TrønderEnergi: Reproducibility of deep transfer learning models for time-series forecasting

Problem description

TrønderEnergi is conducting research on both deep transfer learning models for time-series forecasting and reproducibility. Reproducibility is a challenge for many machine learning models. Deep learning models have specific challenges in this regard. No studies have been done on the reproducibility of transfer learning models for time-series data.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Way: Personalizing a virtual driving instructor

Problem description

Way AS research and develops a virtual driving instructor that provide instructions to students learning to drive in a full-scale car simulator. Learning should be adjusted to each individual student.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Pauline Haddow (5)

Bio-inspired techniques for remote sensing

Our planet is changing, now more than ever before. Understanding these changes and how they impact the environment is crucial for preserving the Earth for the coming generations.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

bio-inspirerte metoder

Oppgavene skreddersys til studenters interesse.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Development of a novel immune-inspired hybrid classification algorithm

The immune system is arguably one of nature's most highly adaptive, distributed and self-organising systems. It has the property of being able to recognise anomalies --- something that deviates from the common rule. In 2018-2019 two masters students proposed a novel hybrid classification algorithm MAIM, combining such features of the Immune Systems with an Island Model Genetic Algorithm (IGA). The preliminary results achieved are promising and resulted in an international publication. The goal of this project is to build on this foundational work and investigate the many avenues available to further extend/refine this novel algorithm.

Contact Pauline haddow, pauline@ntnu.no for further information


Status: Valgbart Eget for:  Lenke: 

Particle Swarm Optimisation as a modelling tool for Climate Change

Particle Swarm Optimisation, where each particle may be thought of as an individual in a society of particles, provides a technique to model influences and effects in society that may prove beneficial in the battle against Climate change. This project is focussed on developing a PSO modelling

environment that enables the study how an individual may become more inclined to increase their individual contribution/sacrifice for the benefit of future populations.

contact: Pauline Haddow

Status: Valgbart Eget for:  Lenke: 

VRP with trucks and drones for Health Service package delivery

In the last years, unmanned aerial vehicles (drones) have attracted the interest of both academia and industry due to their potential to change the way transportation and logistics are tackled. Drones have the potential to significantly reduce the cost, time and reliability of last-mile deliveries. In order to manage transportation by road or air or a combination of both, a vehicle routing problem (VRP) needs to be solved. The vehicle routing problem with drones (VRPD) is an extension of VRP, where drones or a tandem strategy of trucks and drones are involved in the delivery of parcels to customers. One application area of interest is the delivery of small medical packages to inaccessible, remote or dense urban areas where such packets may include blood samples, medicines and vaccines. Such VRPD need to take into account the dynamic and uncertain nature of the application area.

Various masters projects are available within this topic and may include the application of various biological-inspired algorithms such as Genetic algorithm, Multi-objective Optimisation or Particle Swarm Optimisation.

Contact: Pauline Haddow, pauline@ntnu.no

Status: Valgbart Eget for:  Lenke: 

Svein-Olaf Hvasshovd (4)

Dronebasert sanking av sau

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Gjenfinning av sau ved hjelp av drone

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Manuell oppfølging av sau på beite

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Sporing av sau ved hjelp av enkel radioteknologi

Masteroppgave:

Sporing av sau ved hjelp av enkel radioteknologi

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Ali Shariq Imran (2)

Document compliance checking using NLP and deep learning.

Compliance checking of documents is used to check whether the document meets the standards of the organization or not. Each document is analyzed against standards. This process is manual in many organizations, which is a laborious and time-consuming task. Automated compliance checking requires the automated extraction of semantics from the text, which is a difficult task because sometimes the words are not the same used in the target document. This study aims to automate the process of such documents for compliance checking employing natural language processing

techniques and deep learning.

Status: Valgbart Eget for:  Lenke: 

Synthetic sample for extremely imbalance data

Data imbalance is a frequently occurring problem in a classification task where the number of samples in one class exceeds the amount in other classes. Quite often, the minority class data is of great importance representing concepts of interest and is difficult to obtain in the real dataset. Lack of enough data samples results in data imbalance causing poor classification performance while training. Synthetic data generation techniques such as SMOT can address this issue, yet such methods suffer from overfitting and substantial noise. This research work aims at creating an efficient data generation technique overcoming challenges posed by existing state-of-the-art methods.

Status: Valgbart Eget for:  Lenke: 

Maria Letizia Jaccheri (2)

DEVELOPING SOFTWARE FOR INCLUSION WITH NEW TECHNOLOGICAL TRENDS SUCH AS AI AND IOT (COPY)

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Software Engineering and Smart Society

The purpose of this thesis, that can be chosen as project and as thesis, by one or two students and also by several groups is to support the implementation of AI software inside the Software Development process. Each student (or couple of students) will study a sub theme of the theme SE and AI, study the literature, plan an empirical investigation to collect data from processes that involve software engineers and software companies.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Anders Kofod-Petersen (1)

Cool AI stuff

Bring your own idea. We bring AI.

Status: Valgbart Eget for:  Lenke: 

Helge Langseth (6)

Deep RL and transfer learning

This project is about investigating transfer-learning as a means to improve data efficiency for deep reinforcement learning.



[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Explainable AI (XAI)

NTNU is currently establishing a research initiative on "Explainable AI" (XAI) with a number of staff, PhD students, and a high number of industrial collaborators.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Fantasy Premier League

Fantasy Premier League (FPL) is a popular game in which you set up a team of footballers from the English Premier League, choosing your players within a specific budget. Each game-week you'll get feedback on how your players performed in terms of points. You are then given the opportunity to trade players before next game-week starts (you have one "free" trade, that can be saved up for later, and also the opportunity of making additional trades, but at the expense of point-deductions). The players' values can change from one game-week to the next, hence there is a possibility to gain (or loose) funds to be invested in new players. You need to cover all playing positions in the squad and in the team, following a certain rule-set, and so on. Finally, there are lots of extras, like choosing one player as your captain, and using so-called wildcards in clever ways (see the [website](#) for detailed rules).

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Prediction of personalized ski jumping results (AI Lab Pitch)

Background

For many, ski jumping is seen as a sport where the main objective will be to jump as far as possible. This is only part of the truth as a ski jumping competition is a point based competition based on a complex scoring system. An example of this is from the ski flying competition in Kulm in Austria the 16th of February 2020. The Norwegian Marius Lindvik jumped 242m the jump was the second longest only 0.5m behind the longest jump. Nevertheless he was placed at 13th place this round, 16.9 point behind the leader who jumped 12m shorter than him. The four variables that decide the result is a combination of jumping length, style, wind conditions and starting gate. The style of a ski jump is highly influenced by the jumping length. When jumping longer than hill size, the hill flattens out and it is extremely hard for the ski jumper to land and this highly influence the style points. By starting from a lower start gate, the ski jumper will have lower speed at the end of the inrun, which will influence the jumping length. A coach can request a gate change to a lower gate, but then the ski jumper has to jump at least 95% of the hill size to get the extra point one gets by going to a lower gate. Thus, by not jumping long enough the ski jumper will then lose speed at the end of the inrun, lose jumping meters and gain nothing.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Uncertainty-aware Deep Learning a.k.a. Deep Bayesian Learning

Description: Deep learning has been reported to improve upon previous state of the art in many traditional machine learning tasks, like image classification, recommender systems, text-to-speech, and so on. Nevertheless, there are still fundamentally problematic issues with these systems, that invite theoretical work on extensions of deep learning towards (traditional) probabilistic reasoning. This is a topic of some interest, which has lead to nice tools that can be used for implementation/evaluation, like Tensorflow Probability and Pyro (built on top of PyTorch). For typical research trends, see Part III of "The Deep Learning Book" by Goodfellow et al. The selection of interesting research question(s) in this area will depend on the students' interest.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Your very own project!

The projects I have made available are simply *proposals* for you to consider. However, the best projects come from motivated students, and if you have your own ideas regarding a project that is related to

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Frank Lindseth (4)

AI Lab Thesis Pitches related to Visual Intelligence (AI&CV)

AI Lab Thesis Pitches related to Visual Intelligence (AI/ML/DL and Computer Vision) from Industry/SINTEF/NTNU:

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

AI-agents trained by RL in simulated environments

Opptrening av virtuelle agenter i virtuelt miljø (f.eks. Unity / Isaac) ved bruk av reinforcement learning

Status: Valgbart Eget for:  Lenke: 

Autonomous vehicles (AVs), AI/ML/DL and Computer Vision (CV)

Interested in AVs, AI and CV?

Have a look [here](#)

Status: Valgbart Eget for:  Lenke: 

Digital Twins (DTs), Wearable sensors and Medical Imaging++

Interstet in Digital Twins (DTs), Wearable sensors and Medical Imaging?

Have a look [here](#)



Status: Valgbart Eget for:  Lenke: 

Ole Jakob Mengshoel (6)

Automated Engineering (AI Lab Pitch)

Description

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Evolutionary Algorithms with Applications

In AI and ML, several methods rely on stochasticity or randomization: mutation and crossover in evolutionary algorithms; dropout and stochastic gradient descent in deep learning; stochasticity in stochastic local search; and randomization in systematic search. Evolutionary algorithms (EAs), which we study here, are competitive in solving many computationally hard problems while modeling important biological phenomena. Further, EAs are interesting in that they can be studied formally, for example by means of Markov chains.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Improved Ambulance Response via Improved Placement of Resources (AI Lab Pitch)

Proposal for master thesis at Norwegian Open AI Lab, NTNU, from Norwegian National Advisory Unit for Prehospital Emergency Medicine (NAKOS), and Department of Emergency Medical Communication Centre (EMCC), Division of Prehospital Services, Oslo University Hospital.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Machine Learning with Applications

This projects focuses on machine learning and its application; in particular the areas of environment, health, medicine, and transportation are of interest. Beyond the machine learning and application dimensions, one or more of the factors safety, explainability and sustainability will typically be important.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Next Generation Responsible Gaming Solutions Driven by AI

Norsk Tipping has the ambition to be world leading within responsible gaming. As part of the company's mandate Norsk Tipping is required to provide and offer gaming activities in a safe and secure environment under public control with the aim of preventing the negative consequences of gambling. This project focuses on the use of and research on AI technologies for this purpose.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Stochastic Local Search: Algorithms and Applications

In AI and ML, several methods rely on stochasticity or randomization: mutation and crossover in evolutionary algorithms; dropout and stochastic gradient descent in deep learning; stochasticity in stochastic local search (SLS); and randomization in systematic search. SLS algorithms, which we study here, are competitive in solving computationally hard problems such as satisfiability (SAT), sparse signal recovery, scheduling, and most probable explanations in Bayesian networks (BNs). Essentially, SLS algorithms are greedy optimizers that also make random moves in order to avoid getting trapped in local but non-global optima. Further, SLS algorithms are interesting in that they can be studied formally, for example by means of Markov chains.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Rudolf Mester (15)

AI for Mobile Systems: Let us define a project after your own interests

Besides the more or less fixed topics which are found in the list, there is always the possibility to define a project according to your own interests, as long as it is scientifically solid or a real engineering challenge.



[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Building a simulation framework for autonomous driving

This project aims at creating a game engine based simulation environment for autonomous driving with a strong emphasis on physically realistic car dynamics, realistic road networks (based on OpenStreetMap), allowing for massive multi-agent simulations.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Building an intelligent mobile robot for cooperative navigation or communication

This project aims at building a mid scale mobile robot, which could use the same hardware platform as the model race cars used in the MIT model race car project <https://mit-racecar.github.io>

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 


Computer Vision in Bad Weather conditions / Bad Visibility

This project is a cooperation with a leading industrial partner that is one major player in the field of autonomous driving.


[\[Vis hele beskrivelsen \]](#)Status: Valgbart Eget for:  Lenke: 

Convolutional neural network based object tracking in drone-based inspection

This is one of three related topics originating from a cooperation between DNV GL and NTNU, addressing the task of inspecting ship tanks for cracks and similar faults, using a drone equipped with a camera.

[\[Vis hele beskrivelsen \]](#)Status: Valgbart Eget for:  Lenke: 

Detecting cracks from a stack of motion compensated drone images

[\[Vis hele beskrivelsen \]](#)Status: Valgbart Eget for:  Lenke: 

Egomotion estimation and map building for the Revolve Autonomous Race Car

This project is related to the Revolve student project aiming at building / improving an Autonomous Race Car that can participate in the international Formula Student competition. Revolve is participating to this yearly competition already for a number of years. Each year, a new version of this race car is developed, and of course it is a fundamental goal of the overall Revolve project to achieve a good rank in the annual competition.

[\[Vis hele beskrivelsen \]](#)Status: Valgbart Eget for:  Lenke: 

Environment perception for a mid scale robotic model car

The perception of the environment, the determination of drivable area, and the detection and classification of obstacles is a central task when it comes to building an intelligent mobile robot.

[\[Vis hele beskrivelsen \]](#)Status: Valgbart Eget for:  Lenke: 

Environment Perception for Underwater Robots

This project is offered in the context of a new upstarting research project which is performed as a cooperation between the cybernetics department (ITK) and computer science (IDI). The overall project AROS deals with the task to provide autonomy to the snake underwater robots developed by ITK (Prof. Kristin Y. Pettersen and colleagues). It is funded by the Norwegian Research Council.

[\[Vis hele beskrivelsen \]](#)Status: Valgbart Eget for:  Lenke: 

Multi-Camera Traffic Surveillance on Urban Crossings

This project aims at developing methods for processing synchronized video streams from multiple cameras mounted at large urban crossings. The approach to be taken should allow for a setup of such a system with a minimum of human effort, applying methods for automatically finding out about the image-to-image relationships. An example of a learning-based approach allowing this is the work of C.Conrad et al. [<https://ieeexplore.ieee.org/abstract/document/5981689>]

[\[Vis hele beskrivelsen \]](#)Status: Valgbart Eget for:  Lenke: 

Multi-Modal Thermal-Visual-Inertial Odometry in Smoke and Dust-filled Environments

In this research-intensive project you are tasked with the goal of designing a multi-modal sensor

fusion framework that exploits both visible-light and thermal camera data, as well as inertial measurements (i.e., accelerometer and gyroscope readings). The purpose of the approach is to enable resilient localization in environments that are not only GPS-denied but further degraded by the presence of dust and smoke. To achieve this goal you are tasked to utilize some type of fixed-lag estimator or possibly do extensive use of pose graph optimization techniques in combination with appropriate design of feature extraction, matching and tracking front-ends. For the latter you are encouraged to investigate a wide variety of approaches, including direct- and semi-direct methods. The designed method will be tested onboard a flying robot integrating a time synchronized visual-thermal-inertial sensing module. Field experiments will be conducted in underground environments filled with dust or smoke obscuring. It is noted that the proposed work is aligned with an ongoing project for the DARPA Subterranean Challenge (namely research activities of Team CERBERUS): <https://subtchallenge.com/>

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Object detection and multiple objects tracking in drone based inspection

This is one of three related topics originating from a cooperation between DNV GL and NTNU, addressing the task of inspecting ship tanks for cracks and similar faults, using a drone equipped with a camera.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Quantifying the reliability of results from deep neural networks

This project attempts to answer the question how reliable the mostly stunning results of deep neural networks used for classification (what kind of object is this?) or estimation (how distant is this pedestrian from my car's camera?) are.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Robust, fast and lightweight environment perception for next generation autonomous race cars

This project is related to the Revolve student project aiming at building an autonomous race car. Its purpose is to explore methods of furthering the utility of the stereo camera system used in the current vehicle, either as a fusion of LiDaR and camera, or as a pure stereo camera configuration.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Structured Deep Object Detection

The most powerful modern visual object detection approaches today are based on deep learning. They usually require large sets of labeled training data.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Patrick Mikalef (10)

Artificial Intelligence in Business: Uncovering challenges and obstacles of adoption.

The last few years have seen an explosion in interest regarding the use of Artificial Intelligence and much talk about the potential business value. Nevertheless, there is significantly less talk about the challenge's organizations will face when implementing such solutions and how they should overcome these obstacles. Inhibiting factors are not only of a technological nature but also include organizational and human factors. This project will involve collecting and analyzing data in collaboration with the researchers from the Big Data Observatory (<https://www.observatory.no>).

Status: Valgbart Eignet for:  Lenke: 

Artificial Intelligence in the Healthcare sector

Advanced forms of analytics and artificial intelligence are becoming increasingly deployed to support the work of healthcare workers. Medical doctors, nurses, and administrative staff either use, or are aided by sophisticated technologies which are posed to radically change the nature of their work. For example, radiologists now rely increasingly more on machine learning techniques to and other applications of AI to diagnose patients, while a lot of procedural and repetitive tasks are being done by machines. The objective of this project is to understand how the nature of work for health practitioners is changing, and what positive and negative consequences they experience. The thesis will be based on field work in a hospital setting and will require a thorough understanding of the work patterns of health professionals and how technology influences them.

Status: Valgbart Eignet for: + Lenke: 

Big Data Analytics: Challenges and obstacles in deployments

Over the last few years we have seen more companies trying to deploy big data analytics to outperform competition. Nevertheless, there is ongoing debate about whether such investments do indeed create value if so how this value can be captured and what are the main challenges in doing this. The objective of this master thesis is to perform a qualitative study through interviews and focus groups on companies in Norway and examine the ways in which they are applying big data analytics to create business value, the stages they go through in implementation and the obstacles they face. The project is in cooperation with the Big Data Observatory (<https://www.observatory.no>), during which you will learn how to develop research methods and analyze qualitative data.

Status: Valgbart Eignet for:  Lenke: 

Exploring the black box of AI Governance

AI governance is a notion that is often attributed to a range of different practices and processes. From establishing a process of developing AI applications, ensuring that quality outcomes are achieved, and to deciding the role and responsibilities of stakeholders. AI governance now plays an important part related to the business value that AI can deliver, and to ensuring that projects comply with ethical and regulatory frameworks. This project will seek to understand how organizations develop AI governance practices, what aspects they take into account when doing so, how they deploy them, and what the outcomes of them are at the business and project performance levels.

Status: Valgbart Eignet for:  Lenke: 

Human-Machine Symbiosis: How does decision-making change in the age of Big Data Analytics?

The nature of decision-making is changing drastically, both in personal lives and in the business sphere. An increasing amount of decisions are now based on insight that is generated through analytics. Despite this, often individuals are faced with cognitive-overload, conflicted views, or biases that result in non-adoption of insight. This project will be done in collaboration with the Big Data Observatory (<https://www.observatory.no>) and involve designing a study protocol and collecting and analyzing neurophysiological data (eye-tracking and electroencephalography) from study participants. This will be done with the help of an expert in such tools.

Status: Valgbart Eignet for:  Lenke: 

Organizational decision-making in the age of AI

Artificial Intelligence is now being used at an increasing rate to augment or automate organizational decision-making. From processes such as performing credit checks on customers of banks, aiding in forecasting of future events, and automating manual and repetitive tasks, AI is introducing a new way of making decisions for organizations. The purpose of this project is to examine through empirical methods the effects and processes of transition to AI-based decision-making structures.

Status: Valgbart Eignet for:  Lenke: 

Responsible AI in organizations

The notion of responsible AI entails a large range of aspects regarding how AI applications are developed, utilized, and monitored throughout their lifecycle. The purpose of this project is to explore what responsible AI means for organizations, which processes and structures they are establishing in order to attain set indicators of responsible AI, as well as what are the organizational impacts of it. Does adopting responsible AI result in any organizational gains? Does it influence how customers/citizens perceive the organization, or is it restricting what they can do with novel technologies?

Status: *Valgbart* Egnet for:  Lenke: 

The potential of Artificial Intelligence for public administration

While there has been a long discussion about the potential of using Artificial Intelligence in private organizations, now more and more public organizations are implementing solutions to support their operations. From uses for fraud detection, chatbots, autonomous vehicles, or infrastructure monitoring, AI is gaining ground in applications for public administration. This project will be done in connection to SINTEF Digital and will involve data collection, analysis and reporting. The aim is to find out what is the status of AI adoption, what are the potential interesting uses, and what is the value that is realized.

Status: *Valgbart* Egnet for:  Lenke: 

The Strategic Value of Big Data Analytics

Today more and more companies are using big data analytics to support or drive their business strategies. Yet, there is ongoing debate about whether such investments do indeed create value if so how this value can be captured. The objective of this master thesis is to perform a quantitative study on companies in Norway and examine the ways in which they are applying big data analytics to create business value. The project is in cooperation with the Big Data Observatory (<https://www.observatory.no>), during which you will learn how to develop research methods and analyze quantitative data.

Status: *Valgbart* Egnet for:  Lenke: 

What is the Business Value of Artificial Intelligence?

While there has been a lot of focus on the technical aspects related to artificial intelligence, recent years have seen a growing discussion about what the application of AI could be for private and public organizations. The objective of this master thesis project is to examine the readiness of private and public organizations to adopt AI, and the value they have derived from such investments. This project will involve collecting and analyzing data in collaboration with the researchers from the Big Data Observatory (<https://www.observatory.no>). It is an exciting opportunity to see how organizations are planning to use AI and what steps they need to take to adopt such technologies.

Status: *Valgbart* Egnet for:  Lenke: 

Eric Monteiro (1)

Data science - in practice

Data-driven data science is attracting a lot of interest.

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Hai Thanh Nguyen (4)

Blockchain-based Data Marketplace

The European regulations about privacy, the GDPR, is changing people's understanding and attitude towards data/information they own and those the others own. The ownership of

data/information has always been a concern but with GDPR there will be more awareness as well as more obligations related to data collection and sharing.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Decentralized AI

Nowadays, big tech giants, such as Google, Facebook, Amazon, IBM and Microsoft, are dominating the AI market by offering cloud-based AI solutions and APIs. They are collecting user data in one place through free services and systems, analyze it for insights and resell to third parties, such as advertisement companies. This model is centralized AI, which is working fine now. But in the long-run it could lead to monopolization of the AI market. This could also cause unfair pricing, lack of transparency, interoperability, privacy issues and excluding smaller companies from AI innovation. Fortunately, there is the emergence of a decentralized AI market, born at the intersection of blockchain, on-device AI and edge computing/IoT.

In this project, we will investigate the possibility to build a proof-of-concept of a decentralized AI application through blockchain, such as Ethereum. AI agents will train and learn models from their own data. The decentralized AI application to be developed in this project then can combine multiple algorithms/models (developed by different agents) performing different sub-tasks. One of possible applications is Decentralized Autonomous Cars. 1 - 2 students.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Deep Learning to combat with micro-plastic pollution

An estimated 275 million tonnes of plastic waste was produced on a global scale in 2010, with 8 million of those tonnes being introduced to the oceans - about 3% of global annual plastics waste. Once the plastic reaches the oceans, it is broken down into smaller particles (micro-plastic) by being exposed to ultra violet (UV) radiation and mechanical abrasion from wave actions [1]. The quantity of plastic waste floating at the ocean surface in 2013 was estimated to be approximately 269,000 tonnes (small macro- to micro-plastic), this estimate does not include plastic in-depth or at the seafloor). The plastic debris can affect the wildlife in multiple ways, such as entanglement-entrapping, encircling, or constricting, ingestion- accidental ingestion or ingestion of prey containing plastic, and interaction- being in contact with plastic debris [1]. It is therefore important to be able to detect and collect the plastic waste in nature, before it reaches the oceans. Once plastic waste has reached a micro-stadium, it is near impossible to collect it and remove it from the water. An analysis on deep sea locations (range from 1176 to 4843m) showed that there was an average abundance of 1 micro-plastic per 25cm³ (particle sizes ranging from 75 to 161µm) [2]

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

General Data Protection Regulation (GDPR) and opportunities it brings: analysis of my all-data and generating insights

After enforcement of GDPR (General Data Protection Regulation) (May 2018), all companies and institutions collecting data about individuals are obliged to deliver to people the data they collected about them (e.g., whatever facebook, google, amazon, insurance companies etc collects about me shall deliver the data they collected about me when I asked for it). GDPR will give a chance for people to look into her/his data stored by those companies.

So, what people can do with so much (and rich) data about themselves? It would be super hard for them to analyze, extract insights and even look into the raw data downloaded from Facebook, Google, etc..

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eignet for:  Lenke: 

Sobah Abbas Petersen (4)

Accelerating learning at the workplace

This project will focus on methods and means to accelerate the process of learning within a workplace using digital technologies; on how this can be achieved and evaluated. The project will contribute to an industrial project in the process industry that uses a simulation game to support learning. The task will include the following activities:

- Literature review and state of the art on workplace learning, to identify relevant theories and

examples from literature.

- Literature review and state of the art on accelerating learning at the workplace.
- Literature review on evaluation methods for accelerating learning at the workplace.

The expected outcome of this work will be a framework for evaluating accelerated learning at the workplace. The data from the game sessions can be analysed and used to support this work and to demonstrate the results from the project.

Status: *Valgbart* Eignet for:  Lenke: 

Games and playful interactions

This project will aim to obtain an overview of Serious Games, Gamification and playful interaction to identify the purposes of each and how they overlap and complement each other in different situations. This will be done through case studies and relevant examples. Examples of application areas will be in learning and social contexts.

Status: *Valgbart* Eignet for:  Lenke: 

Mobile Application for Global Employability Skills

This work will explore the concepts of skills and competences that are relevant in a work context and design and evaluate a mobile application to help students document their skills and competences. The tasks will include:

- A literature review of relevant concepts, relevant design and evaluation concepts.
- Explore and develop concepts and prototypes of front-end design.
- Conduct evaluations and iterative improvements, with focus on user interface and usability.

This work will be conducted within the European ERASMUS+ project GES App.

Prerequisites – prior knowledge or interest in interaction design and app development will be useful.

Status: *Valgbart* Eignet for:  Lenke: 

Modelling Smart and Sustainable Cities

ICT plays an important role as enabling technologies in the field of smart and sustainable cities. The Smart cities concept often takes on a limited view of a city and tends to focus on one or few aspects of a city. In this project, we would like to explore the possibilities of modelling a city by looking at it from a holistic way. We would use the ideas of conceptual modelling and enterprise architectures to understand a city. We would also like to explore the city as a complex system and use complex systems modelling approach to simulate how a city evolves. The outcome of the project will be a model of a city. The tasks include:

- Literature review of enterprise architectures for a smart and sustainable city.
- Literature review of how to model a city.
- Design and develop a model of a city as a complex system.

The work could be extended to a Masters project where the model would be further enhanced and evaluated.

Status: *Valgbart* Eignet for:  Lenke: 

Heri Ramampiaro (4)

Big data and AI methods for CP Diagnosis

[[Vis hele beskrivelsen](#)]

Status: *Tildelt* Eignet for:   Lenke: 

Data miningsfunksjon for AsterixDB

I denne oppgaven skal du utvikle en funksjon (User Defined Function (UDF)) for å lese inn datastrøm inn til et Big Data-håndteringssystem kalt AsterixDB (se <https://asterixdb.apache.org>). Ideen er at en slik funksjon skal kunne fungere som et verktøy for feks. klassifisering av datastrøm (som feks. Tweets) før dataen blir lagret og håndtert videre i et bigdatasystem for analyse e.l.



[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

De-identification of text documents for privacy protection

Many public & private organisations struggle to manage the personal data they gather or produce. This data may relate to patients, customers, welfare recipients, or even defendants in court cases. Such data must comply with privacy and data protection laws, such as the General Data Protection Regulation (GDPR) newly introduced in Europe. In particular, personal data cannot be distributed to third parties (or used for secondary purposes) without legal ground, such as the consent of the individuals to whom the data refers.

[[Vis hele beskrivelsen](#)]

Status: Tildelt Eget for:  Lenke: 

Utvikling av metoder for effektiv detektering av støtende ytringer

I denne oppgaven skal du/dere implementere og evaluere tekstbaserte systemer for analyse av hatefulle ytringer i sosiale media. Hovedfokus for denne oppgaven vil være å viderføre arbeidet som er gjort så langt og utvikle nye metoder som støtter flere språk enn bare Engelsk og Norsk. Se [her](#) for mer informasjon om tidlig arbeid.


Status: Valgbart Eget for:  Lenke: 

Massimiliano Ruocco (9)

Data Driven Generative Model for Cyclist Performance Simulation (In collaboration with Team INEOS) [NAIL pitch 2020/2021]

[more information [here](#)]

[[Vis hele beskrivelsen](#)]

Status: Tildelt Eget for:  Lenke: 

Deep Learning for biomass density estimation in underwater environment

Project in collaboration with Sintef Digital

Status: Valgbart Eget for:  Lenke: 

Deep Learning Models for detecting wind turbines' curtailment [Collaboration with Refinitiv 2020/2021]

[More information [here](#)]

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

GAN for CFD simulations and Wind Flow assesment in Smart Building Environment [Collaboration with UiS and NablaFlow 2020/2021]



Use of Generative Adversarial Network as a Data Driven Method for CFD simulations and wind flow assessment in smart building context.

Master Thesis in collaboration with NablaFlow and UiS.

Status: Tildelt Eget for:  Lenke: 

Generative Adversarial Network for Temporal Window imputation for Multivariate Time Series Data [NAIL pitch 2020/2021]

[more information [here](#)]



[\[Vis hele beskrivelsen \]](#)Status: *Tildelt* Eget for:  Lenke: 

Graph Neural Network for Anomaly Detection in the Telco domain [Project in Collaboration with Telenor Research]

Problem Definition

[\[Vis hele beskrivelsen \]](#)Status: *Valgbart* Eget for:  Lenke: 

Neural Language Models in Speech Recognition [NAIL Pitch 2020/2021]

[More information [here](#)][\[Vis hele beskrivelsen \]](#)Status: *Valgbart* Eget for:  Lenke: 

Prediction of Marginal CO2 emission intensity in power grid in Smart Building environment [2020/2020 project in collaboration with Sintef Community]

Problem Description

[\[Vis hele beskrivelsen \]](#)Status: *Valgbart* Eget for:  Lenke: 

Transfer Learning for Data-efficient analysis of similar IoT devices [NAIL pitch 2020/2021]

[More details [here](#)][\[Vis hele beskrivelsen \]](#)Status: *Valgbart* Eget for:  Lenke: 

Kshitij Sharma (4)

Design of a smart emotion-aware reflection system for teachers

Supervisors: Kshitij Sharma and Sofia Papavlasopoulou

[\[Vis hele beskrivelsen \]](#)Status: *Valgbart* Eget for:  Lenke: 

Design of a smart gaze-aware feedback system for programming



The focus of the thesis is to develop an intelligent feedback system that helps the students while they are programming. This help should be provided in real-time using the eye-tracking data from the student and the log data from the IDE that the student is using. The challenge is to develop a system that is both effective and efficient in helping the students when they are facing difficulties in programming medium-size software.

[\[Vis hele beskrivelsen \]](#)Status: *Valgbart* Eget for:  Lenke: 

Design of a smart stress-aware feedback system for programming.

The focus of the thesis is to develop an intelligent feedback system that helps the students while they are programming. This help should be provided in real-time using the eye-tracking data from the student and the log data from the IDE that the student is using. The challenge is to develop a system that is both effective and efficient in helping the students when they are facing difficulties in programming medium-size software.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Using Artificial Intelligence to Predict Student Performance using Eye-tracking Data and Facial Expressions

The focus of the thesis is to develop artificial intelligence pipelines to enhance the prediction of student performance in individual learning tasks, such as video-based learning, programming, assessment. The challenge is to create pipelines that are better suited for a small number of students but with high frequency data (eye-tracking and facial expressions).

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Rune Sætre (2)

A plausible way to understand simple correlations in Norwegian texts

Sticos are developing a bot called @else (<http://else.sticos.no>) to help Human Resources (HR) departments be more efficient in their work. A lot of their time is consumed by reoccurring questions from their employees and managers. For years HR software have tried to tackle this problem by using a personnel manual. However, the use of it is sparse. The problem lies in accessibility and the fact that is easier to ask the question directly and get a qualified answer to your problem on the fly.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

ChatBots - Dialog interfaces - Text / Phone

We have several systems that make it possible to ask natural language queries over Internet, by SMS or by voice over telephone about various tasks, e.g bus routes or telephone information. You can try yourself by calling +47 7352 1290, or checking <http://busstuc.idi.ntnu.no>

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Pål Sætrum (3)

Machine learning to identify consistent biological signals

Contemporary biomedical research generates large quantities of data, where each experiment's design choice contributes to a potential bias in data. More often than not, the analyses deal with the issue by analysing only a single dataset at time, as the biases are difficult to accurately describe. Ironically, combining datasets with different biases can be used to identify and eliminate the biases, and keep only the genuine biological variation.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Modeling cell-cycle phase distribution in cell cultures

The cell-cycle is a fundamental molecular process, and disruptions in this process are a hallmark of cancer. When studying eukaryotic cell cycle, the most common approach involves synchronizing a cell culture. In this method, the cells, grown in a medium, are prevented to progress through the cell cycle past a certain phase, usually through use of a chemical agent. The block is then released, and the cells are allowed to progress through the cell cycle.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Problems in bioinformatics

The [bioinformatics group](#) works on developing and using computational models to predict how changes in gene regulation can control development and cause disease. Towards this end, we develop custom algorithms, statistical simulations, and machine learning-based solutions to analyze and interpret biological data; examples of previous MSc-theses include a [genetic programming \(GP\) approach to predict microRNA target sites](#), a [support vector machine \(SVM\) approach to identify microRNA genes](#), and an [approach that combines GP and SVMs to identify related proteins](#).

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Theoharis Theoharis (13)

3D Face Reconstruction from 2D Images

3D face reconstruction is the task of transforming 2D image(s) of a face into a 3D model.

[[Vis hele beskrivelsen](#)]

Status: Tildelt Eget for:  Lenke: 

3D Face Tracking

Face Tracking is a popular research item of the Computer Vision field. Initially, face tracking was based on the extraction of hand-crafted features. The rise of deep learning networks has replaced the hand-crafted features with features automatically extracted by the deep network. Although 2D face tracking has been well studied [1-5], that is not the case for 3D data.

Up until recently, deep networks could not be sufficiently implemented in the case of 3D faces for two reasons: 1) lack of existence of large 3D face datasets and 2) deep networks cannot readily consume 3D data (3D meshes, point clouds etc.) as input.

The 1st issue has been solved with the improvement of 3D data acquisition hardware as well as software capable of producing synthetic 3D facial data [6]. More and more 3D face datasets are thus being produced [7-9].

For resolving the 2nd issue, initially, the methodologies converted the actual 3D data into a 2D modality like depth images or geometry images [10, 11]. Thus, making the data compatible with existing deep networks. This is expected to change in the near future, due to the newest machine learning trend, the so-called Geometric Deep Learning (GDL) [12]. GDL introduces deep networks that can be fed with 3D meshes, point clouds and graphs. Thus, GDL models are very interesting to be studied in order to determine whether they can achieve a performance boost in terms of 3D facial tracking, compared against the 2D case, based on standard evaluation measures.

[[Vis hele beskrivelsen](#)]

Status: Tildelt Eget for:  Lenke: 

3D Facial Recognition based on Geometric Deep Learning

[[Vis hele beskrivelsen](#)]

Status: Tildelt Eget for:  Lenke: 

Adventures in Material Point Method (MPM)

Background:

The Material Point Method (MPM) was created in 1994 by Z. Chen et al. as a method for simulating various solids, liquids and gases. In recent times MPM has seen prominent use in graphics simulations, in particular due to Disney's use of the method to simulate snow in Frozen.

[[Vis hele beskrivelsen](#)]

Status: Tildelt Eget for:  Lenke: 

Animation on the GPU

Animation is an integral part in many 3D applications, especially those who require interactivity. Animation can be thought of as transformations changing over time, giving the illusion of motion for the objects being transformed.

[[Vis hele beskrivelsen](#)]

Status: *Tildelt* Eget for:  Lenke: 

Anti-aliasing in Ray Tracing

Background:

[[Vis hele beskrivelsen](#)]

Status: *Tildelt* Eget for:  Lenke: 

Define your own project in Visual Computing

Open to students who have a strong interest and an idea for a project in Visual Computing.

One or more students will be chosen based on their performance in the Visual Computing courses and the suitability of their proposal.

Requirements:

TDT4195 and preferably TDT4230 and/or TDT4265

Status: *Valgbart* Eget for:  Lenke: 

Geometric Transformations in WebGL

In computer graphics teaching there is a need to visualize concepts in order to effectively communicate details.

Computer graphics is visual by nature and thus concepts might be easier to grasp if they are visualized.

In addition, an interactive experience would help students to 'learn by doing'.

[[Vis hele beskrivelsen](#)]

Status: *Tildelt* Eget for:  Lenke: 

Landscape Modelling Simulation based on User Defined Properties

Landscape modelling is a field with a lot of research done and an increasing demand. The process of designing, modelling and rendering realistic landscapes is a time consuming job and this project aims to improve this process. By automatically generating realistic landscapes and let a designer influence how the terrain is generated could save the designer a lot of time and possibly deliver better results. There are many approaches on how to generate these landscapes and lately there has been a focus on the cooperation between the designer and the software generating the landscape. Some approaches uses real landscape data and machine learning while an other approach is to simulate the world to create the landscape.

[[Vis hele beskrivelsen](#)]

Status: *Tildelt* Eget for:  Lenke: 

Ray tracing visualization in VR

The goal of this project is to create an interactive visualization of ray and path tracing that a user can explore in VR. Ray tracing concepts can be hard to learn from descriptions or flat figures, so this project aims at providing an intuitive understanding of ray tracing by letting the user directly "follow" a ray of light on its journey throughout a 3D scene. The application will be made in Unity and will consist of one or more scenes that the user can explore. In addition to ray tracing, general concepts from computer graphics like vector math can also be visualized.

Components:

- Literature review of ray and path tracing
- Writing a path tracer from scratch to gain firsthand knowledge about the intricacies of ray tracing
- Creating the Unity VR visualization of ray tracing

Requirements:

- TDT4230
- Programming with OpenGL and Unity

Status: *Tildelt* Eget for:  Lenke: 

Real time volumetric smoke with ray tracing

Volumetric rendering of smoke, clouds and fog is utilized to create photo realistic scenes in computer graphics. However these techniques are offline due to their computational cost. With modern hardware Ray Tracing becoming closer to mainstream, there appears to be potential for real-time volumetric smoke simulation methods.

[[Vis hele beskrivelsen](#)]

Status: *Tildelt* Eget for:  Lenke: 

Real-time Path Tracing

Goal

The main focus of this thesis is to deliver a system for real-time path tracing based on the current state-of-the-art. More specifically, the following list presents the primary goals:

[[Vis hele beskrivelsen](#)]

Status: *Tildelt* Eget for:  Lenke: 

Single view 3D reconstruction for robotic grasping of 3D objects

Robotic grasping is a complex operation that tries to imitate the way humans grasp objects. For robotic grasping to work, it is necessary for the robot to know the shape of the object to be grasped. Humans can usually infer this shape from a single view, based on previous knowledge and experience. Making robots infer shape from a single view is the aim of this thesis, which includes the following components:

[[Vis hele beskrivelsen](#)]

Status: *Tildelt* Eget for:  Lenke: 

Hallvard Trætteberg (2)

[Learning2Program] Learning Analytics for TDT4100

Læringsanalyse er systematisk innsamling og analyse av data om læringsaktiviteter og sammenhengen med læringsutbytte. Målet er å få mer innsikt i hva som skaper god læring og bruke det til å forbedre våre emner.


[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Eget for:    Lenke: 

[Learning2Program] Læringsstøtte vha. læringsanalyse

Læringsanalyse (learning analytics) er teknikker for å samle inn og analysere data om læringsprosessen, så en kan gi bedre læringsstøtte. Vi jobber med å ta dette i bruk i TDT4100 og andre programmeringsfag.

[[Vis hele beskrivelsen](#)]


Status: Valgbart Eget for:  Lenke: 

Gunnar Tufte (4)

Hybrid biological/digital computing machines

At the computing group biological/digital hybrid machines is a recent approach to unconventional computing machines. The [morphogenetic engineering](#) initiative and the [NTNU Cyborg project](#) are project including such hybrid computers.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Learning in ,or learning from, self-organizing growing neural network

Keywords: ANN methods and principles, bio-inspired design, evolution, development, genetic algorithm, self-organization, c/c++.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

On the properties of self-organizing growing neural networks

Keywords: ANN methods and principles, bio-inspired design, evolution, development, genetic algorithm, self-organization, c/c++.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Self-organizing nanosystems: a discrete modeling approach

This project is connected to the research project [SOCRATES](#).

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Tiago Veiga (3)

Learning control policies to actuate in Trondheim's air quality

Under the AI4EU project (<https://www.ai4eu.eu>) a urban simulator of Trondheim is being developed, based on the SUMO traffic simulator. SUMO is an open source traffic simulator that is developed to simulate realistic road networks. As a side effect it also models the pollutant emissions of vehicles which allows us to model the effect of traffic pollution in an urban scenario. Traffic data is publicly available which can be inputted to the traffic simulator and obtain realistic simulated traffic patterns. This simulator serves as a tool that captures the realistic patterns of air quality data and can be used as an environment to train autonomous agents, both in what concerns to improve air quality levels and the quality of the information on pollution levels. Therefore, the goal of this thesis is the deployment of agents that learn, through reinforcement learning or other planning algorithms, from data coming from this simulator. The goal of the agent can be defined on the setup of the project. Some examples are:

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Optimal placement of air quality sensors

As part of the AI4IoT pilot, a network of air quality low-cost sensors have been deployed throughout the city of Trondheim, with the goal of improving the spatial coverage of air quality information in the city, in comparison to the few industrial sensors previously available.. In this type of scenarios, sensor placement and coverage is crucial to improve the information available in the system and may depend on several factors, including the objectives of the system designer. For instance, the minimal set of sensors to cover a given area, how to place sensors such that the information lost in

case of failures is minimal, among others. Therefore, the goal of this thesis is to investigate the sensor placement/coverage problem applied to air quality sensors. Air quality sensors have an added interest in that coverage is not necessarily a well-defined measure (as it is for cameras, for instance) and the preparation of the project will have to investigate how to measure it, as well. Moreover, we have available a urban simulator which models pollution patterns in the city (from traffic and other sources) which can be used as a testing environment for the developed methods during the thesis.

For more information on the topic, feel free to contact Tiago Veiga (tiago.veiga@ntnu.no) or Kerstin Bach (kerstin.bach@ntnu.no).

Status: Valgbart Eignet for:  Lenke: 

Transferring calibration models between low-cost air quality sensors

As part of the AI4IoT pilot, a network of air quality low-cost sensors have been deployed throughout the city of Trondheim, with the goal of improving the spatial coverage of air quality information in the city, in comparison to the few industrial sensors previously available. While the additional data allows us to gather new information not available before, low-cost sensors are noisier and less reliable. Among others, two of the most important related to that are: 1) how to calibrate a low-cost sensor to provide measurements as good as possible when compared to a reference; 2) how to use low-cost sensors to compute air quality predictions. Calibrations can be based on physical models or data-driven. Whatever the option it must be assessed against a reference sensor, typically a more expensive, industrial sensor. In Trondheim, only a few of these are available and two of the newly deployed low-cost sensors have been co-located on the same location as a reference sensor. At these locations, we can compute calibration/prediction models with the reference data as target. Therefore, the question to be investigated in this thesis is: how to transfer a calibration/prediction model between sensors which don't have a near reference in the network? Besides air quality data, other related data is publicly available (weather, traffic, etc) and can be taken into account in the project.

For more information on the topic, feel free to contact Tiago Veiga (tiago.veiga@ntnu.no) or Kerstin Bach (kerstin.bach@ntnu.no).

Status: Valgbart Eignet for:  Lenke: 

Zhirong Yang (6)

A meta learning algorithm for supervised learning

Meta learning is a subfield of machine learning where automatic learning algorithms are applied on metadata about machine learning experiments. We consider a new approach to meta learning for supervised supervised learning. Given a set of supervised training examples, and an algorithm (e.g. convolutional neural network with back propagation using stochastic gradient descent) for supervised learning, we will develop a meta learning algorithm that supervises the supervised learning algorithm.

In a typical modern supervised learning algorithm, a set of supervised training examples is provided, and the supervised learning algorithm proceeds through several iterations. For each iteration it is presented with a randomly selected subset of the training examples (i.e. minibatches), and the error is computed and corrected through e.g. back propagation using stochastic gradient descent. This random selection of subsets provides regularization, but may be considered a feedforward selection with respect to the performance of the supervised learning algorithm at a given iteration. Feedforward implies no feedback. Regardless of how well or bad the supervised learning algorithm performs on a minibatch, the next minibatch will be the same. We suggest that there may be a better approach.

The meta learning algorithm we propose is for supervised supervised learning. The core concept is to select samples to include in minibatches based on the performance of the supervised learning algorithm on these samples. Hence there is feedback between the supervised learning algorithm and the selection of sample subsets. We propose that this will provide more robust learning with greater generalization ability and faster training time.

The Master's thesis candidate will:

- Implement a meta learning algorithm for supervising supervised learning algorithms on the standard MNIST, CIFAR-10 and CIFAR-100 data sets and compare its training time and generalization ability with regular supervised learning using the same neural network architecture.
- Test the meta learning algorithm on fish species classification data sets provided in the SMARTFISH H2020 project.
- Test the meta learning algorithm on robot learning from demonstration using a hardware setup provided in the Neodroid project.

Co-supervisor John Reidar Mathiassen will provide the candidate with more in-depth details of the meta learning algorithm.

Status: *Tildelt* Egnet for:  Lenke: 

Application of machine learning to ILI data denoising

The project is for Master thesis work at AkerSolutions

[[Vis hele beskrivelsen](#)]

Status: *Tildelt* Egnet for:  Lenke: 

Automatic hierarchical sequence segmentation

Given a sequence of nodes and their neighboring similarities, can you segment the nodes automatically?



[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Stochastic Multiplicative Updates

This is a project on basic research. We focus on a fundamental optimization problem in machine learning. Successfully solving this problem will improve a wide range of tasks, for example, cluster analysis, topic discovery, signal processing, recommendation.

[[Vis hele beskrivelsen](#)]

Status: *Tildelt* Egnet for:  Lenke: 

The intelligent decision-making process for hydro scheduling

Objective:

The objective of this thesis is to apply machine learning techniques to hydropower production scheduling data and perform case studies to assess the effectiveness of such techniques.


[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Visualization aided cluster analysis

Cluster analysis is one of the the fundamental tasks in machine learning and data mining. It is used in a wide range of applications such as biology, medicine, world wide web, chemistry, climatology, finance, and social science. In practice, data is often distributed in curved manifolds and the number of clusters is unknown. Conventional clustering methods do not handle such situations. In the project we will attack the problem by using visualization techniques, especially modern nonlinear dimensionality reduction, to facilitate human in the loop of cluster discovery.

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Özlem Özgöbek (3)

Fake News (Disinformation) Detection


The impact of news articles on the society can not be underestimated and as the number of online news are increasing, distinguishing the fake news from real news is becoming a challenge for people. This project focuses on analyzing and tracking news articles from different news sources or social media channels, in order to find an efficient way of detecting fake news.

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Egnet for:  Lenke: 

Privacy in recommender systems

This project focuses on the privacy issues on recommender systems and explores the ways of developing a privacy aware recommender systems. Details can be discussed with the students.

Status: *Valgbart* Egnet for:  Lenke: 

Recommender systems for higher education

Recommender systems are systems that automatically generate suggestions for the users, mostly in a personalized way. Building recommender systems may require different methods from machine learning to natural language processing, depending on the domain and the approach.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Pinar Öztürk (5)

Computer vision for road maintenance - for municipality

Trondheim Kommune (TK) has one car equipped with a roof mounted 4K camera. The car drives around the city on various assignments and records while driving. Currently the 4K camera is out of order, however, we have data from multiple trips on the same road segment for a period of 4 months from the beginning of 2020.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Discovering unknown pollutants: Bridging machine learning with data on chemistry&biology

This project aims towards the development of an artificial intelligence/machine learning (AI/ML) to identify unknown pollutants in environmental samples.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Evolutionary game theory for Public Good Games – Data sharing

The problem of cooperation has been studied in game theory for long time with a focus on Prisoners dilemma which is a 2-player game. This project topic is about N-player games and focuses on studying and developing mechanism for the emergence of cooperation in societies. There are some known reasons why people “defect” instead of cooperation. There are reasons why they cooperate. This project aims to understand the incentive mechanisms underlying cooperation and to understand their dynamics. This is particularly important for production of public goods. There are many examples of this overarching problem. Here is one: There is a specific platform for sharing data which may help people in their daily life. This happens only if many people share the data. However, sharing data has a cost (e.g., takes time or may have cognitive load) as well as the benefit from having access to such data. A rational agent would just use the platform for getting the information and let the others do the data-sharing job. The research question is what kind of mechanisms can promote cooperation.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Mining Feature-sets for Detection of Bias and Discrimination in Data - For Fair AI.

This project is about discovering feature sets in data that creates discrimination in decision-making AI systems. Discrimination is a problem that the Field of Fairness in AI needs to deal with. It has been shown that existing AI system that rely on models trained with arbitrary dataset may discriminate certain groups of people when they are used for decision making in the process of hiring people, approving bank loan, etc. The decisions are often unadventurous for a group with a (set of) shared attributes, e.g., skin colour, gender, age, etc.

[[Vis hele beskrivelsen](#)]

Status: Valgbart Eget for:  Lenke: 

Using multi-objective optimization to meet fairness and justice requirements from AI

Ethical issues in Artificial intelligence and machine learning has become a hot topic in the last couple of years. It is a very complicated and broad issue. This project focuses only on one

dimension of it: fairness. It is known that human beings make discrimination in employee hiring situation and evaluation of bank loan applications on the basis of gender, ethnic origin, race, etc. Computer systems using machine learning (ML) methods are found to repeat the same kind of discrimination.

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Eget for:  Lenke: 

Trond Aalberg (1)

Informasjonsgjenfinning i semantiske data

Semantisk web data brukes på flere og flere områder og kjennetegnes av å være en lavnivå representasjon av data med eksplisitt semantisk typing. Data lagres typisk i triple-stores og aksesseres med spørringer i sparql. Dette gjør at informasjonen er vanskelig tilgjengelig uten dedikerte applikasjonsspesifikk programvare.

[[Vis hele beskrivelsen](#)]

Status: *Valgbart* Eget for:  Lenke: 