Medisinsk AI

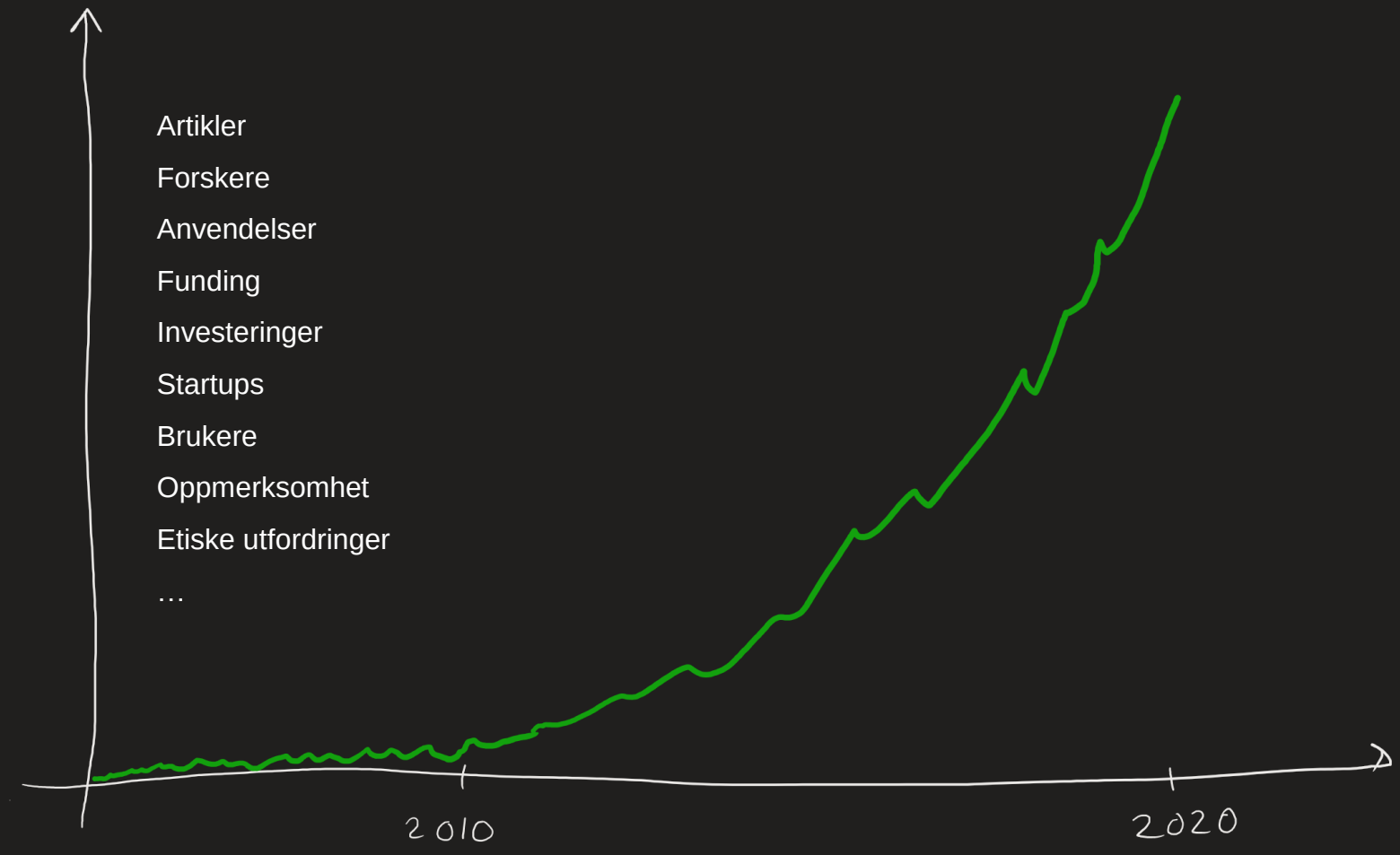
ELMED219 motivasjonsforelesning #2

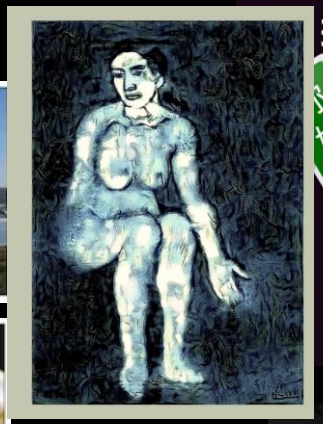
Alexander S. Lundervold, lundervold.net

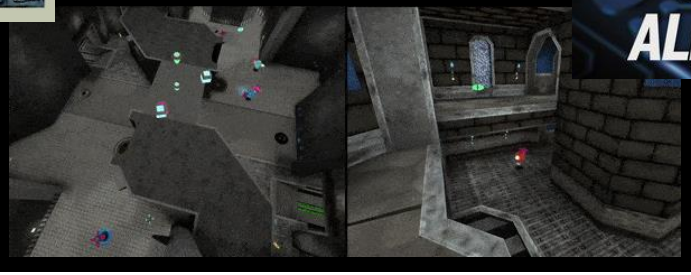
Kunstig intelligens

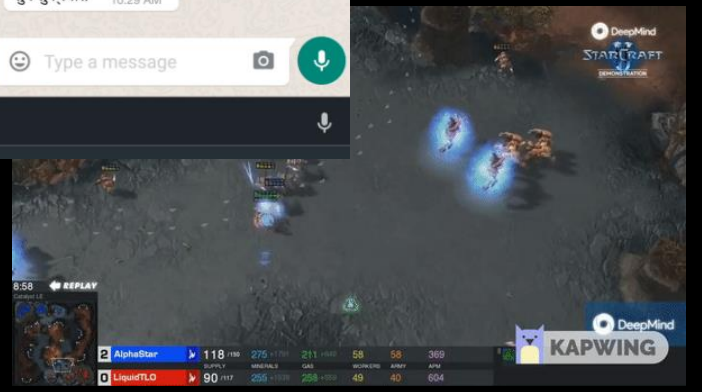
Maskinlæring

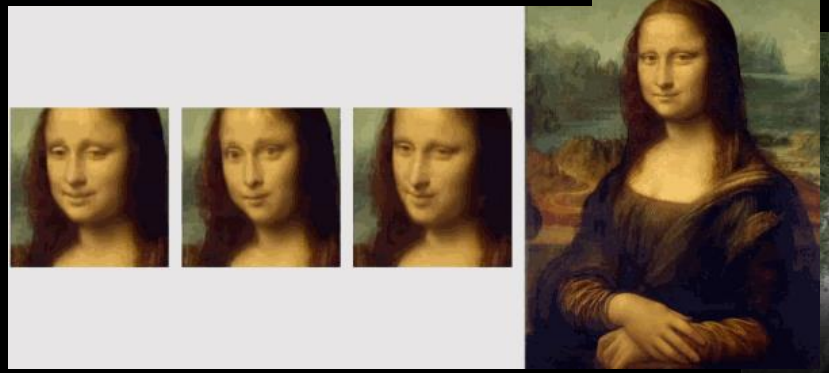
Deep learning

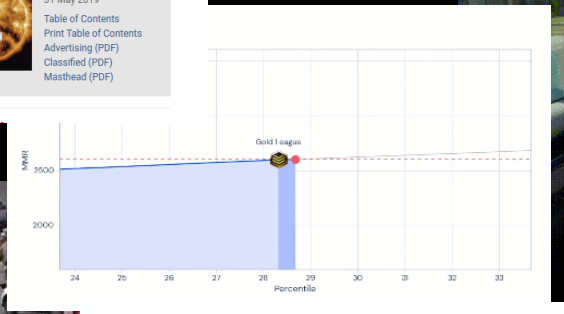


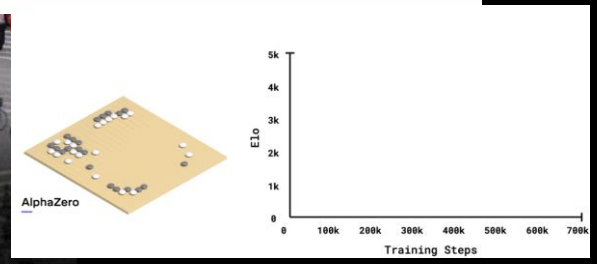












Attributions for illustrations used in the presentation are available upon request

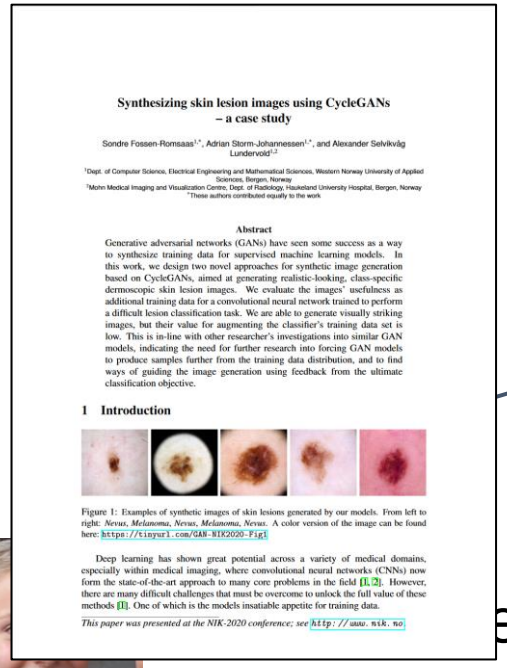
AI i medisin


Object Detection - NvDriveNet detection
car
suv-truck
suv-truck
suv-truck
car
Front:
car
car
suv-truck
car
Rear :


S 146.95

Generiske teknikker

All utvikling potensielt anvendbar innen medisin



Synthesizing skin lesion images using CycleGANs – a case study

Sondre Fossen-Romsaas[1,*], Adrian Storm-Johannessen[1,*], and Alexander Selvikvåg Lundervold[1,2]

[1]Dept. of Computer Science, Electrical Engineering and Mathematical Sciences, Western Norway University of Applied Sciences, Bergen, Norway
[2]Mohn Medical Imaging and Visualization Centre, Dept. of Radiology, Haukeland University Hospital, Bergen, Norway
[*]These authors contributed equally to the work

Abstract

Generative adversarial networks (GANs) have seen some success as a way to synthesize training data for supervised machine learning models. In this work, we design two novel approaches for synthetic image generation based on CycleGANs, aimed at generating realistic-looking, class-specific dermoscopic skin lesion images. We evaluate the images' usefulness as additional training data for a convolutional neural network trained to perform a difficult lesion classification task. We are able to generate visually striking images, but their value for augmenting the classifier's training data set is low. This is in-line with other researcher's investigations into similar GAN models, indicating the need for further research into forcing GAN models to produce samples further from the training data distribution, and to find ways of guiding the image generation using feedback from the ultimate classification objective.

1 Introduction

Figure 1: Examples of synthetic images of skin lesions generated by our models. From left to right: *Nevus*, *Melanoma*, *Nevus*, *Melanoma*, *Nevus*. A color version of the image can be found here: https://tinyurl.com/GAN-NIK2020-Fig1

Deep learning has shown great potential across a variety of medical domains, especially within medical imaging, where convolutional neural networks (CNNs) now form the state-of-the-art approach to many core problems in the field [1, 2]. However, there are many difficult challenges that must be overcome to unlock the full value of these methods [3]. One of which is the models insatiable appetite for training data.

This paper was presented at the NIK-2020 conference; see http://www.nik.no

MAYO CLINIC

Medical Image Synthesis for Data Augmentation and Anonymization Using Generative Adversarial Networks

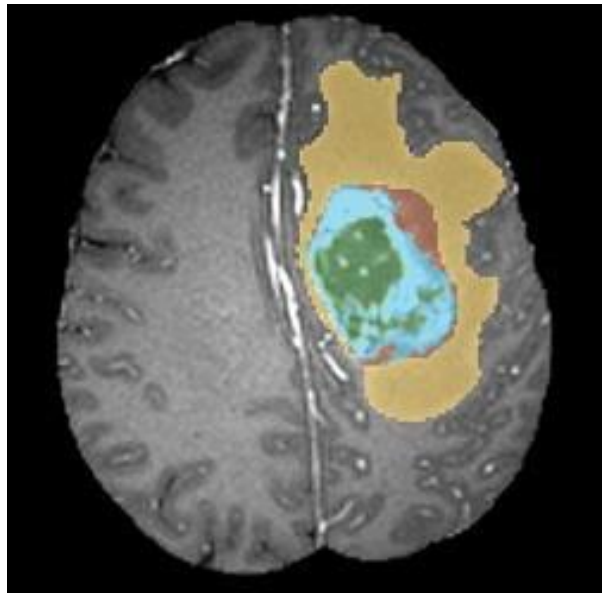
Authors | Authors and affiliations

Hoo-Chang Shin, Neil A. Tenenholtz, Jameson K. Rogers, Christopher G. Schwarz, Matthew L. Senjem, Jeffrey L. Gunter, Katherine P. Andriole, Mark Michalski

eneriske teknikker

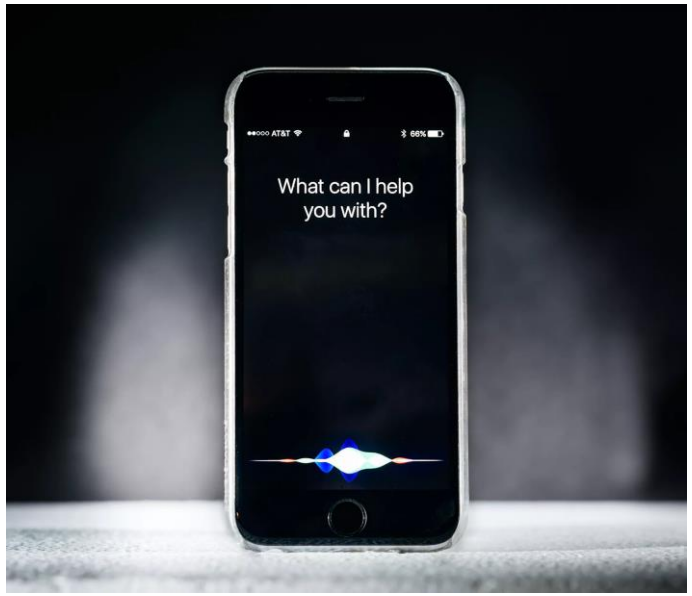
All utvikling potensielt anvendbar innen medisin

Fake!



Fake!

https://thispersondoesnotexist.com/



Generiske teknikker

All utvikling potensielt anvendbar innen medisin

PhoneMD:
Learning to Diagnose Parkinson's Disease from Smartphone Data

Patrick Schwab
Institute of Robotics and Intelligent Systems
ETH Zurich, Switzerland
patrick.schwab@hest.ethz.ch

Walter Karlen
Institute of Robotics and Intelligent Systems
ETH Zurich, Switzerland
walter.karlen@ieee.org

Parkinson's fra stemmetremor

KoKom IMMIV Høgskulen på Vestlandet

HELSE BERGEN HELSE VEST IKT

Helsetenesteutvikling, FoU

Artificial intelligence (AI) support in stroke calls

Relevance to the call

While the application of artificial intelligence (AI) within healthcare has seen a huge surge of interest during the last few years, its use in acute care medicine has been limited. Care takers in emergency medicine need to make rapid assessments in a critical setting, where evaluation of patient behavior and symptoms combined with patient history and clinical information usually is necessary for making quick decisions. To provide assistance in these decision processes this project will explore the use of AI to combine all information available in the emergency setting and thus contribute to and expand current knowledge in the field.

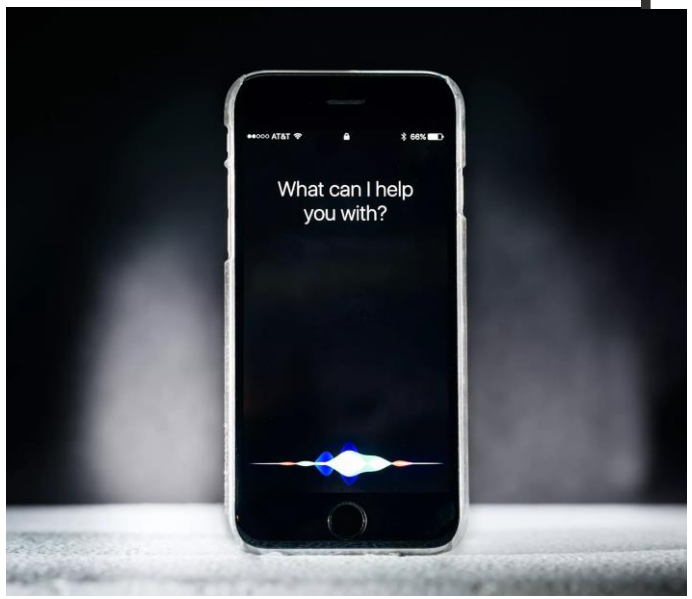
The project will be a joint effort from a wide variety of organizations and research environments encompassing representatives from research within AI and machine learning, clinical research, IT and emergency medicine.

1. Excellence

In Norway, the national medical emergency number 113 is run by 16 emergency medical communication centers (EMCC). Emergency telephone calls typically contain a vast amount of information that the medical dispatcher must rapidly decipher to draw a conclusion about the

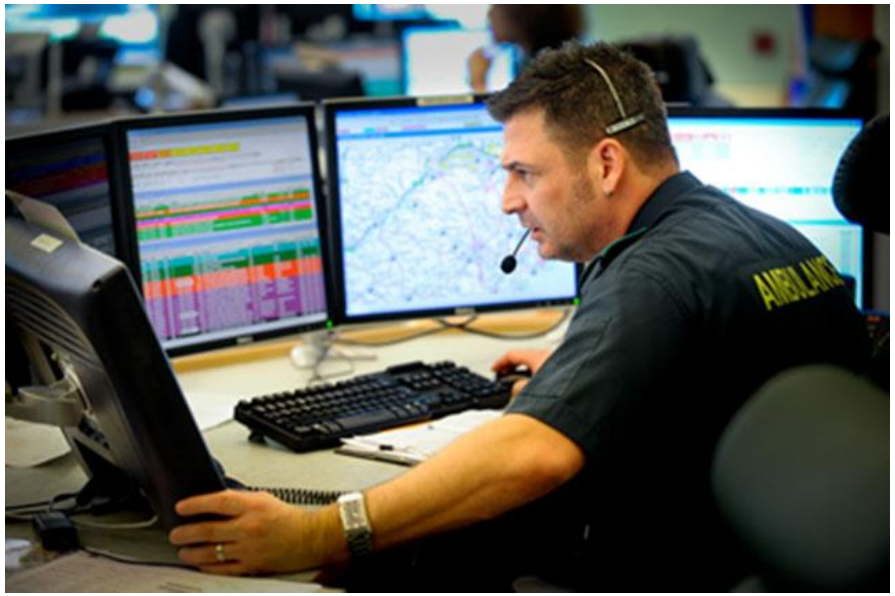
achine learning as a supportive tool to recognize cardiac rest in emergency calls

Nikolaj Blomberg[a,b,*], Fredrik Folke[a,b,c], Annette Kjær Ersbøll[d], Helle Collatz Christensen[a], stian Torp-Pedersen[e,f], Michael R. Sayre[g], Catherine R. Counts[g], Freddy K. Lippert[a,b]



Generiske teknikker

All utvikling potensielt anvendbar innen medisin



AMK: klassifikasjon fra lyd

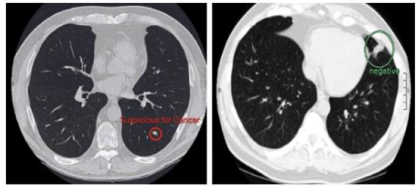
Skin cancer can't hide from deep-learning diagnostics

May 21, 2019 | Dave Pearson | Diagnostics

AI

Google's lung cancer detection AI outperforms 6 human radiologists

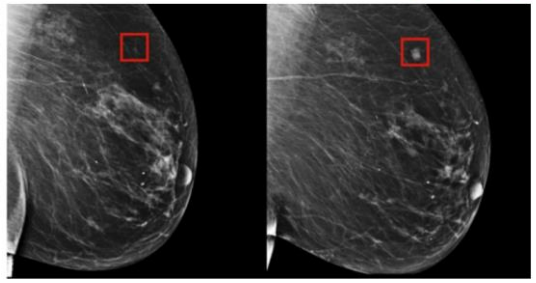
KHARI JOHNSON @KHARIJOHNSON MAY 20, 2019 8:00 AM



Deep Learning Model Can Predict Breast Cancer up to Five Years in Advance

The system will help develop individual risk management plans.

By Jessica Miley
May 24th, 2019



MIT

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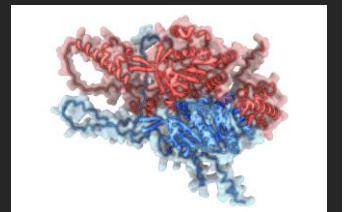
HOME > NEWS > ALL NEWS > AI CRACKS THE CODE OF PROTEIN COMPLEXES—PROVIDING A ROAD MAP FOR NEW DRUG TARGETS

NEWS | BIOLOGY

AI cracks the code of protein complexes—providing a road map for new drug targets

Software maps thousands of the partnered proteins that govern cell biology



11 NOV 2021 · 2:00 PM · BY ROBERT F. SERVICE

New Results

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Protein complex prediction with AlphaFold-Multimer

Richard Evans, Michael O'Neill, Alexander Pritzel, Natasha Antropova, Andrew Senior, Tim Green, Augustin Žídek, Russ Bates, Sam Blackwell, Jason Yim, Olaf Ronneberger, Sebastian Bodenstein, Michal Zielinski, Alex Bridgland, Anna Potapenko, Andrew Cowie, Kathryn Tunyasuvunakool, Rishub Jain, Ellen Clancy, Pushmeet Kohli, John Jumper, Demis Hassabis

doi: https://doi.org/10.1101/2021.10.04.463034

NEWS | 30 November 2020

'It will change everything': DeepMind's AI makes gigantic leap in solving protein structures

Powerful antibiotic discovered using machine learning for first time

Team at MIT says halicin kills some of the world's most dangerous strains

Skin cancer can't hide from deep-learning diagnostics

May 21, 2019 | Dave Pearson | Diagnostics

NEWS CAREERS JOURNALS

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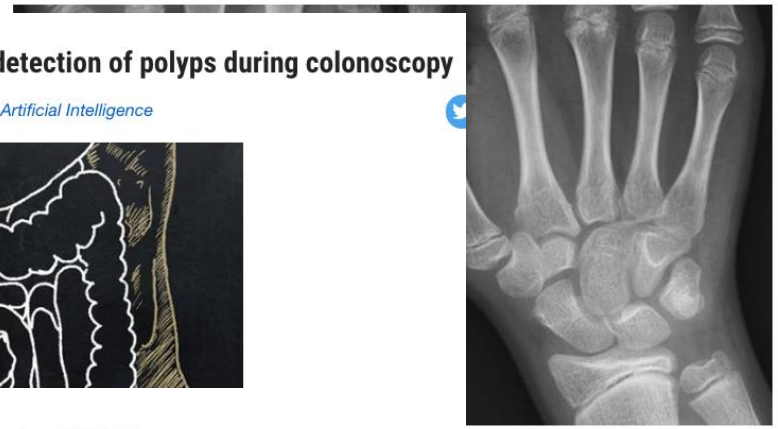
FDA Approves AI Tool That Can Detect Wrist Fractures

The FDA has approved a new tool that can improve the accuracy of wrist fracture diagnosis.

By Jessica Miley
May 28th, 2018



Deep learning improves detection of polyps during colonoscopy

November 07, 2018 | Matt O'Connor | Artificial Intelligence

Nevit Dilmen/Wikimedia Commons

ME > NEWS > ALL NEWS > AI CRACKS THE CODE OF PROTEIN COMPLEXES—PROVID

WS | BIOLOGY

AI cracks the code of prote
–providing a road map for

oftware maps thousands of the partnered proteins

NOV 2021 · 2:00 PM · BY ROBERT F. SERVICE

Results

tein complex prediction with AlphaFold-Multimer

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bastian Bodenstein, Michal Zielinski, Alex Bridgland, Anna Potapenko, Andrew
athryn Tunyasuvunakool, Rishub Jain, Ellen Clancy, Pushmeet Kohli, John
emis Hassabis

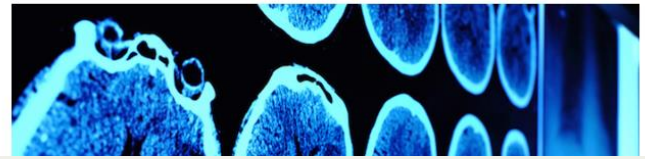
https://doi.org/10.1101/2021.10.04.463034

rticle is a preprint and has not been certified by peer review [what does this mean?].

Science LOG IN

Deep Learning Tool Identifies Disease Markers of Alzheimer's

A deep learning tool was able to rapidly detect markers of Alzheimer's disease in human brain tissue.



NOVEMBER 15, 2017

Stanford algorithm can diagnose pneumonia better than radiologists

Stanford researchers have developed a deep learning algorithm that evaluates chest X-rays for signs of disease. In just over a month of development, their algorithm outperformed expert radiologists at diagnosing pneumonia.

BY TAYLOR KUBOTA

Stanford researchers have developed an algorithm that offers diagnoses based off chest X-ray images. It can diagnose up to 14 types of medical conditions and is able to diagnose pneumonia better than expert radiologists working alone. A paper about the algorithm, called CheXNet, was published Nov. 14 on the open-access, scientific preprint website arXiv.

"Interpreting X-ray images to diagnose pathologies like

Deep learning predicts OCT measures of diabetic macular thickening

Exudates in the macula showing clinically significant macular edema (CSME) can be deceiving for the diagnosis of abnormal macular thickening. Left: Color fundus photo shows exudates indicating CSME, with associated CST <250 um. Right: CFP shows no CSME, but has associated CST >250 um. (Images courtesy of Jeffrey Wilks, MD, PhD)

By Steve Lenier
May 21, 2019

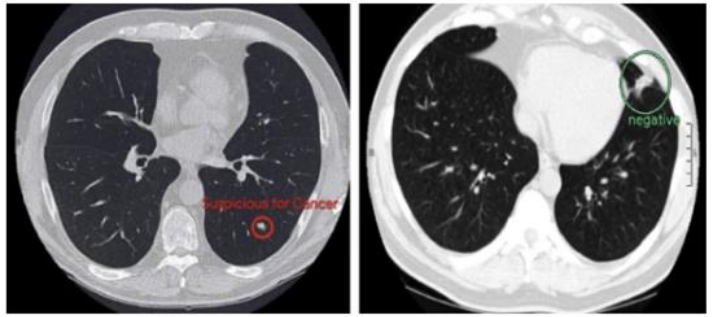
Deep learning detects ACL tears on MRI sir

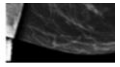
May 17, 2019 | Matt O'Connor | Artificial Intelligence

AI

Google's lung cancer detection AI outperforms 6 human radiologists

KHARI JOHNSON @KHARIJOHNSON MAY 20, 2019 8:00 AM





Novel Molecules Designed by Artificial Intelligence May Accelerate Drug Discovery

TOPICS: Artificial Intelligence Biotechnology InSilico Medicine

Zeitschrift für Medizinische Physik

Volume 29, Issue 2, May 2019, Pages 102-127

Review

An overview of deep learning in medical imaging focusing on MRI

Alexander Selvikvåg Lundervold [a, b], Arvid Lundervold [a, c, d]

Show more

https://doi.org/10.1016/j.zemedi.2018.11.002

Abstract

What has happened in machine learning lately, and what does it mean for the future of medical image analysis? Machine learning has witnessed a tremendous amount of attention over the last few years. The current boom started around 2009 when so-called deep artificial neural networks

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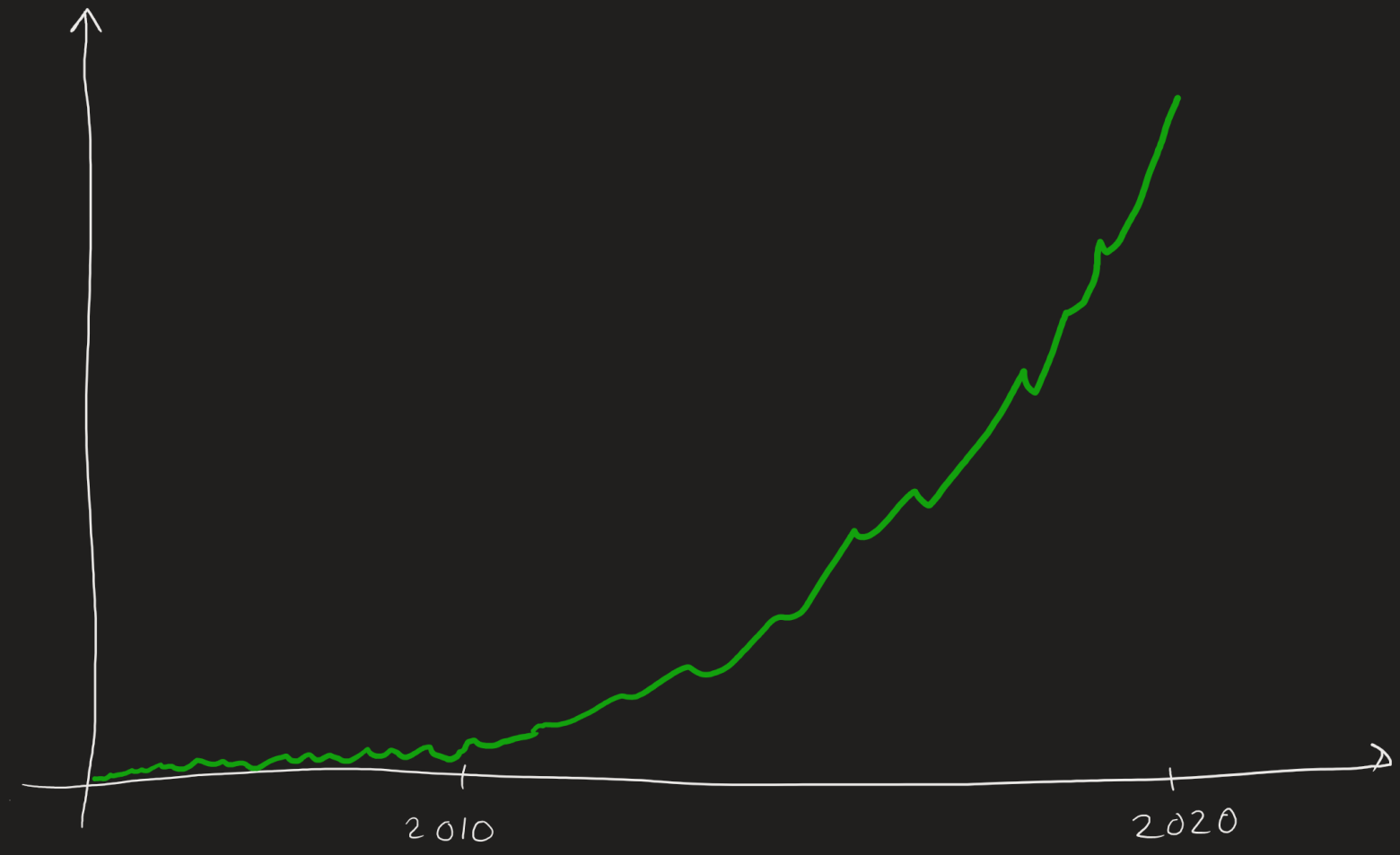
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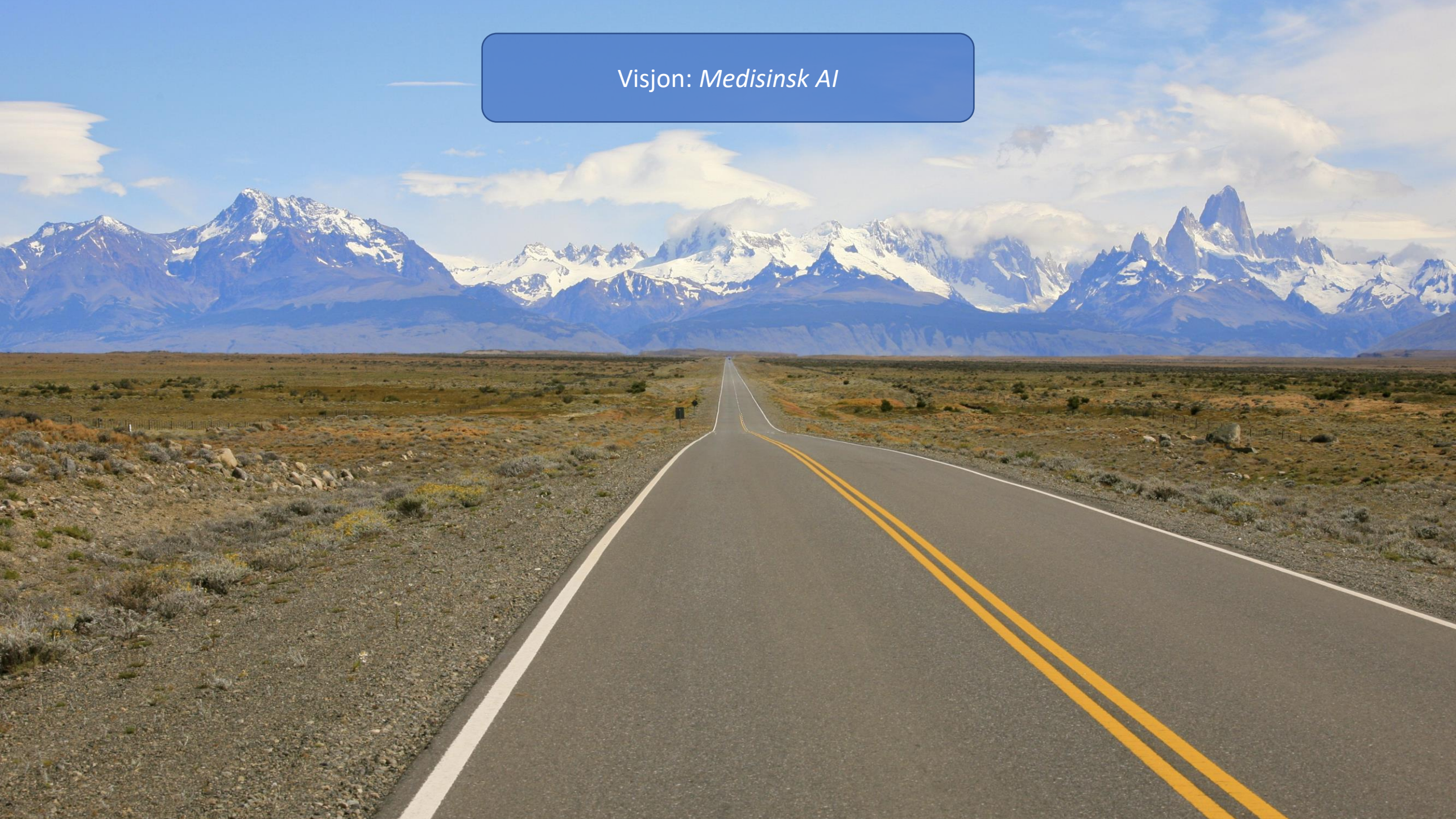
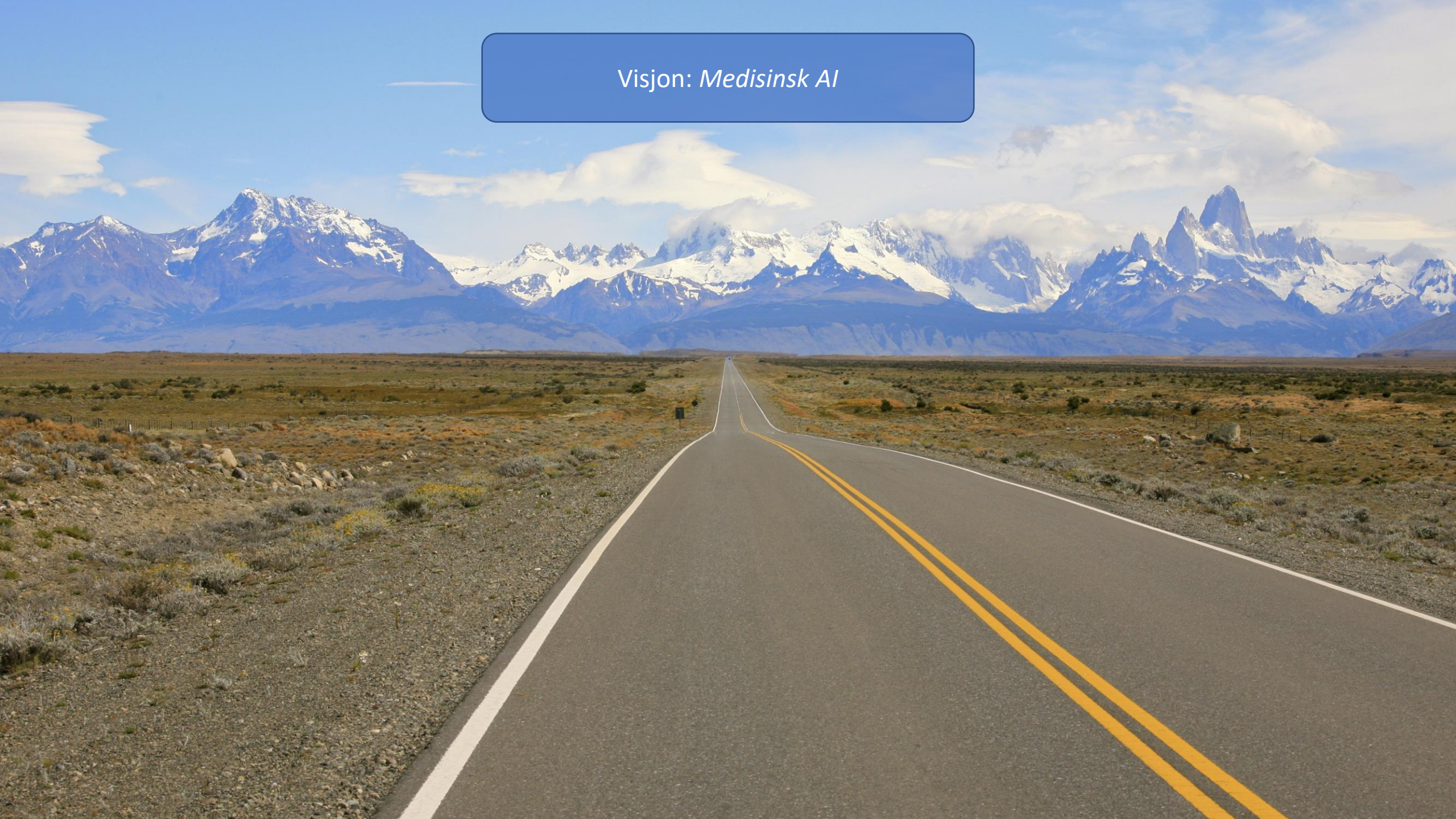

Visjon: *Medisinsk AI*

Definisjon av «Medisinsk AI»

Definisjon av «Medisinsk AI»

- Intet «AI-system» kan løse problemer innen medisin og helse uten mange ikke-AI-komponenter
- *Beregningsorientert medisin*
- Medisinsk ekspertise
- Teknologi og ekspertise fra *software engineering*, *data science*, maskinlæring, helseinformatikk
- Kompleks infrastruktur
- Etikk & regulering
- …


Visjon: *Medisinsk AI*

Visjon: *Medisinsk AI*

REVIEW ARTICLE | FOCUS

https://doi.org/10.1038/s41591-018-0300-7

nature medicine

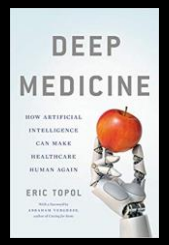
High-performance medicine: the convergence of human and artificial intelligence

Eric J. Topol

7. januar 2019

Eric Topol, MD

«almost every type of clinician [...] will be using AI technology, and in particular deep learning, in the future»



Eric Topol, Nat. Medicine, Jan 7 2019

Stem cell and regene-rative medicine	Digital health data and registries	Wearable health/ assisitive living technology	Mental health and well-being	Pre-hospital services/ home nursing	Radiology, Laboratory Digital Pathology	Novel drug discovery	Disease and patient stratificatiion	Patient safety and risk	Hospital manage-ment

Deep medicine

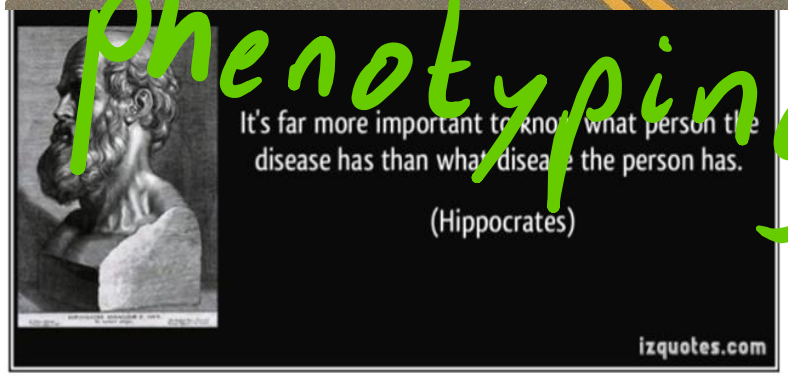
Deep phenotyping

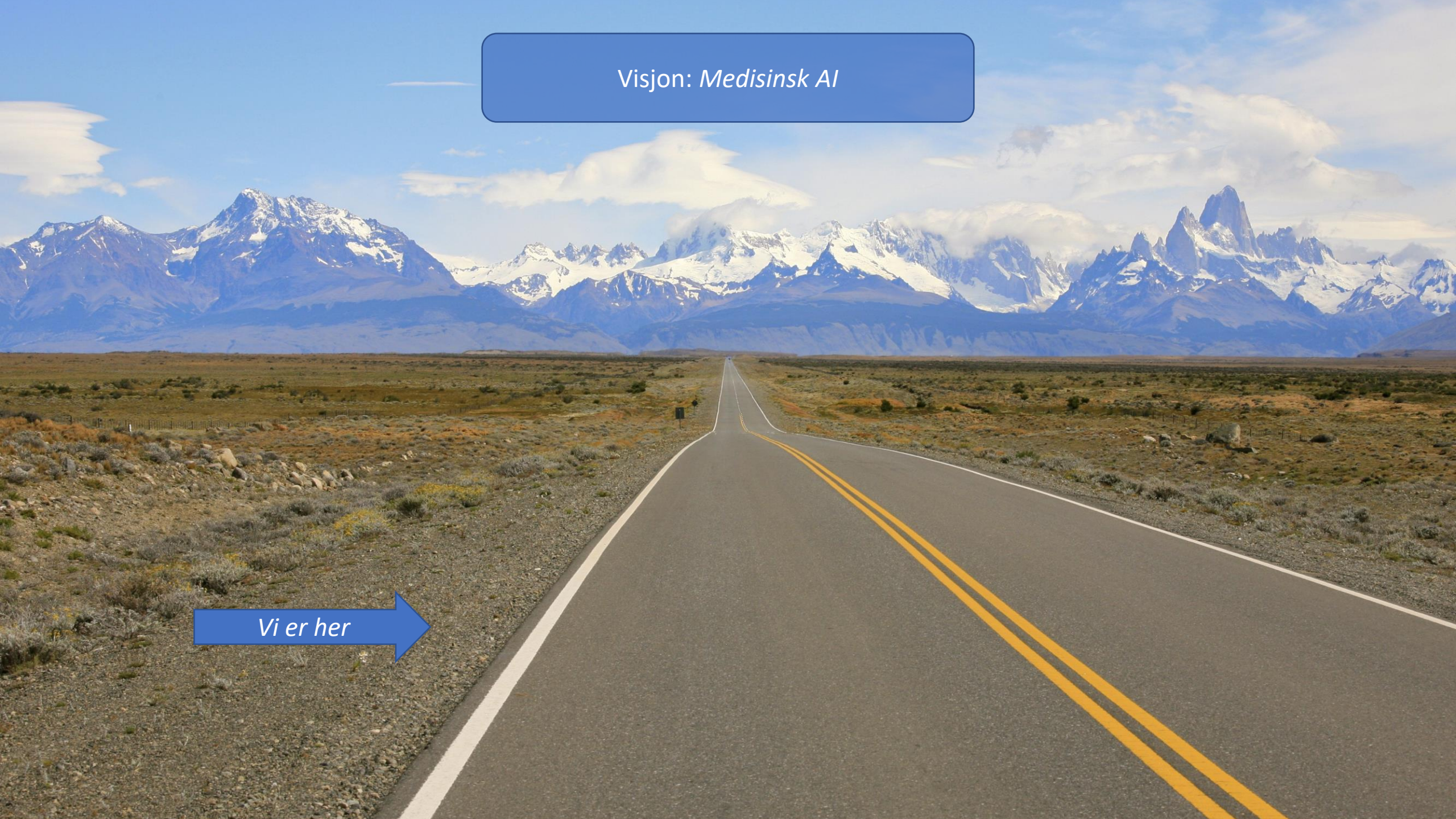
Preventative

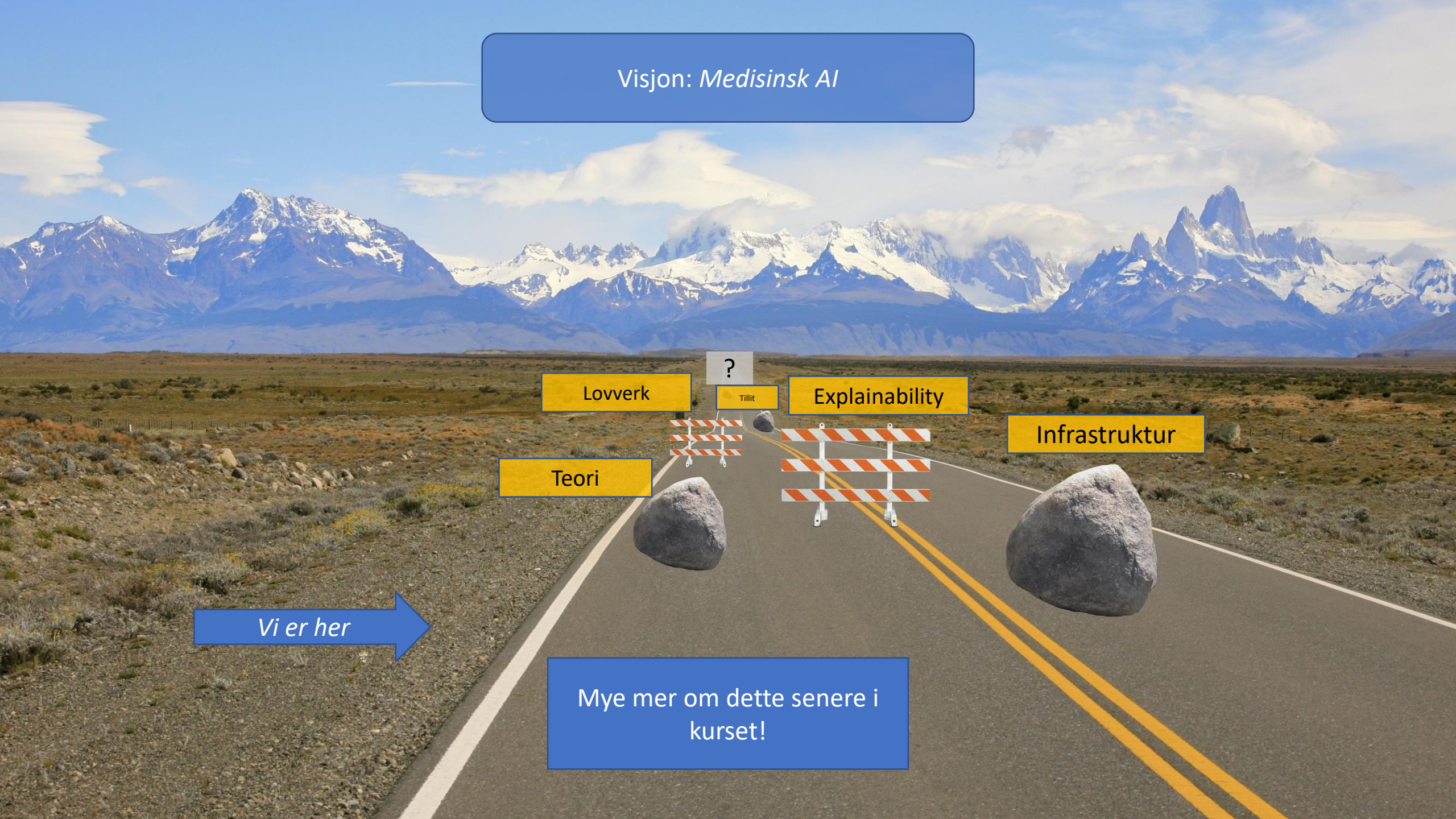
Personalized

Precise

Participatory




Visjon: *Medisinsk AI*
Vi er her


Visjon: *Medisinsk AI*
?
Tillit
Lovverk
Explainability
Infrastruktur
Teori
Vi er her
Mye mer om dette senere i kurset!


Visjon: *Medisinsk AI*
Mer om dette senere i kurset
"Perspectives on Medical AI", Fredag Jan. 21
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Vi er her
Mye mer om dette senere i kurset!


Teori
Forskning
Praksis
Pasientbehandling

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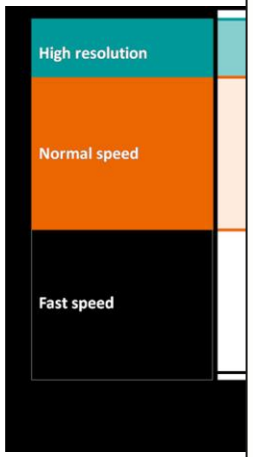
Siemens Biogra



AI for Radiology
an implementation guide

Products | Companies | Project AIR | Blogs | About | Contact

Products

Find the artificial intelligence based software for radiology that you are looking for.
All products listed are available for the European market (CE marked).

Subspeciality: All | Modality: All | CE: All | CE class: All | FDA class: All | Search... | Search

185/185 results

AI4MedImaging

AI4MedImaging

AI4CMR

Heart ventricles segmentation, quantification of ventricular volumes, myocardial mass, and ejection ...

The AI4CMR software performs a automatic cardiac segmentation and interpretation of Cardiac Magnetic Resonance (CMR), allowing quantification of various parameters without the need for intervention ...

Subspeciality: Cardiac
Modality: MR

Read more

CE: Class IIa - MDR
FDA:

Information source: Vendor
Certification verified: Yes

SIEMENS Healthineers

Siemens Healthineers

AI-Rad Companion Brain MR

brain volume quantification, segmentation, normative comparison, report generation

AI-Rad Companion Brain MR performs an automatic segmentation of the different brain areas, including an individual volumetric analysis. It compares the different volumes to a normative database and ...

Subspeciality: Neuro
Modality: MR

Read more

CE: Class IIa - MDR
FDA: Class II

Information source: Vendor
Certification verified: Yes

SIEMENS Healthineers

Siemens Healthineers

AI-Rad Companion Chest CT

Segmentation and volume quantification of lungs, lung lobes, lung lesions, heart, thoracic aorta, ...

CE: Class IIa - MDR
FDA: Class II

are: Edison

En *takeaway*: avgjørende å ha både tekniske personer og klinikere ombord

Ingen av disse kan få dette til på egen hånd!

Methods ↔ Clinic

HELSE BERGEN HELSE VEST

STORTINGET

Kurset tilhører Institutt for biomedisin og er assosiert med Mohn Medical Imaging and Visualization Centre og Institutt for datateknologi, elektroteknologi og realfag, Høgskulen på Vestlandet.

ELMED219

IMMIV

Western Norway University of Applied Sciences

UNIVERSITAS BERGENSIS

Høring om

Langtidsplan for forskning og høyere utdanning 2019-2028

Meld. St. 4 (2018-2019)

efolk» og kliniker ord

Kommunal- og moderniseringsdepartementet

Strategi

Nasjonal strategi for kunstig intelligens

Behov for tverrfaglighet

I utdanninger rettet mot utdanningssektoren, helse, kriminalitetsbekjempelse, jus og en rekke andre områder vil det bli viktig med kunnskap om kunstig intelligens og tilgrensende temaer som etikk og personvern knyttet til KI-anvendelser. Ved Universitetet i Bergen er det for eksempel etablert et innføringskurs i kunstig intelligens for medisin- og bioingeniører der studentene får lære om hvordan KI kan benyttes i klinisk arbeid. Målet er blant annet å bidra til økt tverrfaglig samarbeid mellom medisinere og ingeniører. Ved universitetene i Bergen og Oslo tilbys også emner i kunstig intelligens og maskinlæring rettet mot samfunnsvitere.

Høyere utdanningsinstitusjoner bør vurdere hvordan temaer med relevans for kunstig intelligens kan bli en integrert del av utdanningene på områder som vil bli endret av kunstig intelligens fremover.

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